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NFPT takes a unique physiological look at nutrition as it applies to fitness and athletics and the apparently healthy individual. This manual offers insight regarding energy provision from the time foods enter into the digestive process to when they are delivered to body cells and most importantly how it all relates to fitness and athletics. Never has the physiology of nutrition been taught to the fitness professional in a way that is more intriguing and comprehensive!

This manual content comprehensively addresses complicated body functions relating to physiological processes and “nutrient metabolism” as it is affected by all forms of exercise, and its impact on issues ranging from general health to advanced sports performance.

NOTE – Your scope of practice as a Sports Nutrition Specialist allows you to provide insight relating to the interrelationships between physiology and nutrition relative to fitness, exercise, and athletic performance among apparently healthy individuals. Dietitians are the appropriate health care professionals to be consulted for the planning and managing of a patient’s diet in hospitals and providing specialized dietary advice. Moreover, a dietitian should be involved in providing nutrition advice if the client is not apparently healthy. Moreover, Sports Nutrition Specialists cannot diagnose disease and advise on treatment of disease. Dietitians provide nutritional care relating to the effects of disease on nutrient metabolism using diet therapy, nutritional assessments, and clinical nutrition counseling.

Understand that your implementation of nutrition methodologies discussed in this manual are applied at your risk as any fitness nutrition recommendations may result in client injury or even death without proper screening and the required involvement of the appropriate health care professional.
Introduction

Taking A Unique Approach To Making Dietary Recommendations

Teaching healthy dietary practices can be viewed from 2 totally separate perspectives. One perspective, generally that of the dietitian and most fitness professionals, is to educate from the outside. To provide for client distinction between nutritious wholesome foods and junk foods, identifying carbohydrate, protein, and fat sources, and offering consumer advice regarding food labeling. The other perspective is from the inside, or physiological perspective to include an education on what the body does with different foods once ingested, and foods’ positive & negative affects on physical health and well being. Knowledge gained from both perspectives is important. However, since education from the “outside” perspective is so widely practiced and made so readily available, it may be more interesting to focus on the not so common “inside” perspective in this study & reference manual.

Let’s begin our studies by discussing the body’s internal nutrient provision & utilization systems. The following will reflect a variety of little known facts and functions that occur inside the body relative to educating clients in the area of enhancing positive lifelong dietary habits, as well as ways to prevent the negative effects of poor eating habits.

With these facts established, it seems logical that we next look at the purposes these nutrients serve once present in the bloodstream, the positive and negative effects of high and low levels of each, and lastly how to enhance the positives while minimizing the negatives through dietary control.
3,500 – The Simple Math

Why should the number 3,500 always stand out in your mind as a nutrition specialist? This number has everything to do with the prescription of an overall fitness program as it centers around the total caloric intake.

It has long been known that 3,500 calories equate to a pound of bodyweight in the metabolically average apparently healthy individual with select exceptions. In this particular aspect, fitness can be reduced to a mathematical equation. In a perfect world, you would first prefer to have the diagnostic capability to determine RMR (Resting Metabolic Rate). The term RMR is somewhat similar to the term BMR. The RMR test basically determines how many calories an individual expends while sleeping. Each individual has a unique RMR. Generally speaking, those who have difficulty in losing weight will have a low RMR and those finding it difficult to gain weight will have a high RMR. The diagnostic determination of RMR is by far more accurate than the vague determination of BMR most of us will likely be using in determining resting caloric consumption. Prolonged, extremely low calorie dieting will slow the metabolism even more and would be reflected in a follow-up RMR sometime after a restricted caloric intake had been maintained. For this reason, especially among those with already low RMRs, it is important to keep caloric consumption at or above RMR needs otherwise these already low RMR dieters may be positioning themselves for an even greater fat accumulation due to an even slower metabolism. Conversely, it is just as important to maintain RMR minimum intake among those with already high RMRs in order to prevent an undesirable starvation loss of body (muscle) tissue.

Individuals with low RMRs typically expend fewer calories during both daily activity and the performance of exercise than do those with high RMRs who are performing the same work. When considering total daily activity expenditures, keep this in mind. With this issue addressed we can get on with the application of the magic number 3,500.

Diet & 3,500...

The least attractive method used for fat loss is unfortunately the most commonly used...dieting!

First of all, when one diets, there is always the opportunity for the body to cannibalize muscles and not draw from its fat reserves. This is unavoidable and can only be offset in degrees through the performance of resistance exercise. Even during the most moderate dieting the body views fat reserves as being more valuable than lean muscle as a starvation fuel source to hoard and will use sedentary muscles for energy instead. Through regular resistance exercise during dieting the body must continually adapt by the preserving and even building of otherwise useless muscle tissue in an effort to keep up with your imposed strength demands. This forces a greater degree of fat loss on a low calorie diet and the preservation of metabolically active muscle tissue which keeps the metabolic rate high.

Where do you draw the line when dieting? This is where the magic number 3,500 comes in. It is generally accepted that the optimum fat loss rate is achieved by consuming 500 calories/day below an individual’s weight maintenance intake need (RMR + daily activity + exercise expenditure). This is effectively measured in the tables provided elsewhere in this manual. At this 500 calories/day decrease, one should lose bodyweight at a rate of 1 pound per week (7x500=3,500). A diet any lower may result in unacceptable lean tissue loss. Conversely, those wishing to gain weight should also use the...
number 3,500 to regulate their weight gain. When gaining weight, using resistance training in the process to optimize the lean weight increase and minimize the fat increase, the participant needs to keep additional calories at approximately 500/day over their weight maintenance intake (RMR + daily activity + exercise expenditure). Once again, this is effectively measured in the tables provided elsewhere in this manual. Generally, these additional 3,500 calories (500 calories/day increase) will result in weight gain at a rate of 1 pound per week.

Both fat loss as well as weight gain diets that are too extreme end up being counter-productive resulting in either too much muscle loss during weight loss dieting, or too much fat increase during weight gain dieting. Never, under any circumstances, prescribe a diet that is less than is required for RMR needs (approx. 11 x LBW discussed elsewhere in this manual).

**Exercise & 3,500...**

The healthiest, however most difficult, way to lose fat is to exercise. If one could perform activity with a caloric expenditure of 500/day, he/she will lose weight at a rate of 1 pound per week. With this in mind, where weight maintenance is concerned, an increased expenditure of 500 calories/day through exercise amounts to the same as reducing calories at a rate of 500/day. Conversely, a reduction of activity expenditure in the amount of 500 calories/day amounts to the same as a 500 calorie/day increase in calories. Once again, this is the ideal weight loss rate. Keep in mind when exercising for fat loss though, that intense aerobic activity causes lean tissue loss, and also that resistance exercise needs to be performed during fat loss dieting to minimize the lean weight loss while dieting.

For the weight gain fitness program participant, it is not recommended that he/she perform a significant amount of aerobic activity opting of course to perform heavy resistance training to optimize lean weight increase. Unlike the fat loss participant, the best method of weight gain is to increase calories, taking care to perform resistance exercise at moderate to high intensity to insure against undesirable fat accumulation.

**Diet & Exercise...**

Combining proper caloric intake with the right exercise program is the preferred method of achieving any weight maintenance goal, fat loss or weight gain. Understand that if the participant is exercising and dieting each of these two variables need to be considered. For example, if a fat loss fitness program participant is expending 300 calories/day during exercise, the daily caloric intake need only be reduced by 200 calories. If the weight gain participant is expending 300 calories/day during exercise, the diet needs to be increased by 800 calories offsetting this expenditure to arrive at the desirable 500 calorie/day increase.
Metabolism of Nutrients

Carbohydrate Metabolism

Carbohydrates are ingested; enter into the stomach, and then into the small intestine, where almost all digestion occurs. The principle enzyme that breaks down carbohydrates in the small intestine is amylase. These enzymes then break down carbohydrates into simple sugars such as fructose, galactose, glucose, and smaller chains of glucose molecules (glucose polymers).

These simple sugars are then absorbed through the lining of the small intestine and transported to the liver through the portal vein where the liver then converts all these simple sugars into the common sugar glucose. Glucose is the only usable form of simple sugar in the body.
The liver, the most active organ in the body, performs some 64 vital functions. The liver releases this new glucose into the bloodstream to raise blood sugar levels to where they are supposed to be. If the supply of this newly ingested glucose is too high, it raises the blood sugar level. The excess glucose must be eliminated from the bloodstream. The pancreas houses the hormone insulin. When the blood sugar reaches increasing levels, insulin is released to transport and/or make available the excess glucose to body tissues. The muscle tissue is then the first stop for “insulin-carried” glucose, especially after exercise when muscle energy stores are low. Insulin actually opens up receptor sites on muscles allowing for the uptake of glucose to replenish depleted muscle energy stores. Once glucose is absorbed into the cell it is used for energy, the unused portion of this new glucose is then converted and stored in the muscle as glycogen. Glycogen is then saved in the muscle cells for anaerobic (heavy) activities. It is important to note that muscle tissues can only take up glucose at a gradual rate. If too much insulin-carried glucose is available at one time in the bloodstream, insulin’s next stop for the storage of this abundant glucose is the liver.

Not unlike muscles, the liver can only take up glucose at a gradual rate. The liver has the potential to store between 300 and 400 calories of glycogen. This liver glycogen, in contrast to muscle glycogen, is primarily used for brain function as well as for aerobic activities. When the liver stores are full, and there is still a considerable amount of excess insulin-carried glucose in the bloodstream, it will be taken off and stored as fat in adipose tissue. Unlike muscle & liver, fat (adipose) cells store blood glucose quite rapidly.

It is important to note that if the carbohydrates ingested are already simple sugars, or are low in soluble dietary fiber, they will be taken up into the blood too quickly. The pancreas then reacts quickly resulting in an “over-release” of insulin. Since the muscle tissues and liver take up blood-glucose very slowly, the surplus of insulin-carried blood glucose will bypass the two, and be rapidly stored in fat cells. Also, since the hormone insulin overreacts in this situation, and it’s function is to eliminate sugar from the blood, within 20 to 30 minutes, blood sugar levels may fall below resting levels (hypoglycemia). This reduces the glucose supply to the central nervous system having a noticeable effect on higher brain function, making you feel sluggish, tired, and run down.

The liver is then responsible for correcting this low blood sugar problem with the help of another hormone called glucagon, which is also released from the pancreas. Glucagon is released in response to low blood sugar levels. The glucagon then triggers the liver to release stored glycogen as glucose to replenish blood-sugar levels. This intermittent release of stored glycogen from the Liver to regulate bloodsugar primarily for brain function is known as glycogenolysis.

If glucagon reaches the liver and for some reason, such as extreme dieting, or overexertion, the liver cannot provide glucose for the blood, a sequence of events occur resulting in the eventual breakdown of blood proteins, and the undesirable cannibalism of organ and muscle tissue for the needed glucose energy. This process of tissue breakdown for energy is known as gluconeogenesis.

**Protein Metabolism**

The body has the life sustaining ability to transform ingested proteins into living body tissues through a series of metabolic processes.
When a protein is ingested it moves from the stomach into the small intestine, where almost all digestion occurs. The enzyme pepsin acts to break down proteins into smaller proteins (peptides) and individual amino acids. Complete proteins need to be ingested every 3 to 4 hours to insure the availability of all possible combinations of amino acids for cellular uptake.

Since the body cannot store individual amino acids, they are collected and exchanged in the liver, the blood, and the interstitial spaces (space surrounding individual muscle fibers), and cannot be used for cellular protein synthesis until all of the right combinations are present at once. The amino acids that are present are useless for protein synthesis until they are combined with the required missing amino acids. If the missing amino acids are not provided within 3 to 4 hours, the existing amino acids are deaminated and are no longer useful for protein synthesis.

The liver uses amino acids to build and store cannibalistic enzymes as well, for their release during times of physical stress. The liver builds blood proteins using amino acids. When the diet is insufficient in protein sparing carbohydrates, amino acids are deaminated by liver enzymes and used to produce glucose energy with a toxic by-product of ammonia. This by-product is further broken down by the liver into urea toxins and excreted in the urine.

The above amino acid deamination occurs via a process called gluconeogenesis, and usually occurs during strict dieting, overexertion, and/or while on a very high protein intake. This process is obviously undesirable because amino acids should be spared to rebuild tissues and make structural repairs. The most effective way of sparing amino acids for this purpose is to insure the ingestion of sufficient amounts of carbohydrates to provide for imposed energy needs. It is also important to note that too much protein intake may place undue stress on the liver and kidney in the case of a pre-existing condition. In order to minimize this stress while on a high protein intake, ingest large quantities of fluids.

**Fat Metabolism**

Ingested fats travel through the stomach and into the small intestine. The lipolytic enzymes bile and lypase act upon them, which is an emulsifier. Once broken down by these enzymes into phospholipids, triglycerides, and cholesterol, they are packaged back into chylomicrons and bypass the liver, entering directly into the bloodstream through the lymphatic system. These chylomicrons are taken up by adipose tissue or eventually make it to the liver where they are broken back down into phospholipids, triglycerides, and LDL and VLDL cholesterol. It is interesting to note that the VLDLs and LDLs that are ingested are exactly the same as that cholesterol the liver makes.

The phospholipids are released into the blood for transport to cells for structural membrane formation. Some of the triglycerides are broken down into fatty acids and glycerol. The fatty acids, which are the body’s abundant source of energy during both low level and steady state aerobic activity, are released into the blood. Glycerol is converted to glucose and either stored as glycogen, or released into the blood as well. Remaining triglycerides are either stored in the liver, or released into the blood for storage in fat tissue, and possible collection in the interstitial spaces (compartments surrounding muscle fibers) for adaptive purposes, which will be discussed elsewhere.

The LDL and VLDL cholesterol is released into the blood and are responsible for platelet formation in cardiovascular tissue contributing to cardiovascular diseases.
A typical healthy diet, according to some medical and scientific sources, consists of about 20 to 30 percent fat. This is a little on the high side. There is absolutely no reason for not being able to find sufficient healthy carbohydrate and protein sources to enable a person to keep their total fat intake down to about 20-25% of total calories consumed.

**Macronutrient Elements**

**Glucose**

*Description & Purpose*

The nutrient glucose is the body’s most preferred source of energy during daily activity. Under normal conditions glucose is converted and used for energy more rapidly than any other nutrient. The average adult cardiovascular system has the capacity to maintain approximately 80 calories of blood glucose. When circulating glucose rises above this level, the hormone *Insulin* is released from the Pancreas, and its function is to rid the circulatory system of the excess glucose in any way possible. In order for glucose to be taken up from the blood by all body tissues and organs (except the brain), the hormone insulin must accompany it, hence the familiar term “insulin-carried” glucose. Insulin-carried glucose is gradually taken up by the liver and converted to its storage form, *glycogen* if its stores are low. The liver’s capacity is approximately 300-400 calories of stored glycogen. When the liver glycogen stores are full, abundant muscle tissues, as needed, take up remaining insulin-carried glucose in the event the muscles are recovering from some sort of strenuous muscular activity. The final destination for remaining excess insulin-carried glucose is the adipose (fat) tissue. Also, it is important to realize that insulin-carried glucose uptake occurs much more rapidly in adipose tissues than in liver and muscle tissues. The order of uptake above reflects the desirable sequence of energy repletion under ideal conditions of recovery from activity.

**High Glucose Levels**

When gross increases in blood glucose occur (*carbohydrate overindulgence or simple sugar ingestion*), the release of insulin will be exaggerated resulting in the immediate removal of most if not all circulating insulin-carried blood-glucose since insulin’s function is to remove its attached glucose molecule from the blood at all costs. Furthermore, due to the more rapid glucose uptake by adipose tissues, the majority of this overabundance of insulin-carried glucose will end up in adipose tissues. This, of course, is clearly undesirable, and if continued, can result in overweight conditions, pancreas disorders, and blood sugar abnormalities (*Hypoglycemia* or *Type II Diabetes*).

**Low Glucose Levels**

When glucose levels are low (*low calorie dieting, low carbohydrate intake, negative energy balance, post-workout energy depleted state, aftermath of high calorie simple sugar intake*), the Pancreas releases a hormone called *Glucagon* whose function it is to stimulate the liver to convert and release its stored glycogen (*glucose*) into the bloodstream (*Glycogenolysis*). When liver stores are exhausted (typical under the above listed conditions), catabolic and cannibalistic enzymes and hormones are released into the blood that break down amino acids, blood proteins, and body tissues (*mostly muscle*), for energy. If a low blood glucose condition is prolonged and extreme, metabolic acidosis and death may occur as a result of the toxicity of the bi-prod-
products of protein and body tissue cannibalism (Ketone bodies).

**Amino Acids**

*Description & Purpose*

Amino Acids are the end result of protein ingestion. Amino acids are used for three basic functions in the body. #1-the building blocks for body tissue repair and synthesis. #2-the synthesis of hormones, enzymes, and blood proteins. #3-for energy production through deamination.

Amino acid use in building body tissue is well known. Specific amino acid combinations are predetermined through genetic nitrogenous base coding, to be synthesized into living body tissues, muscle tissues, hormones, even blood proteins (to include antibodies). While other specific amino acid combinations are destined to be synthesized by the liver into the very enzymes and hormones that convert free amino acids, blood/body protein and fatty tissue, into energy through deamination, catabolism, and cannibalism.

It is important to note that whenever energy is produced a degree of amino acid deamination is unavoidable. It is equally important to realize that free amino acids are available in the bloodstream for 3-4 hours for combining with other amino acids for the uptake and synthesis of body tissues. If after this approximate length of time, amino acids are still free in the bloodstream, they will be degraded and/or deaminated by liver enzymes into energy. This amino acid deamination results in the toxic bi-product ammonia, which the liver then converts into urea nitrogen for excretion.

**High Protein Levels**

There are two primary metabolic conditions during which an undesirably high protein level exists.

#1-*In the presence of sufficient total calories*, a level of protein intake that is greater than the body’s need will likely result in a positive nitrogen balance, but at the expense of over stressing the liver. Remember that through deamination the liver is charged with breaking down the toxin ammonia into urea for excretion. This requires more work on the part of the liver. The greater the excess amino acids the harder the liver has to work. Overabundant amino acid presence in the blood accelerates metabolism and more water is lost during these increased chemical reactions, possibly causing dehydration in varying degrees. An alternative to decreasing the protein intake under these stated conditions is the consideration of increasing the intensity of exercise. This will minimize the excess circulating amino acids. The best way to optimize protein intake is through UUN testing (discussed elsewhere) and then altering resistance training intensity.

#2-*In the absence of sufficient calories*, whether protein ingestion is high or not, a high level of circulating “broken-down” body proteins and resulting amino acids will indeed result in a negative nitrogen balance, as well as the liver's production of keto acids (toxic to brain function). This, low calorie, overabundant amino acid presence is clearly a more critical metabolic situation than when total calories are sufficient as outlined above, and is undesirable regardless of health and fitness goals. This situation occurs during prolonged and extreme dieting and or overexertion. Remember that fat loss goals and appearance take a back seat when health is threatened. Maximizing fat loss results does sometimes call for a substantial restriction of total calories, however, using Keto-stix (available at most drug stores), will reveal threatening ‘trace’ measurements of acetate. A positive Keto-stix reading is a serious matter and requires immediate action. Reduce intensity and frequency of resistance exercise, increase total calories,
reduce protein intake, spend more time recovering between sessions, drink more fluids, and/or minimize aerobic activity. Any one or a combination of several above recommended actions should result in a safer metabolic condition. Keep in mind that increasing the protein intake while reducing the carbohydrate intake with fat loss in mind will have positive fat loss effects since amino acid deamination constitutes more work and accelerates metabolism. It is not suggested to maintain an extremely low calorie, high protein intake for periods longer than 3-4 weeks, and increased water intake must be an integral part of this short-term dietary fat loss measure.

Low Protein Levels

#1-In the presence of sufficient total calories, low protein ingestion will not easily accommodate the building of new tissue. It becomes extremely important, if ingesting little or no protein, that energy needs are being completely provided for through ingested carbohydrates and fats, freeing up what few amino acids are present in the blood for the synthesis of body proteins listed earlier to include muscle tissues. When too little protein is being ingested and intense resistance training is performed, catabolism is prolonged and a long-term negative nitrogen balance can be anticipated. While there is argument that several natural complex carbohydrates contain protein, it is admitted that several amino acids are missing from these carbohydrates (argument made by vegetarian). In most cases when ingested proteins are insufficient even for the required synthesis and repair of vital blood proteins and organ tissues, catabolic enzymes and cannibalistic hormones are dispatched to degrade and cannibalize existing ‘low priority’ body tissues using their bi-products as building blocks instead. Since antibodies, for example, are among these ‘unneeded’ body tissues that are cannibalized, the body’s immune system suffers.

#2-In the absence of sufficient total calories, while performing little or no strenuous activity, it is likely that few amino acids will escape the deamination process. Furthermore, the synthesis of protein based hormones, enzymes, blood proteins and various body tissues will be compromised at best. The performance of strenuous resistance exercise under these low calorie, low protein dietary conditions will result in the continued cannibalism of various structural body tissues that may include muscle and organ tissues.

Optimizing Protein Intake

In an effort to maintain a “positive nitrogen balance” (ingesting more nitrogen than excreting), the intention should be to provide a steady flow of ingested protein (every 3-4 hours), consisting of a wide variety of amino acids allowing for all possible combinations. In this way you will be insuring the continued synthesis of body tissues, hormones and enzymes (positive nitrogen balance). It is important to realize that amino acids are most effectively spared from the process of deamination in the presence of sufficient blood-glucose energy that results primarily from carbohydrate ingestion in the apparently healthy individual. So, as long as protein intake is sufficient, the ingestion of more total carbohydrate calories will contribute to a positive nitrogen balance. Furthermore, since not unlike glucose, insulin must carry amino acids into muscle tissues, and carbohydrate ingestion causes insulin release, it would make good sense to ingest proteins with carbohydrates to optimize insulin-carried amino acid uptake and utilization in body tissues.

All protein foods have varying Protein Efficiency Ratios (PERs), with milk and egg proteins rating highest on the list of “complete” proteins.

The steady provision of protein throughout the day will generally result in a positive nitrogen balance. Where
activity is concerned, the greater the intensity and duration of resistance exercise, the greater the required protein ingestion.

Here is a suggestion to those of your clients who are not currently training for size & strength. Let your activity dictate your protein intake. If you trained today with a greater degree of intensity than usual, then ingest additional proteins every 3-4 hours. If your exercise intensity level was somewhat low today, then concentrating on your protein intake will not be as important unless you are practicing a high protein low carbohydrate diet.

As mentioned elsewhere, as an endurance athlete performing aerobic activity for 90+ minutes in a single session, consider the ingestion of proteins during the activity instead of complex carbohydrates. Protein ingestion may act to maintain blood-sugar levels longer.

**Fats-**

*Description & Purpose*

Contrary to popular belief, fats are a required nutrient in the diet. However, it is suggested that a balanced diet consisting of proteins and carbohydrates usually contains all the essential fats making deliberate fat ingestion unnecessary for the apparently healthy individual. This is the position of the National Federation of Professional Trainers.

As discussed elsewhere, ingested fats are broken down in the stomach & small intestine into *phospholipids*, *cholesterols* and *triglycerides*. In turn, these fatty tissue components are ‘packaged’ into bundles called *chylomicrons* and enter the bloodstream through the lymphatic system where the liver once again breaks them back down.

*Phospholipids* generally remain in the bloodstream to maintain circulating blood lipids. These phospholipids undergo gradual hormonal degradation and bi-products of this process are excreted.

*Cholesterols* (mostly LDL) are taken up by various body tissues, to include muscle, for tissue component repair. It is thought that LDL uptake increases linear to intensity and duration of exercise. HDL, otherwise known as the ‘good’ cholesterol, is a bi-product of this uptake of LDL by body tissues. It stands to reason then that exercise decreases circulating LDLS while increasing circulating HDLS. Also, it is important to note that the Liver can synthesis its own cholesterol, usually in the form of VLDLs. Keep in mind that it is the increasing ratio of circulating LDL to HDL that represents the greater threat of cardiovascular disease, not simply the total circulating levels of cholesterol.

*Triglycerides* circulate in the bloodstream and are broken down into *fatty acids* and *glycerol* to meet immediate energy needs during rest, low level activity and during the performance of aerobic activity. When in abundance, triglycerides are stored in the liver and adipose tissues as fat.

**More on Fats**

The first thing you should advise your client to do is to consume moderate amounts of saturated fats and cholesterols. These food sources include dairy products, fast foods, red meats, fried foods, and cooking oil that is solid at room temperature.

There are three basic reasons for a client to have high total cholesterol levels over 240 mg/dcl, inactivity, heredity, over-consumption.

*Heredity*

Since there was very minimal cholesterol in the diet long ago the human body adapted by calling on the liver to make its own cholesterol. Tendencies toward high cholesterol production in the liver
can be passed from generation to generation as genetic traits. Cholesterol is essential for the production of hormones and for the repair of certain body tissues to include muscle. When hormones are synthesized, LDLs (low density lipoproteins) and VLDLs (very low density lipoproteins) are needed. When tissues are damaged through the performance of work, cholesterol is needed for repair. In fact, the HDLs (high density lipoproteins), which are considered to be the good cholesterol, are actually secreted from the liver into the blood to assist with the uptake and use of LDLs and VLDLs for tissue repair after the performance of strenuous work such as resistance training.

It is not surprising then that we encourage those with an inherited cholesterol overproduction problem, to perform resistance exercise to increase the good HDL cholesterols, because HDLs in turn attract and eliminate the bad LDL and VLDL cholesterols from the bloodstream. Simple cutting down on dietary intake for those with an inherited cholesterol problem may not in itself have an optimal effect.

**Over-Consumption**

The other case of high cholesterol is simply due to over-consumption, and can easily be determined through your preliminary dietary review. If the client’s food selection consists of considerable saturated fats, which are high in cholesterol, you may wish to recommend he or she have a complete blood profile performed with special emphasis on their total cholesterol and the LDL to HDL cholesterol ratio (no greater than 5 to 1).

It is very important that the client know it is not simply the total cholesterol being too high that represents a problem. The ratio of LDL to HDL is a major concern as well, and should be no greater than 5 to 1.

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**Amino Acids in Muscle**

Once amino acids have been taken up into the muscle, there are two basic cellular functions they are called upon to perform. The first, and most vital function is to become cellular catalysts. These catalysts perform cellular work, and the rate of their depletion is directly related to the amount and duration of cellular work performed. Without catalysts, the muscle fiber would no longer function. For this reason, catalyst replenishment takes precedence over repairing tissue. The second function in the case of muscle conditioning is the use of surplus amino acids as the building blocks used to create and repair body tissues. This process is commonly known as “protein synthesis” in muscle tissue.

If the duration of intense exercise is too great, catalysts are depleted and must be replaced immediately in order for them to perform survival functions. The absorbed amino acids that are intended for protein synthesis are the first to be converted into catalysts. If there are insufficient amino acids present, the muscle tissue itself will be used (gluconeogenesis). This constitutes overtraining and is obviously undesirable.

The simplest way for your client to avoid this type of “catalyst depleting” overtraining is to consume adequate total calories to include complete protein every 3 to 4 hours.

Also, since the body prefers to use carbohydrates for energy, insure the client is consuming an adequate amount of carbohydrates which spares protein. Last, of course, set up a routine for your client that is not over exertive, and there will be sufficient post-workout recovery catalysts and energy present to immediately initiate anabolism and avoid continued catabolism (tissue breakdown). It is interesting to note that the individual amino acids Leucine, Isoleucine, and Valine...
make up almost 60% of all muscle tissue. They are believed, therefore, to be the primary amino acids that are most readily taken up and converted into catalysts, sparing other amino acids for protein synthesis and energy production.

**The Role of Fat**

The body is an adaptive mechanism. Fat is actually transported and stored in different locations based on the exercise and activity needs imposed on the body and genetics.

Ingested fat is of 3 types, the newest man-made addition to the fat family, “trans-fats” which are by far the worst to ingest and are very high in cholesterol; saturated, containing cholesterol; and unsaturated, which does not contain cholesterol. All contribute equally to fat accumulation. It is also interesting to note that in the absence of dietary fat, excess carbohydrates and proteins are converted and stored as fat. The end result being the same, only the process is slower. For this reason, a calorie, is a calorie. A high total caloric intake, even low in fat, is more likely to contribute to fat accumulation than a low total caloric intake consisting of moderate to high levels of ingested fat. Under temporary restrictive dietary conditions (pertaining to those individuals with average metabolisms), the body is deprived of its needed total calories in the first place, and it becomes desperate for ingested calories it can use for energy, even if they are fat calories. When the body’s demand for total calories is once again met, it then becomes important to restrict the now overabundant fat calorie consumption, because now these fat calories are surplus, and will be readily stored in fat cells. In relation to low calorie diets, the body’s priority system places quantity first and then quality. If your metabolism is slow however, the quality of the low calorie diet becomes more important.

Even with this understanding, it is obvious that avoiding excess fat intake is still the healthy thing to do. There is no benefit for a healthy diet to consist of more than 20-25% fat.

**The Role Fatty Acids Play in Carbohydrate Replacement**

It is a scientific fact that fatty acids are the muscle’s desired source of energy at rest. Fatty acids are taken up into the cell and used to make ATP that fuels the cell allowing it to perform daily functions. While recovering from high volume resistance training workouts, there is a considerable amount of glycogen that needs to be replaced using fatty acids at rest as the source of fuel enabling the muscle to replenish its reserves. No fatty acids...no energy to replenish glycogen reserves. Simple. It is almost humanly impossible to not be able to produce sufficient fatty acids at rest to provide for this recovery function. Fat loss will always be the end result of recovery from energy exhaustive resistance training while on the appropriate nutritional program.

Fatty acids are the desired source of ATP energy production at rest. When near “O” body fat exists (3% body fat is normally required to support live tissue), and the muscles are still not completely carbohydrate loaded, the introduction of dietary fat while carbohydrate loading will once again provide fatty acids for the production of ATP energy necessary to enable the muscle to efficiently perform the tasks of storing glycogen to the point of super-saturation. In order to elaborate on the above, there have been reported deaths among high level professional bodybuilders who drove their body fat and fat ingestion so low as to result in related conditions.
Strictly following a proper diet can at times be extremely difficult, if not impossible. It takes practice! It may take up to a year to completely change current bad eating habits into good ones. Suggest to your client that he/she work on their diet one meal at a time. Work on the first meal for a period of a week, two weeks, or as long as it takes to make this particular meal healthy, then move on to the next.

DO NOT associate the word diet with starvation! This is one of the worst things a person can do to himself or herself both physically and mentally. When their body senses starvation, it will go into a survival mode, and conserve body fat, instead opting to use amino acids, blood proteins, and muscle & organ tissue as primary sources of energy.
Mentally they are destined to break down and feast on junk food, later viewing this as a personal failure. Starvation as a means of fat loss should be practiced only by a qualified physician for the treatment of severe cases of obesity. As the client learns more about their diet, they may be surprised at their required number of calories. Not everyone has the same caloric needs. Stick to a consistent number of calories, monitor body fat percentage, and when this percentage levels off, you will then know exactly what the participant’s caloric needs are. This will then allow you to make adjustments to their diet for weight loss or weight gain. Also, keep in mind that one gram of fat is more than double the number of calories found in one gram of protein or carbohydrates.

Think of food simply as energy. The purpose of this energy is for oxidative functions of the body. So, generally speaking, if you are eating lower quality energy, your body functions are of lower quality.

Because of today’s hectic lifestyles it is common to take in lower quality energy (fast foods, etc.). Our western civilization has developed one of the worst, if not the worst, diets in the entire world. We practically have a monopoly on heart disease and certain cancers. As the age old saying goes, “you are what you eat”!

Following a proper diet may mean for some the transformation of one big meal a day into 4-5 smaller meals. Eating only 1-2 large meals per day may mean that their body spends time in the starvation mode for many hours at a time. Also, eating more calories at a given time than can be readily used, may result in fat storage. Eating 4-5 small meals each day causes digestion to take place for longer periods throughout the day, which actually raises the metabolism. Following a proper diet will usually mean, for most people, to lower fat intake.

When discussing diet, it is essential to mention the body’s most immediate needs are oxygen and water. Adequate fluid intake is extremely vital to many internal body functions. If your clients are like most, and physical appearance dominates their motivation to exercise and eat properly, consider the following. In addition to muscle cannibalism caused by starvation and muscle atrophy caused by inactivity, there is similar muscle shrinkage due to dehydration. A considerable amount of muscle is fluid. When the body senses dehydration, it retains water. During this period, a portion of the fluids in the muscle will be given up to help with various needs elsewhere in the body. Not unlike starvation, dehydration will cause fat cells to increase in size. Only this time these fat cells are pulling in survival stores of water (more on water retention later in this manual). Since during dehydration a large portion of this water taken up by fat cells comes directly from muscle tissues, your body composition will suffer tremendously.

Since we spend so much time and effort training to improve our physical appearance, it only makes sense for us to avoid inactivity, starvation & dehydration.

What is Junk Food?

Posing this question to the average person will usually elicit a response of “that’s easy, food that’s not good for me!” Is this an accurate statement? Close enough?

There are regulatory agencies in place applying stricter nutritional guidelines for the care of domestic animals than human beings!

To be more specific, in terms of describing junk food, consider the following definition. “Any man-made
digestible or partially digestible substance lacking sufficient enzymes, or the enzyme producing elements required to break down the host substance, thus calling upon the body to produce the appropriate enzymes on its own taxing related body systems”.

One of the many locations in the human body where enzymes are produced is actually in the lining of the small intestine itself. It has been theorized that in the beginning of man’s existence, there was no need for the body to create enzymes (mainly in the intestinal tract), because in that time, all “natural” sources of nutrients contained ample enzyme producing elements for the proper assimilation of the host foods. Over the years then, starting with procedures as seemingly innocent as food preparation and cooking, our bodies have gradually adapted by learning to produce additional enzymes on their own. While this is an interesting theory, it remains just that, a theory.

It would seem significant at this point to loosely define healthy foods. In contrast to the above definition of junk foods, by reversing, if you will, the definition of junk foods, you arrive at a functional definition of healthful foods.

**Negative Calorie Foods**

Is this possible? Can a food actually have not only no calories, but also even negative calories? No way! And, if it were possible, what effect would ingesting negative calories really have? Could you literally eat your way to fat loss...the more you eat the more you lose? And, on the down side, would the ingestion of “negative calories” potentially off-set your “positive calorie” energy reserves, canceling out the effectiveness of your strength training...because, as we all know, we need calories to manufacture energy both for exercise and for recovering from exercise?

After performing some research, there may actually be some truth to this innovative perspective on the composition of some foods.

All right, in fact, there really is no such thing as negative calorie foods! That is to say, not until after these particular foods have been ingested. What happens after that, however, may come dangerously close to what could ultimately be interpreted as truly a fat loss response on the part of resulting internal metabolic processes.

All foods have a caloric (calories), macro-nutrient (carbohydrate, fat, protein), and vitamin & mineral content, with many having their own enzymes. For the purpose of this subject area, we will concern ourselves with the caloric & enzyme producing components of foods. It has been simplified by researchers, that vitamins can be considered biochemical's found in foods that, among their many other functions, stimulate living tissues to produce enzymes. Ideally foods contain and cause the production of sufficient enzymes to breakdown that particular food’s caloric nutrients. Therefore, for our purposes, one relative result of vitamin ingestion is the production of enzymes.

As a side note, this lay definition of vitamins paves the way for a more clear understanding of empty calories (junk food) as well. Foods falling into this “empty calorie” category would be foods with too little enzyme producing elements, vitamins & minerals, while containing a surplus of calories. The ingestion of empty calorie foods requires the body to produce significant amounts of its own enzymes (usually in the lining of the intestinal tract) to be able to convert...
these “empty calories” into usable energy. Obviously, these enzyme-producing functions in the body should be reserved for the performance of other internal, and more vital metabolic reactions.

It is a given these days, that it is difficult to find foods that contain a sufficient amount of vitamins & minerals to alone break down their own “host” caloric nutrients (purely natural food). This situation can be attributed to nutrient robbing pesticide application, processing, the use of preservatives, and various commonly used poor cooking practices.

Surprisingly, in the case of the foods in question, not only are there sufficient vitamins & minerals, there is actually a surplus of these enzyme producing biochemicals! This simply means that once ingested, these “negative caloric” foods provide for enzyme production in quantities sufficient to break down not only its own host calories, but additional calories present in digestion as well! Is this discovery truly a tremendous breakthrough? Not really. Unless of course, research is performed confirming that these surplus enzymes produced in digestion are in some way transported into the bloodstream. As likely as this enzyme transport would seem, until now there has been no real evidence to support this conclusion.

Reference #1:

According to a recent study performed by Dr. Dean Ornish, M.D. of the University of California, at San Francisco, research subjects adhered to, a vegetarian diet consisting mostly of fruits and vegetables, as an experimental study on the reversal of heart disease. As a result, each of the research subjects (all suffering from heart disease), lost an average of “20 pounds” without cutting calories, or limiting serving sizes. In light of the fact that these subjects were 40 years and older (with relatively slowed metabolisms), and the research performed involved no prescribed exercise program, this constitutes a dramatic weight loss that could only be attributed to the consumption of various fruits & vegetables and could point to foods in this fruit and vegetable group as having a “negative caloric effect”.

Reference #2:

In an article in the January, ‘94 Issue of Self Magazine, contributed by Dr. Neal Barnard M.D., author of “Food For Life” (Harmony Books), he basically supports the concept of “negative caloric” foods (keep in mind there were no research studies referenced in this article to support his claims).

Let’s speculate for a moment. With the above information in mind, while obviously not conclusive, let us assume the transport of these “surplus digestive enzymes” into the blood is a given. Now then, the fact is, enzymes are responsible for the acceleration of ALL chemical reactions in the body. The acceleration of chemical reactions in the body then equates to a faster metabolism (this effect is implied by the earlier referenced studies performed by Dr. Dean Ornish, M. D.). Now then, this conclusive discovery would truly be a tremendous breakthrough. The greater value then, in identifying and ingesting these “negative caloric” foods, is not in their ability to break down other existing calories in digestion at all. The true potential benefits lie in the increased enzymes produced, being absorbed through the mucosa in the small intestine thus entering into the bloodstream where they can positively affect the rate of metabolism. Based on the above, this may possibly be the case.

In building upon the above conjectures, to optimize this metabolic acceleration, these researched & identified “negative caloric” foods should preferably be ingested in the absence of additional enzyme robbing “empty calories” (junk food). This would insure that an opti-
mum amount of enzymes are produced for absorption into the bloodstream and not wasted during digestive processes on assimilated calories from foods with poor vitamin and nutrient content.

All things considered then, stocking your kitchen with “negative calorie” foods (most fruits & vegetables), coupled with the frequent ingestion of these foods in the absence of empty calories, could actually contribute to a continued increase in the metabolic rate. A higher metabolic rate offers incredible health and fat loss benefits. It would be unfair not to offer up a list of what have been determined to be negative calorie foods. Below is a list of some of the foods Dr. Barnerd claims to have a negative calorie effect. Because some of the foods listed by Dr. Barnerd were not fruits and vegetables and were to us “questionable”, we are only providing you with the fruits & vegetables from his list. We feel more comfortable doing this since there was more validity to Dr. Ornish’s studies, and it is clear that the foods used in his research study were fruits & vegetables almost exclusively.

- Citrus fruits (of all varieties);
- Corn;
- Broccoli;
- Spinach;
- Carrots;
- Potatoes;
- Chickpeas;
- Sweet Potatoes;
- Green Beans;
- Black Beans;
- Green Peas;
- Lentils.

**Importance of Water**

An estimated 60% of total body weight is water. Water helps to maintain body temperature and allows for over 50% of all chemical reactions occurring in the body. It is also responsible for the movement of nutrients, digestion, absorption processes, circulation, and the excretion of wastes.

Water also is a vital component in synovial fluid (which is a joint lubricant), and cerebrospinal fluid in the nervous system. Water is in part responsible for the transmission of light and sound in the eyes and ears.

The body’s average daily loss of fluids through excretion, respiration, chemical reactions, and perspiration varies from about 1 to 3 quarts. A high protein intake calls for an even greater amount of fluids.

At 2% dehydration, the body’s work capacity decreases by 12 to 15%. Also, body temperature and heart rate increase during periods of dehydration. The body’s prevention mechanism is osmoreceptor transmission to the brain stimulating a sensation of thirst prior to the occurrence of dehydration.

The primary contributor to life threatening dehydration occurs with vomiting and diarrhea during illness, calling for not only the replenishment of fluids but also electrolytes and minerals. Conversely, moderate exercise induced fluid loss seldom requires significant need for electrolyte replacement in the absence of sweating.

In any case, when the body is deprived of fluids, it will pull water from any or all reserves earlier mentioned in an effort to maintain critical blood volume and a safe body temperature. A prolonged low fluid intake, high sodium ingestion, or excessive prolonged use of diuretics such as caffeine, alcohol, and others, can trigger a variety of hormonal responses resulting in the survival storage of surplus fluids. By increasing fluid intake, this survival fluid storage response will be effectively reversed and a desirable loss of excess water weight will occur.

Fluid imbalances contribute to a host of metabolic disorders, and you can easily reduce all of these potential health threats simply by getting into the habit of drinking more water, at least 8 to 10 glasses daily.

Water can be absorbed from the small intestine at a maximum rate of 8 to 10
ounces every 20 minutes, and should be ingested during and after exercise (especially in hot, humid climates). Cold water enters the small intestine faster, and is therefore suggested.

In preparing for exercise when profuse sweating is anticipated, simply weigh in prior to and after, and then ingest 16 ounces of water per pound of weight lost, at the above prescribed rate (8 to 10 ounces every 20 minutes). A sports drink may be used.

Never take in large amounts of sodium during exercise. The temporary hypertonic concentration of sodium in the blood will result in an osmotic shift of fluids out of the working muscles. This causes severe cramping and increased susceptibility to heat injuries (such as heat stroke and heat exhaustion.)

However, if activity is very intense and/or lasts longer than about 60 minutes, and produces profuse sweating a sports drink can be used that is 6 to 8% sugar solution (over 10% may interfere with fluid absorption), and a sodium concentration of about 100 mgs/8 ozs of fluid. Sweat rates vary and may increase the need for fluid and electrolyte replacement. Also, it is advised to drink between 16 and 24 ozs of fluids within 30 minutes after event completion.

Also, stay away from any amino acid supplement that is produced by a process called hydrolysis. Some amino acids are compromised and rendered useless, or these supplements could include toxic by-products formed during processing.

What makes us thirsty?

Sodium, being the electrolyte responsible for fluid retention, holds the key to why we thirst. Throughout the day, active or not, there is a gradual reduction in blood fluids from chemical reactions. Of course this occurs much more rapidly during exercise than at rest, but never the less it occurs constantly.

When fluids are lost and sodium remains, there is a steady increase in the concentrations of sodium in the blood. When the concentration reaches a certain level the thirst centers in the brain are triggered to create the sensation of thirst. Upon the ingestion of additional fluids, the sodium concentration is diluted down to acceptable levels shutting down the thirst center in the brain.

The Electrolytes
Sodium & Potassium

In better understanding these electrolytes and their significance relating to the subject matter, it is accurate to say that Potassium is the electrolyte that pulls fluids into the muscles while Sodium pulls water out of the muscles. When sodium is more concentrated outside the muscle than the potassium is inside the muscle water shifts out of the muscle (undesirable). This will cause cramping and heat injuries. When sodium is less concentrated outside the muscle than the potassium is inside the muscle water shifts into the muscle (desirable). An ongoing chemical reaction called the “sodium/potassium pump” works continuously in an effort to maintain a balance of these electrolytes. In fact, 2/3 of all the energy being used at rest is needed by this “pump” to maintain this crucial water balancing act. Moreover, be aware that water is also brought into the muscles along with carbohydrates (Insulin-carried glucose), at a ratio of 3 to 1. This is a contributing factor to muscle size increase during carbohydrate loading.

There is no established dietary requirement for sodium but it is generally observed that the usual intake far exceeds the need. The average American ingests 6-18 grams of sodium chloride each day. The National Research Council recommends a daily sodium chloride intake of 1 gram per kilogram of water consumed. An excess of sodium ingestion may cause

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an increased amount of potassium to be lost in the urine. A prolonged abnormally high amount of sodium in the body will result in fluid retention accompanied by dizziness and swelling of areas such as the legs and face. An intake of 14 to 28 grams of salt daily is considered excessive. It should be known that diets consisting of excessive amounts of salt contribute to the increasing incidents of high blood pressure. The simplest ways to reduce sodium intake is to eliminate the use of table salt, processed and breaded foods.

It is generally correct that blood concentrations of sodium, found in salt, is directly related to the regulation of safe body fluid levels as a part of the process previously discussed. Another benefit to the presence of sodium is the re-absorption of water (otherwise excreted) in the kidneys.

While there are various neurotransmitter and hormonal actions that play vital roles in this delicate balancing act, water intake and sodium level manipulation are the only means by which to consciously attempt to control fluid levels (without physician assistance and/or the use of prescription dose medication).

At first glance, the ingestion of large amounts of sodium would appear to be a must for any dehydrated condition, regardless of its cause. This is simply not the case, especially in regard to exercise induced fluid loss. During exercise, especially in a warm environment, water loss is attributed to perspiration, increased water dissipation due to heat generated during accelerated chemical reactions, increased respiration, and lastly, water losses from inside working muscles due to the friction caused by increased contractile component movement. Significant amounts of sodium (3.0 to 5.0 grams) ingested less than 1 hour prior to the performance of intense and/or prolonged activity in hot and humid climates, should be avoided. The basis for this recommendation lies in the complete understanding of the above sodium concentration concept as touched upon below.

If the vascular system is maintaining a certain concentration of sodium throughout, and a great amount of sodium is ingested in a single dose just prior to, or during exercise, the vascular system will immediately direct fluid to the localized area where the sodium is now too concentrated (mostly in the gut) in order to “dilute” this sodium down to the normal concentration levels. This is accomplished by drawing upon “reserve fluids”, in most instances from the intramuscular areas. This temporarily pulls desperately needed water out of the working muscles, and in extreme cases, the heart, leading to severe dehydration, muscle cramping, and in the case of the heart, this short-term fluid loss could result in cardiac failure. For these reasons it is obvious that “salt tablet” use, still practiced by some coaching staffs on various levels of athletics, should be discontinued.

Carbohydrate Needs

Carbohydrates found in pasta, grains, vegetables, fruits, breads, cereals, rice, beans, sugar, candies, etc., are all of two basic types, complex and simple sugars. If a carbohydrate contains soluble fiber it is considered “complex” and is desirably absorbed more slowly. If a carbohydrate is lacking soluble fiber or is in other words a simple sugar, it will be absorbed quickly into the blood (only desirable when energy “sugar” is needed quickly). Prolonged eating behavior that centers around the ingestion of these simple sugars can lead to metabolic disorders such as Hypoglycemia and Type II Diabetes; both of which are relative to blood sugar levels and contribute to mood swings, depression, and several other mental impairments. Simply insur-
ing that each time you eat, you consume at least one food that offers a soluble fiber source can reduce the likelihood of these occurrences. All natural complex carbohydrates are sources of soluble fiber.

While discussing fiber, it is also appropriate to explain the role of insoluble fiber as well. Insoluble fiber is not digestible. Insoluble fiber absorbs water from the small intestines, and then passes on to the large intestine using these fluids to allow for smooth passage and excretion of wastes. A diet lacking in insoluble fiber will reduce the efficiency of waste excretion. The longer wastes are in digestion, the greater the absorption of “toxic” fluids. These fluids contain bacteria, toxins, and carcinogens, which end up in the bloodstream and have been connected to several types of cancers, and other metabolic disorders.

When you are looking for a source of insoluble fiber, look for the word “BRAN” on food labels. It is important to note that you will know when you are eating too much insoluble fiber when you are experiencing stomach cramps within about 20 to 30 minutes after eating.

Optimizing Carbohydrate Intake

In reality, since adipose tissue takes up glucose most rapidly, in the presence of overabundant insulin-carried glucose, a simultaneous uptake of glucose will likely occur in all tissues resulting in adipose tissue’s immediate competition with liver and muscular needs even when liver and muscle glycogen stores are significantly depleted. The generally accepted dietary suggestion of eating frequent small meals as opposed to eating infrequent large meals acts to regulate and minimize the amount of available circulating glucose over the 80 calorie level which represents the glucose concentration capacity of the circulatory system. It is when carbohydrates are ingested in large quantities and/or in the form of simple sugars that conditions are favorable for the over-release of insulin and subsequent undesirable increased adipose tissue insulin-carried glucose uptake. Limiting and controlling the availability of insulin-carried glucose in the blood is one of the primary keys to successful fat loss.

The perfect diet relative to carbohydrate intake, would call for the consistent and controlled frequent ingestion of carbohydrates in such amounts and with proper timing as to steadily maintain the circulating glucose slightly above the 80 calorie circulatory capacity. This, in turn, stimulating the pancreas to release only the amount of insulin appropriate to provide for daily energy needs and to gradually replete any and all glucose energy stores (muscle & liver glycogen), with an insufficient amount remaining for significant adipose (fat) tissue storage. This well-timed appropriately measured quantity of dietary carbohydrate ingestion would cause an extremely moderate and steady release of insulin. A closely guarded maintenance of blood sugar levels is generally accepted as being the foundation of healthy eating. What other dietary considerations can be practiced to this end relative to carbohydrate ingestion?

#1 When ingesting a significant amount of simple sugar (100+ calories), by also ingesting either a moderate amount of complex carbohydrates, or even some protein, these combined “macro-nutrients” will digest into a chyme thereby compromising the absorption rate of the otherwise unaccompanied simple sugar for its more gradual uptake into the bloodstream. This
**compromised rate of absorption** in turn desirably prevents the exaggerated over-release of insulin. In simpler terms, if you are going to eat simple sugars, eat them along with complex carbohydrates and/or protein. Do NOT ingest over 100 calories of unaccompanied simple sugar in any one meal that is not pre, during, or post-workout.

**#2** Knowing the difference between simple and complex carbohydrates is obviously essential to regulating blood-sugar. There is a rating system known as the “Glycemic Index” that scores various foods relative to their unaccompanied absorption rate into the bloodstream on a scale of 1 to 100. The higher the food’s glycemic index rating, the faster its sugar will end up in the bloodstream. These lists can be acquired by other means, however, as an NFPT Certified Nutrition Specialist, you are supplied with a “Master Food List” that includes Glycemic Index ratings (*a complete index on all foods is not known to exist at this time)*.

**#3** Provide carbohydrates to the body when it needs them and learn how much the body needs relative to the hour of the day and/or activity performed. These considerations will ideally minimize adipose tissue glucose uptake (*fat storage*).

**a. Carbohydrates and time-of-day** - Realize that when waking, the liver has been releasing glucose energy throughout the night for brain function and is likely low on stored glycogen (storage form of glucose). And, blood glucose levels will likely be low as well (80 calories or lower). This should tell you that anywhere from 300-500 calories of ingested simple and complex carbohydrates at breakfast will likely be put to good use since the early morning “empty” Liver is able to store 300-400 calories of “glycogen”. Therefore, breakfast is the meal of the day that can arguably consist of the most carbohydrates with the intention of discouraging fat accumulation. As the day wears on, in the absence of exercise consideration, carbohydrate consumption should ideally taper off up to bedtime. The metabolism naturally winds down in the evening and ingested carbohydrates at that time will serve no purpose and be stored as fat. Then, upon waking, initiate this entire carbohydrate intake cycle all over again. Remember, high carbohydrates in the morning and low carbohydrates at night.

**b. Carbohydrates and activity** - Generally speaking, glucose reserves for aerobic activity come more so from the liver than from the muscle tissues, especially once “steady state” has been achieved. Complex carbohydrate ingestion should be relatively substantial 2-3 hours prior to the performance of aerobic activity to insure all glycogen stores are full upon initiating the exercise. It was long recommended to ingest complex carbohydrates during aerobic activity that is prolonged (90+ minutes). While this practice is still beneficial, it has since been determined that proteins are the preferred fuel of choice during prolonged aerobic activity, since the *amino acid deamination process* (which results in glucose production), requires more time and the resulting glucose level is more gradual and sustained. Blood-sugar levels remain intact for long periods when ingesting proteins and/or complex carbohydrates during prolonged...
aerobic activity. It is significant to know that, in seeming opposition to this discussion, it is the exhaustion of muscle glycogen stores that result in an aerobic athlete “hitting the wall”. To explain however, it is when the blood fails to provide sufficient glucose energy during long duration aerobic performance (not addressing fatty acid involvement), that the muscle glycogen stores are tapped into. It is when these muscle stores are finally “tapped out” that the aerobic athlete hits the wall.

After a typical aerobic exercise session (20-60 minutes), while it is appropriate to replete carbohydrates to insure replenishment of Liver and blood-sugar levels (300-400 exhausted liver calories + 80-100 exhausted blood-sugar calories = 500 carbohydrate calorie maximum requirement), there is no great urgency, as the chief energy source for the performance of steady state aerobic activity is fatty acids.

Contrary in almost every respect to aerobic activity, muscle glucose reserves used for anaerobic, or resistance activity, are substantial and they require immediate replenishment in order to end catabolism (stage of metabolism during all forms of exercise), ward off cannibalism and initiate anabolism. Anaerobic energy reserves used to fuel a muscle during resistance exercise are chiefly exhausted from the working muscles. For this reason, so long as the glycogen stores of a targeted muscle are repleted through proper recovery (with proper nutrient provision over an adequate period of time), there is little need to make a conscious effort to ingest a significant measure of complex carbohydrates prior to a resistance training session with the intention of fueling your muscles for a weight training workout. However, it could be argued that a weight training bout suspected to include extremely intense muscle activity for a long period may be extraordinarily exhaustive to the cardio-respiratory systems therefore demanding a substantial high carbohydrate pre-workout meal similar to those dietary principles discussed above concerning aerobic training dietary preparation.

Moreover, it should be noted that any digestion occurring upon the initiation of resistance training, or any strenuous activity, might rob the muscles of energy and oxygen rich blood. Blood is needed in and around the intestinal region during digestion, and therefore will not entirely be made available to the working muscles to provide the much needed nutrients and oxygen. If a significant amount of food is present in digestion and the resistance exercise session is relatively intense and/or prolonged, nausea and dizziness will bring a quick end to any strenuous exercise session. Also, contrary to aerobic exercise, the post-resistance workout meal should be rich in complex carbohydrates in an effort to replace as quickly as possible depleted muscle energy stores along with an appreciable measure of protein as building blocks for “protein synthesis” given there is sufficient intensity during resistance training to call upon this anabolic need. The above discussed carbohydrate replenishment will spare intercellular proteins, and quicken the desirable metabolic shift to anabolism. As discussed above meals following aerobic exercise sessions require only moderate carbohydrate and total caloric intake since the chief aerobic energy source was fatty acids.

*More related information on this issue is covered elsewhere in this study manual.
Lowering Carbohydrates Will Lower Triglycerides

Our society has become overly conscious of excessive fat intake, ingesting carbohydrates at will with no professional direction. Our contesting this is not to say we should all throw caution to the wind in terms of fat consumption. Rather, we need to be more conscious of the over consumption of carbohydrates and more educated on the surprising role the carbohydrate actually plays in the accumulation of extramuscular fat. Our society’s pre-occupation with its war against fat, is getting us into even deeper trouble in terms of deteriorating health. The moderation of total carbohydrate calories for health maintenance, offers the more scientific approach. Science would agree with the lowering of carbohydrates along with a slight increase in protein intake. Fat intake should always be modest but should not be dwelled upon. The health and fitness professional advocacy of the “fat begets fat” position is a major contributor to the unbridled over consumption of carbohydrate calories, by those taught to concern themselves only with reduction in fat intake for fat loss while not addressing carbohydrate consumption. The simple truth is that almost everything has fat in it and cannot be avoided among most. The control of total calories is the dietary starting point of weight maintenance and fat loss. For example, if your clients’ energy needs for a given period are 2,000 calories, and they ingested only 1,500 calories, even if all from fat in this period, according to the “fat begets fat” position, there would occur an accumulation of fat. This is not possible. As long as the body’s total energy needs are not met by other preferred calorie sources (as in this negative calorie balance example), the above stated ingested fats will ALL be converted and used for energy without significantly measurable fat gain and quite likely a net weight loss due to the absence of sufficient total calories. Keep in mind however, a prolonged low calorie diet, such as is used in the example above, would lead to a slower metabolism and ultimately would then contribute to weight gain. Generally speaking, energy output must meet or exceed energy input or weight gain will occur taking precedence over the sources (carbohydrates, fats, proteins), of the energy input. Quality of calories is of greatest concern after the quantity of required calories are met. This is NOT a recommendation to ingest poor quality foods merely a fact for your consideration. Clearly, if we eat too much the quality of the surplus calories MUST be called into question.

It is no secret to researchers and educators that the triglyceride is comprised of fatty acids and glycerol. So long as the body is being provided with an abundance of ingested foods, the body will prefer using these “exogenous” calorie sources for energy production, and triglycerides will continue to be transported in the bloodstream, bound for storage in the liver and adipose tissues. Only when needed are these triglycerides broken down into fatty acids and glycerols for use as energy by the body. Glycerols, derived from the breakdown of triglycerides, are used for energy in exactly the same way as glucose. With this in mind, in the absence of sufficient blood glucose (reduced carbohydrate intake), the over-abundant triglycerides present will be broken down with the glycerols being used for glucose energy, and the fatty acids being used for sedentary and low level activity. Prolonged low carbohydrate intake will therefore result in reduced triglyceride levels. It is just that simple.
General Metabolic Considerations

There are three general categories of body types each with an associated type of metabolism: endomorphic, ectomorphic, and mesomorphic. For our purposes, the endomorph struggles to lose weight, and fewer calories should generally be recommended. The ectomorph struggles to gain weight and may need additional calories to do so. The mesomorphic category generally reflects the average metabolic classification. The General Dietary Advice Chart, as presented elsewhere, applies more to the mesomorphic individual.

In determining a client's metabolic category, compare client-eating habits to client appearance. For example, the client who consumes a large number of calories and still appears extremely thin is ectomorphic and should be treated as such. The client consuming few calories and who appears extremely thin should be approached as an average healthy individual in regard to the use of the General Dietary Advice Chart. Conversely, the client who consumes few calories and appears extremely heavy, is quite likely endomorphic and should be treated as such. The client consuming a large number of calories and who appears extremely heavy should be approached as a mesomorph in regard to the use of the General Dietary Advice Chart.

It is suggested to assign a 500 calorie per day adjustment. Keep in mind this is purely speculative as there are varying degrees to these categories. You will need to make the daily caloric adjustment decision on a case-by-case basis. Monitoring body composition will allow you to make future adjustments quite accurately.

Glycemic Index and Glycemic Load

What Do They Mean for Your Health?

It has been assumed that simple carbohydrates increased blood sugar rapidly and that the complex, high fiber carbohydrates had a slower impact on blood sugar. Research into biochemistry and food science has yielded the glycemic index (GI) and the glycemic load (GL) concepts, which are altering our understanding of how blood-sugar is affected by carbohydrate consumption.

The GI is a number assigned to each food telling how fast the carbohydrate triggers a rise in blood glucose. Some carbohydrates are fast release and will therefore have a higher number on the GI. For example table sugar or sucrose has a glycemic value of 100. If a food has a low GI value that means it is slow to release its sugars, causing a slow rise in blood glucose and a slower secretion of the hormone insulin which is desirable.

GI basically tells you how fast a certain food turns into simple sugar in the blood. It does not tell you how much carbohydrate is in a serving. To understand how a food impacts the blood sugar, both theses factors must be considered. That is where the glycemic load comes in. The GL is the GI divided by 100 and multiplied by the available grams of carbohydrates which are the (carbohydrates minus the fiber in grams per serving of the food.) Reading food labels will give you the information needed to make these calculations. The chart at the end of this chapter is for some common non-processed foods that do not come with nutritional content labels.

In order to do adequate calculations, be aware of the high, medium, and low values for GI and GL. A value of 70 or more is high GI. Medium is 56 to 69 and low is 55 or less. For GL high is 20, medium is 11 to 19 and low is 10 or under.
Below are grams of carbohydrates contained in a REASONABLE serving size

<table>
<thead>
<tr>
<th>Food</th>
<th>serving size</th>
<th>GI</th>
<th>Grams</th>
<th>GL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>1</td>
<td>38</td>
<td>21</td>
<td>8</td>
</tr>
<tr>
<td>Banana</td>
<td>1</td>
<td>62</td>
<td>26.7</td>
<td>16.5</td>
</tr>
<tr>
<td>Orange</td>
<td>1</td>
<td>42</td>
<td>15.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Pear</td>
<td>1</td>
<td>34</td>
<td>25</td>
<td>8.5</td>
</tr>
<tr>
<td>Carrots</td>
<td>½ cup</td>
<td>92</td>
<td>5.5</td>
<td>5.06</td>
</tr>
</tbody>
</table>

The fascinating thing about these figures is that some foods would not be considered good for you based on the GI alone, but since the grams of carbohydrate per serving are low, the GL value makes these foods certainly worth eating. Many foods can be high on the GI but low on the GL (GL being a better determinant of sugar release associated with foods). Carrots, for example, if judged solely on their GI would appear bad for blood sugar balance, when in reality the low grams/serving result in a very low GL.

This GI –vs- GL also speaks to the need for attention paid to portion sizes in weight maintenance. Eating the right portion sizes can make the ingestion of some seemingly unhealthy foods acceptable possibly resulting in a more palatable diet.

For more complete information on GI –vs- GL visit the website: www.glycemicfoodlist.com.

Dietary Roadmap to Success

Too many personal fitness trainers simply tell people what they already know about nutrition from watching television, reading the paper, and listening to the family doctor. Clients will likely expect you to have answers to some of their dietary questions, and trainers that can’t answer these how and why questions, may lose some degree of confidence from their clients.

All recommendations made by personal fitness trainers should be considered goal oriented to include dietary recommendations. Personal fitness trainers should be knowledgeable enough to back up their recommendations with explanations as to how and why their clients should practice them with confidence. Translated explanations are provided for each and every recommendation you make as an NFPT Certified Nutrition Specialist, acting in accordance with provided NFPT manuals and its extensive library of searchable fitness professional education materials. These in-depth NFPT resources will in turn enable you to effectively answer your clients’ how and why questions in professional yet comprehensive terms. There is also nutrition software found on the NFPT website available for NFPT credentialed professionals.
Meal Timing

Cardiac Response to Eating and Exercise

Do not eat within 2-3 hours prior to prolonged and/or intense physical activity. There is a physiological change that takes place relative to the cardiovascular system upon ingestion of foods. This change during digestion acts to redirect blood flow from the muscles to digestion.

Since the body’s total blood volume desirably remains the same, the movement of excess blood to any one part of the body requires an enlargement (vasodilatation) of the vessels in that specific region, and a reduction (vasoconstriction) in the size of the vessels in all other regions. When you eat, there is a greater need for blood in and around digestion for the purpose of carrying nutrients to the main vascular tree. When vessels dilate around digestion, they constrict in muscular areas. If you perform prolonged and/or intense exercise during digestion, the central nervous system will constrict vessels around digestion and dilate vessels in the working muscles. This nervous input and redirection of blood flow slows digestive processes and the motility of the digesting food in the
gut. As a result you may experience not only cramping but also nausea, dizziness, and a general feeling of fatigue.

**Eating Around Resistance Exercise Sessions**

**Pre-Workout Meal**

The pre-workout meal should be ingested hours prior to the performance of resistance exercise. How many hours? As many as 2-3. This is about the same time period as recommended before aerobic activity but for a different reason. Consider this, in intense resistance exercise, little if any energy is being provided to the muscles via the bloodstream. The shorter and more intense, the less extra-muscular energy required. This generally means that energy used during most resistance exercise comes predominately from sources within the working muscles. This being the case, there is less need to insure that liver glycogen stores are full, or even that circulating blood-sugar is optimal (since intense exercise causes an “Insulin-like reaction” in apparently healthy individuals resulting in the conversion of stored glycogen to blood-glucose energy). In preparing for a resistance training session as described above, it would be appropriate to eat a pre-workout meal as much as 2-3 hours prior that is high in protein and complex carbohydrates. This timing will insure that the early stages of digestion (in the stomach and small intestine), have been, or are nearly completed by the beginning of the exercise session. Digestive processes taking place in the stomach and small intestine require the presence of the greatest volume of blood. It is best to minimize digestive activity when performing exercise since both demand blood flow. And, sharing the blood flow will compromise both functions and lead to symptoms referred to elsewhere in this manual. Optimal oxygen and nutrient rich blood flow to the working muscles can be facilitated by the circulatory system only in the absence of digestive processes.

**Post-workout Meal**

During and following an intense bout of resistance exercise the body is in a stage of metabolism known as catabolism, most prevalent inside the just trained muscle fibers. This simply means that internal components (structural body tissues) inside these muscle fibers are being broken down for the energy required to #1-remove wastes accumulated during exercise, #2-repair damages to the muscles incurred during exercise “protein synthesis”, #3-to replace used up stores of muscle glycogen. As you can see, there are obvious needs for the ingestion of a high carbohydrate, high protein post-workout meal under these conditions. The emphasis being placed on complex carbohydrates, with the protein needs variable dependant upon the intensity of the just completed resistance exercise session. The more intense the exercise session was, the greater the resulting protein synthesis and need for the ingestion of complete proteins.

Failure to immediately ingest an appropriate post-workout meal that would otherwise provide the energy required by the just worked muscles will result in continued catabolism with undesirable tissue breakdown and muscle volume reduction. This condition is detrimental to the achievement of any and all fitness goals, as lean weight loss is the end result. And, the only true method of avoidance is through the ingestion of an appropriate post-workout meal as outlined above, at the earliest opportunity following the resistance workout.
Eating Around Aerobic & Incremental Exercise Sessions

Pre-Workout Meal

In the cases of muscle and cardiorespiratory endurance training it would be appropriate to insure liver glycogen stores are full and blood-sugar is at an optimal level at the onset of exercise. Remember however, not to overdo it in the pre-workout meal when it comes to total calories as the liver only has a glycogen storage capacity of 300-400 calories, and the bloodstream no more than 100 calories of glucose. All total then, this amounts to only a 400-500 calorie, predominately complex carbohydrate meal. If the activity will be prolonged beyond 90+ minutes in duration, it would be suggested to include another 250-500 calories (dependent upon specific duration and intensity), in the form of complex carbohydrates, opting for protein when possible (explained elsewhere). If these additional calories are not provided for activity of the extended duration indicated above, provided energy may be insufficient and body proteins will be cannibalized for the balance of energy needed. As stated earlier, these additional calories should ideally come from protein sources as it takes the body even longer to process and convert ingested protein into energy than it takes to process and convert complex carbohydrates into energy. A more popular solution is to ingest a sports drink containing simple during activity.

Note: While the chief energy substrate during aerobic and endurance activity performance is fatty acids, the use and maintenance of circulating blood-glucose energy is crucial, predominantly originating from carbohydrate ingestion and liver stores. So long as proper warm up of the cardiorespiratory and muscular systems are achieved, and exercise intensity increase is steady and gradual, the redirection of blood flow away from digestion will be equally gradual and adequate to provide oxygen and nutrients for the working muscles’ less than maximum energy needs. When calories are needed for exercise over even longer periods, 2 hours or more, if possible, it would be appropriate to ingest small quantities of additional complex carbohydrates and proteins during exercise performance.

Post-Workout Meal

Since the preferred energy substrate during steady state aerobic and endurance activity of reasonable duration, is fatty acids in the apparently healthy individual, the carbohydrate source glucose should come nowhere near exhaustion. When other-than-resistance activity is performed that is incremental & not steady state, i.e. boxing, basketball, football, etc., glucose expenditure increases and comprises a greater percentage of the total energy expended. Generally, and within given parameters of intensity and duration, the performance of incremental activities such as described above, will result in lower overall post-workout glucose levels than both resistance and steady state aerobic activities because liver as well as muscle glycogen stores are both being tapped.

The major difference between incremental and steady state aerobic activity in relation to glucose energy expenditure is that aerobic glucose energy comes chiefly from the liver, while incremental glucose energy comes not only from the liver but in large part from the working muscles. With this said, it would be appropriate to apply the same basic post-workout meal considerations to incremental activity performance as applied to
moderate resistance activity performance. In short, incremental activity falls somewhere between aerobic and resistance exercise. This means three things. #1 – Liver glycogen depletion; #2 – Muscle glycogen depletion; #3 – Moderate intensity, moderate protein requirements.

In getting back to aerobic activity post-workout meal considerations, it is clear that glucose energy has been expended and is in need of replacement. It is equally clear there is no measurable means to determine carbohydrate replacement amounts due to varying intensities of effort. It is therefore recommended to ingest 400-500 calories coming primarily from complex carbohydrates with some complete proteins in the post-workout meal. In cases of extreme aerobic (and even incremental), energy depletion, a 100 calorie simple sugar is recommended for immediate blood-sugar replacement more quickly initiating the recovery process. Apply these simple sugars especially when signs of mental and physical fatigue are present. This practice will bring blood-sugar levels back to a safe level within 5-7 minutes. The carbohydrates will generally insure the repletion of liver glycogen and blood glucose levels, while the protein intake will facilitate the synthesis of various deaminated and cannibalized blood proteins. All measures geared toward bringing the body back to the metabolic state of equilibrium and on from there to the state of anabolism if tissue is damaged and requires repair (another purpose for post-workout protein ingestion).

It should be noted also that “hunger” is not a sensation that is commonly experienced immediately following a workout. The absence of this sensation further encourages the unwillingness of the exercise participant to eat. Proper pre and post-workout dietary habits can therefore be considered a learned dietary behavior and YOU are the teacher. Participants should get out of the habit of allowing their bodies to dictate their diet. Eating is something to be dictated by our brains and not by our bodies. Eating and hunger should have NOTHING in common regarding meal timing. Eating without your body telling you to, makes your body an unwitting accomplice to accelerated metabolism and ultimate fat loss will result when eating by the clock and not the stomach.

**Discipline and Nutrition**

Let us equate your pet’s diet to your own, or to that of one of your clients’. While it is almost certain that pet food is less palatable than let’s say, a steak, or a slice of apple pie, a properly raised and well disciplined pet, having never tasted steak or apple pie, will want for nothing. Wouldn’t it be wonderful to have been born into a world where junk food and dietary temptation never even existed? We too then, would want for nothing. We would eat simply for the purpose of sustaining our body’s dietary needs, and never be faced with making that decision between cookies and grapes. We would be eating nothing but natural healthy foods just like our ancestors, and just like our bodies were created to eat.

Imagine the difference junk-free eating would make in all of our lives. Hundreds of thousands of people around the world currently suffering from every possible diet related disorder ranging anywhere from high blood pressure to diabetes; from depression and low self esteem to the hyperactivity common in our children brought on by hypoglycemia; from cardiovascular diseases to obesity. Just think of how difficult it would be in terms of breaking habits and unlearning eating behavior to go back to totally natural foods. While this may seem somewhat...
unattainable, as a fitness professional, you need to make the effort. It will take you a long way down the road to client respect and success as a fitness professional to do so.

The toughest part of eating right is in the early stages when the very thought of all your favorite foods affect your taste buds. And, like it or not, the real problem doesn’t exist solely in your mouth, but more so in the back of your mind. No, not deep in your subconscious either, rather in certain centers in the brain that are specific to causing physiological responses such as salivation, at the very thought or sight of different foods. You would be amazed to learn how much money actually goes into psychological research in putting together television advertisements for foods. The sole intention of this research is to manipulate regions of our minds in order to sell us a food product.

As you can easily see, you are definitely fighting an uphill battle all the way in declaring war on junk food. Only the strong willed, and the incredibly disciplined even stand a chance for success in establishing and maintaining life-long healthy eating behaviors. Only through effective and continued short-term goal setting, a serious and strong source of motivation, and a crystal clear vision of your ultimate achievement, can you ever hope to survive the arduous drudgery of taste bud denial in the preliminary stages of this dietary transition.

How long do you have to stick to a bland, healthy diet before you lose this taste for junk food? The answer is simple...as long as it takes. As is true with any worthwhile pursuit, if it means enough to you, you’ll do whatever it takes to get the job done. We all have our breaking point when it comes to healthy eating too. Many people would prefer to have their skin slowly and quite painfully peeled away, rather than having to go even one night without their half gallon of ice cream. While others may be able to simply put the thought of certain foods out of their minds completely and focus clearly on their goals and visions of the ultimate achievement.

Strict dieting is therefore not for everyone, as we all have different levels of tolerance to the actions of the brain centers that actually control taste. This is obviously reflected in the emotional roller coaster ride many overweight Americans are currently on, seemingly at the mercy of their brain centers’ regulation of taste, and the resulting failure to consume fewer calories, and partake exclusively of healthier foods. If anyone has the motivation to succeed it would be the obese. One must also recognize that our society is not exactly conducive to weight control either, with all the psychological manipulation in the food service industry, outrageous restaurant portion sizes, confusing food product labeling, and many food labeling practices bordering on being fraudulent, it is almost as though the cards are stacked against those wishing to make a positive change to their dietary practices.

This chapter was not intended to suggest a willingness to accept a client’s inability to change his or her eating habits on your part, on the contrary, it is intended to encourage an element of patience, and compassion for these people. What may come easy for you may be next to impossible for someone else. These people need to know you’re on their side. No matter how frustrated you feel about a client’s failure to adhere to your dietary recommendations, you should always be supportive, compassionate, and most importantly, a friend!
Post Workout Force Feeding

Much attention has been given to the topic of carbohydrate replacement following exhaustive resistance exercise. Rest assured there is no controversy here— or at least not anymore. Back then, on the surface, the need for immediate protein ingestion after a heavy training bout probably seemed to make a lot of sense. In Arnold’s defense, bodybuilding was then in its infancy, and because of the economic principle of supply and demand, there was no real money invested in the performance of research in the area of bodybuilding nutrition. This has since changed. Due to the steadily increased popularity of the iron game, there are now millions of dollars being spent in researching bodybuilding nutrition & supplements.

In these earlier days, however, before nutritional research was in full swing, the iron game was, for the most part, a guessing game. Do you believe that some of the world’s greatest discoveries were stumbled upon completely by accident? Back then, whatever the winner did must have been right, and what the loser did must have been wrong.

For a time, this hit-or-miss principle applied to other areas of athletics as well. For example, cyclists and other endurance athletes have been ingesting carbohydrate-based drinks during the performance of their respective events for years successfully, probably because someone in the past accidentally did it, and it worked. Ask one of these cyclists exactly why the timely intake of these carbohydrates is beneficial, and of the many quite logical responses you will get, the true answer will escape them every time. The very answer that escapes them is the topic of this chapter! You may be asking yourself, “So what? What if they don’t know exactly how it works? As long as it works, the reasons shouldn’t matter?” This way of thinking, has in the past, slowed the advancement of athletic performance in all sports. The truth of the matter is, that the more timely research into the exact reasons why this “carbohydrate ingestion during activity” worked for the endurance athlete, could have led to the earlier discovery of its positive effect on ALL athletes and resistance trainees. The practice of simple carbohydrate ingestion during post-resistance workout activity offers an extremely functional method of minimizing the duration of catabolism by “forcing” post-workout carbohydrate replacement on the muscles!

The primary reason why the ingestion of carbohydrates during activity by endurance athletes can productively be applied to those performing resistance exercises is because all athletes share a common denominator...the basic human anatomy. While various forms of exercise have distinct differences in the demands they impose upon the body, the energy pathways during recovery from exercise remain the same.

Let’s get back to the resistance trainee. It was Mike Mentzer who first ushered in the practice of eating post-workout carbohydrates. ICE CREAM contained the carbohydrates of his choice. In discussing the use of objectivity in the area of bodybuilding nutrition, Mike Mentzer comes to mind as one of the first to take a more learned approach. Mentzer’s post-workout “carbohydrate loading” sermons were at first met with indifference in the bodybuilding community. It wasn’t long, however, before this “methodology” was upheld time and time again through various studies. Mentzer’s once controversial carbohydrate replacement theory has today evolved into a cornerstone of the very foundation of productive resistance training & nutrition.

The NFPT has researched and now successfully applied a “force-feeding” principle that effectively enhances the
value of post-workout carbohydrate loading by including the performance of activity simultaneous to “simple carbohydrate” ingestion. The performance of this activity discourages Insulin from taking glucose to fat cells. Since we know fat cells generally mobilize fat during activity, and they cannot store Insulin-carried glucose & release fat at the same time, the Insulin has nowhere else to take the majority of this new glucose during the performance of this exercise but to the energy depleted muscle tissues. Hence, “force-feeding”. The application of “force-feeding” has appeared quite successful among resistance athletes in every instance to the best of our knowledge and research. The following is a brief summary of the concept of “force-feeding”.

An abundant amount of Insulin releasing simple sugar should be ingested immediately following a muscle glycogen depleting resistance- training session. Simultaneously perform post-workout low intensity aerobic activity. This will accelerate the insulin-carried glucose uptake in the badly depleted muscles (recovery), with minimal insulin-carried glucose being deposited in adipose tissues (fat cells) since these fat cells are forced to release energy during activity and cannot store energy at the same time. This leaves Insulin only one place to take its glucose... directly to glycogen depleted muscle tissues. This carbohydrate-loading will even be more rapid than normal since Insulin must remove overabundant blood glucose quickly.

With this understanding, it is no wonder why endurance athletes experience increased energy levels by ingesting carbohydrates during activity. These newly ingested carbohydrates are being driven directly into the muscle because fat cells are working hard to release needed energy and cannot store and release energy at the same time. Along with this newly delivered insulin-carried glucose comes considerable fluids as well preventing heat injuries, dehydration, and consequent muscle cramping.

Use this “Force-Feeding” concept to accelerate carbohydrate replacement and anabolism before you even leave the gym.

Note - If the client is a diabetic, make the appropriate considerations.

After your clients’ intense and exhaustive resistance- training workout, have him/her hop on a stair-master, exercise bike, or choose any one of a hundred other aerobic activities. Break out some nutritious form of Simple Sugar (fruit juices, honey, etc.). Immediately ingest anywhere from 100 to 500 calories of this simple sugar. The actual number of these calories should be determined based on two variables. #1- How energy exhaustive their training session was, and #2- the length of time they plan on performing the “low to moderate intensity” post-workout aerobic activity. Keep in mind that the circulatory system has an average capacity to maintain 80 calories of glucose before “spilling over”, and that it will take at least 5 to 7 minutes before the ingested simple sugar even reaches the bloodstream. Take these factors into consideration when applying the Force-Feeding concept.

As with the cyclist, as long as they are performing activity, the bulk of ingested sugar will be driven into recovering and working muscle tissues. It is suggested that you experiment somewhat in determining the right exercise duration and number of calories ingested. When properly applied, they should experience a more “full” feeling upon completion of this post-workout activity. The reason for this sensation, as you are probably aware, is due to the enormous amount of water that accompanies Insulin-carried blood glucose into recovering muscles. With this said, have the client drink plenty of water during this activity.

It is a fact that catabolism (break down of muscle tissue), initiated during the workout, typically continues for some time after training until sufficient recov-
Energy (blood glucose) is provided from outside the muscles. Once this “outside help” is provided, damaged muscles will stop eating away at themselves for energy. The Force-Feeding concept directly addresses this issue, thus accelerating recovery from training and shortening the catabolic period.

Used properly, this “Force-Feeding” concept will dramatically minimize the duration of post-workout catabolism “naturally”, and more rapidly initiate anabolism. These principles have been theorized and researched independently by the National Federation of Professional Trainers and found sufficiently effective to warrant publication. While this practice is proven quite safe and free from health risk only apparently healthy individuals should practice “force-feeding”. As mentioned earlier, those diabetics, insulin dependent or otherwise, are advised to take appropriate measures in this concept’s application, given their own familiarity with their specific health concerns. As stated earlier, since the initial publication of this “Force-Feeding” concept, there have been reports of its effectiveness in practical application without a single trainer complaint or report of ineffective implementation.

The questionable role of Insulin in “Force-Feeding”

Insulin cannot intelligently decide the destination of the glucose it carries. Its function is simply to remove overabundant glucose from the blood. For our purposes, there are two storage locations where Insulin can deposit its glucose: the muscle cells and the fat cells. The argument has arisen that since the presence of Insulin inhibits lypolisis (mobilization of fatty acids & glycerol from adipose tissues), that the exercise performed in force-feeding may not totally prevent the abundance of Insulin from depositing at least some glucose in these fat cells since the post-workout aerobic activity is not long in its duration and steady state. Even if this argument is valid (while not researched to NFPT’s satisfaction), the bottom line is this. The purpose of “force-feeding” is to shorten the duration of catabolic metabolism, and to more quickly initiate the anabolic (recovery & growth) process. Even if this incredible achievement can only be accomplished at the cost of some insignificant amount of temporary fat calorie storage, it will certainly be worthwhile in accelerating the recovery process between resistance training workouts.
Weight Training and Nutrition

Nutrition & Resistance Athletes

In the case of the resistance athlete, unlike the aerobic athlete, muscle glycogen stores and blood sugar levels should be at their optimum at the onset of exercise. The majority of energy used during resistance exercise comes from stores already compiled inside the muscle. Optimizing blood glucose levels is a precautionary measure in case of prolonged energy needs in the gym (high volume training). Eating properly during the entire recovery period between workouts is the key to optimizing the replenishment of muscle glycogen stores. From this standpoint, pre-resistance workout meals should be planned 3-4 hours in advance of performance, and at a minimum of 2-3 hours before. This time period is solely for the purpose of completing digestion and optimizing blood flow to working muscles.
The resistance athlete’s desired protein intake is discussed in depth in the protein metabolism and protein requirements section of this manual. To summarize, the greater the resistance and the intensity of effort, the greater the protein needs. It is suggested you refer to these sections for more complete information on this topic.

The most important meal of the day, contrary to popular belief, is the post-workout meal. Also, regardless of the intensity of effort and consequent muscle building needs, carbohydrates should still comprise the majority of your calories in this post-workout meal. The reason for this is simple. When you have finished a workout, there is an energy depletion, and waste product build-up, mostly in the muscles. Energy is needed by the muscles to remove wastes and to begin repairs. While there is a need for building blocks (amino acids) for tissue repair, there is an even greater need for carbohydrate energy in the form of sugar to perform these repairs, to remove wastes, and to replete glycogen stores. For these reasons, post-workout meals should be high in carbohydrates and moderate in proteins.

**Body Tissue Protein Requirements**

There is a method of exacting the amount of protein required by the individual through testing. UUN - Urinary Urea Nitrogen - nitrogen can be measured in the urine. Of consequent importance, the majority of commonly ingested proteins are 16% nitrogen. Therefore, for every 100 grams of ingested dietary protein, about 16 grams are nitrogen.

Explaining the significance of this realization is to determine the amount of your ingested nitrogen and then compare this to the amount of nitrogen excreted in the urine (UUN test). The following are conclusions that can then be objectively drawn from this comparison.

**Lean tissue loss** - If you are excreting more nitrogen than you are ingesting, you are losing lean weight and other body proteins (negative nitrogen balance).

**Lean tissue maintenance** - If you are excreting an amount of nitrogen comparable to the amount ingested, you are allowing for tissue maintenance but not growth (nitrogen balance or equilibrium).

**Lean tissue increase** - If you are excreting less nitrogen than you are ingesting, you are providing the materials with which to build lean tissue (positive nitrogen balance).

Scientists contend that protein intake need not exceed 10-15% of total ingested calories even in the case of size and strength training. In contrast, strength athletes are generally in favor of considerably higher protein intake. Before continuing, it is worth mentioning on behalf of the athlete, that protein needs does increase with increased training intensity. The greater the body tissue breakdown the greater the protein requirement. On behalf of the scientist, too much protein may cause liver and kidney damage (mostly to those genetically pre-disposed), as will be discussed later.

**A note to scientists** - Too little protein intake in conjunction with proper strength training will result in a detectable negative nitrogen balance as earlier explained. To slightly increase dietary protein, while monitoring nitrogen balance, will allow one to arrive at his/her specific, genetically based protein needs. Keep in mind these needs vary based on changes in training intensity and resistance used as mentioned earlier.

**A note to athletes** - Too much protein intake may cause you problems should you have an existing liver or kidney dis-
order. The liver must break down the excess ingested protein over and above the body’s needs. Deamination is discussed in more detail elsewhere in this text. When deamination occurs, toxins derived from this excess ingested protein may cause further liver and kidney damage. On a high protein diet, excessive urea can be found in the urine. This indicates that protein ingestion is far too high. However, moderate to high protein diets for strength-trained individuals appears to be relatively safe but also requires the increased ingestion of water.

In summary, everyone has differing genetic protein needs, and different types of training have differing protein demands. Any mention of protein requirements in this manual is strictly for the purpose of establishing a reference point from which to make changes. The only way to get around the protein requirement controversy is through nitrogen detection (UUN) which is admittedly an expensive and quite clinical approach.

Body Tissue Energy Production

Now that we have discussed body tissue protein requirements, let’s discuss how these same tissues convert nutrients into energy.

ATP is the only form of energy muscles can use. Knowing this, ATP is already synthesized and stored in the tissue cells, so you can perform immediate strenuous work, such as picking up a heavy object, or walking up a flight of stairs. The following events occur in the cell to produce ATP energy:

First, there are about 4 seconds worth of ATP already stored in the cells. After this period of sustained muscle contractions ATP in the working muscle is exhausted and the cells resort to the use of Creatine Phosphate and ADP to create more ATP that can provide energy for about another 25-30 seconds. The cell has a total combined storage of energy available to last up to about 30-35 seconds during sustained muscle contraction before the cell must resort to the conversion and use of stored muscle glycogen. When energy is needed for longer than 30-35 seconds, stored muscle glycogen is broken down into the form Pyruvate to produce ATP. During slightly longer periods, oxygen acquired from the blood assists Pyruvate creating ATP (sometimes referred to as metabolic oxidation.) These energy pathways are common in continuous tension resistance exercise and during the performance of strenuous work.

Also, in resistance exercise, oxygen transport into the working muscles during a set (continuous tension) is limited based on the amount of time the muscle is contracted compared to the amount of time the muscle is in a relaxed state. When the muscle is in a contracted state, nothing can get in or out of the cells, including oxygen. During these contractions, the muscle cell membrane is said to be impermeable.

Therefore, the amount of work that can be performed during prolonged sustained contraction will be limited in part by the amount of intracellular energy stored in the muscle at the onset of contraction. This production of ATP in the absence of oxygen is known as Anaerobic Glycolysis.

When a contraction includes brief periods of relaxation, oxygen can be taken up from outside the cell assisting pyruvate in producing more ATP energy. This relaxation period will slightly increase the duration of the contractions. Also, oxygen uptake and waste removal during relaxation, both act to offset the accumulation of the end product of anaerobic glycolysis, Lactic Acid. And since lactic acid accumulation inhibits the contraction of a muscle fiber, the contractions would be prolonged. With relaxation pauses, ATP is produced from pyruvate, the end product of glycolysis in the
presence of oxygen, in a process called oxidative phosphorylation, also known as metabolic oxidation.

Since the heart and lungs are somewhat slow in delivering oxygen during the onset of aerobic activity, the pyruvate is used for energy until the heart and lungs catch up and can keep up with the oxygen and aerobic energy demand. The rate of breathing is extremely labored at the onset of aerobic exercise because the heart is not yet beating fast enough nor are the blood vessels dilated sufficiently to provide an adequate volume of oxygenated blood to the working muscles, and the lungs are trying to compensate until the heart and blood vessels do catch up.

Once the heart and cardiovascular system catches up and can provide sufficient oxygenated blood, the respiration decreases, and the needed oxygen and fatty acids are being provided. This occurrence is commonly referred to as “catching your second wind”. This occurrence indicates that the majority of energy provided to produce ATP is coming from an aerobic mix of oxygen, glucose, and Fatty Acids. The simple logic is that fatty acids require large amounts of oxygen before they can be efficiently used for ATP energy production, and these large volumes of oxygen can only be provided through the increased cardiorespiratory activity accompanying aerobics. Simply put, during the performance of aerobic activity, increasing amounts of fatty acids and oxygen are used for ATP production. This form of ATP production is called Aerobic Metabolism, and will rarely, if ever occur during the proper performance of weight resistance exercise.

We are ALL Insulin Dependant

A number of researchers recently declared insulin to be the greatest anabolic hormone, which makes the control of insulin secretion a matter of great interest to bodybuilders who train drug-free. But before we discuss this hormone’s anabolic properties, it must be said here and now that if you are not an insulin-dependent diabetic, insulin injections can kill you. Some athletes have tried injections and almost died. Insulin can make you weak, or it can make you strong. It can make you fat, or it can make you lean. The key to making it work for you is to learn to control your body’s secretion of it.

Form & Function

This vital and powerful hormone’s role is to make nutrients in the bloodstream available to body tissues. Even in healthy individuals, abnormality in insulin secretions brought on by poor eating habits and lack of exercise may cause serious metabolic disorders. For example, prolonged poor eating habits can result in type II diabetes accompanied by obesity or, on the other end of the continuum, hypoglycemia. In understanding the roll insulin plays in health & weight management, it would be a good idea to have a six-hour-fasted blood sugar test performed to ensure that your insulin secretions are healthy (The normal range for fasted blood sugar is between 70 and 110 mg/dc.).

Here is an explanation of the insulin process. Your body breaks down all ingested carbohydrates into simple sugars in your small intestine. These simple sugars are absorbed into the bloodstream and enter the liver. The liver converts them all into glucose, the body’s only usable form of simple sugar. This glucose is then introduced back into the bloodstream.

The bloodstream’s capacity for glucose is about 80 calories. When the newly ingested glucose raises the blood sugar level in excess of this capacity, the pancreas releases insulin into the bloodstream to transport the excess glucose to body tissues. This excess glucose is said to be insulin-carried. Insulin must be present
for the uptake of glucose in all body tissues except the brain.

The first stop for this insulin-carried glucose is the liver, where it is stored as glycogen. As an interesting note, after significant aerobic exercise performance is when liver glycogen stores are most depleted (more on this issue elsewhere in this manual). The liver has the potential to store about 300 to 400 calories of glycogen. Generally speaking, when the liver stores are filled and there is still excess insulin-carried glucose present in the blood, the next stop, if there is recovery-taking place due to resistance exercise, is the muscle tissue. This “Insulin-carried” blood glucose enters through “receptor sites” located all along the muscles which open only in the presence of Insulin or during intense exercise.

If there is still more insulin-carried blood glucose after the liver and muscle tissue have taken in all they can handle, the excess will be rapidly stored in extra-muscular fat cells. Moreover, the liver and muscle tissues take up insulin-carried glucose quite gradually as opposed to the way it is rapidly taken up into fat cells.

**Insulin & Amino Acids**

As touched on earlier, another of insulin’s interesting functions is that it must be present to open insulin receptor sites in muscle. This allows amino acids to move into the tissue fibers and serve as catalysts, and more importantly, building blocks for repair and growth. Eating proteins, however, does not stimulate insulin release into the blood. You can ONLY ensure that insulin will be present for amino acid uptake into muscles, which is essential for protein synthesis, by taking in sufficient amounts of carbohydrates along with complete proteins in order to stimulate the pancreas to make Insulin available. Moreover, exercise has an “Insulin-like” affect on the muscles which cause receptor sites to open, therefore the ingestion of amino acid supplements (more quickly assimilated and therefore reaching the muscles faster), can and should be practiced all around the intense resistance exercise session while the muscle receptor sites are still open even in the absence of Insulin. Serious strength trainees need to take advantage of this exercise induced “Insulin-like” reaction. The greater the intensity, the greater the value of this amino acid introduction if the transition from the metabolic stage of catabolism (breaking down tissue) to anabolism (recovery/building tissue), and optimum muscle growth is desirable.

If you do not eat often enough - that is, if your meals are more than about four hours apart, your insulin, amino acid, and blood sugar levels will gradually drop off. There is not sufficient Insulin present during long periods between infrequent meals. Without Insulin anabolism, or recovery/growth, will cease until such time as you take in an adequate amount of complex carbohydrates and complete proteins to once again cause an appropriate amount of insulin release to carry glucose & amino acids to the recovering muscles.

Anabolism is most effective when insulin is continually present, which allows for the continual uptake of glucose and amino acids by the recovering muscle tissue. The most effective way to make this happen is by ingesting complete proteins and sufficient amounts of complex carbohydrates frequently throughout the day. This will provide the body with steady and moderate amounts of insulin. Moreover, since amino acids remain present for protein synthesis for only three to four hours, you should take in complete proteins and complex carbohydrates every three to four hours. Thus, when you’re working to build muscle, it is essential to time your meals in order for insulin to be present and anabolism to more efficiently take place.

**Too Few Carbohydrates?**

If you do not eat enough complex carbohydrates in each meal, your blood
sugar levels may not be high enough to stimulate insulin release, and anabolism cannot occur even in the presence of abundant amounts of complete proteins.

**Too Many Carbohydrates?**

On the other hand, if you take in too many carbohydrates in your meals, you’ll release too much insulin, and the muscles will be provided with more insulin-carried glucose than they can handle. This surplus of over-ingested glucose will trigger too much insulin release resulting in the rapid storage of this blood glucose in fat cells leaving nothing left over for muscle recovery. This also leaves even the most abundant amount of amino acids useless for building tissue since insulin is lost in its provision of the surplus carbohydrates to fat cells.

If you take in simple sugars, your blood sugar will rise too fast, causing an over-release of insulin. This overabundance of insulin will quickly remove almost all glucose from the blood stream. Since liver and muscle tissue takes up glucose gradually, and fat deposits are stored more rapidly, most of this insulin-carried “simple sugar” will end up in fat cells. Your blood sugar level and subsequently, your insulin level will drop, and anabolism will stop until you once again ingest adequate complex carbohydrates and complete proteins.

**Optimal Insulin Secretions**

Consulting a glycemic index chart may help you achieve optimal insulin secretions. The index classifies carbohydrates based on their absorption rate into the bloodstream. You need to keep this absorption rate as low as possible to avoid the aforementioned over-release of insulin. Even though certain natural healthy food such as potatoes and carrots are simple sugars and rate somewhat high on this index, you can still eat them as long as you combine them with other low-glycemic-index carbohydrates. This will act to compromise these “simple sugar carbohydrates’” rate of absorption.

As referred to elsewhere in this manual, the index rates foods on a scale of 0 to 100 - the higher the number, the faster the absorption rate. Ingesting soluble fiber will also act to slow absorption. Soluble fiber is present in almost all natural complex carbohydrates. It is also important to note that intense training opens muscle tissue insulin receptor sites, which makes it unnecessary to ingest large amounts of carbohydrates for insulin presence prior to and during resistance training. This is NOT meant to suggest that the participant should not eat a moderate size pre-workout meal and a reasonable size post-workout meal both consisting of quality complex carbohydrates as well as a quality source of easily digestible complete proteins in accordance with recommendations outlined elsewhere in this manual.

**Energy Crash Course**

The absence of resistance exercise causes muscle tissue to become relatively inactive, especially the mitochondrial elements leading to muscle atrophy. This simply means that the mitochondria no longer know how to efficiently use glucose energy both during and after a workout. Even in the presence of Insulin, untrained muscle receptor sites fail to take up glucose efficiently. This is generally the case in the beginning weight trainer.

During the first weeks of training you must immediately provide these mitochondria with what they need the most for energy replenishment after an exercise session-glucose. We will discuss a form of force-feeding for beginners. After the workout, perform some sort of activity at about 50 percent of maximum heart rate for 10 to 15 minutes while ingesting 100 to 200 calories of simple sugar. This may seem a little unorthodox, but it is physiologically sound. The blood glucose levels will dramatically increase within
five to seven minutes, stimulating the release of insulin and keeping open (post-workout), the muscle tissue receptor sites. As stated earlier, since it is a physiological fact that 1) fat from adipose tissue (extramuscular fat) cannot be stored and released at the same time, and 2) fatty acids and glycerol from adipose tissue must be released from fat cells during the performance of moderate intensity exercise, the simple sugars you’re taking in cannot be taken up in fat cells for as long as you continue to perform the activity.

In light of these facts, and since Insulin’s function is to remove glucose from the blood, this new Insulin-carried glucose has no other choice but to be driven directly into the post-workout depleted muscle tissues, where it is forced-fed to the mitochondria. This is a part of the “force-feeding” concept previously covered in this manual.

Mitochondrial Re-Education

When you screen a new client and find that they have not been performing resistance exercise, and their desired goal is to lose fat, you can effectively use “mitochondrial re-education”. Muscle tissue which has been relatively sedentary from the absence of resistance exercise, will become inactive, especially the mitochondrial elements inside the muscles whose function is to create energy inside the muscle. The process of ingesting carbohydrates immediately after a workout is considered “mitochondrial re-education” and will have the same positive effect on the veteran trainee as the beginner but is most effective in beginning stages of weight training. There is but one discerning difference in the principles between “mitochondrial re-education” and “force-feeding”. In the case of “force-feeding” you are immediately performing some limited intensity aerobic exercise along with the carbohydrate (all simple sugar; 100-200 calories) ingestion. On the other hand, mitochondrial re-education speaks only to the ingestion of a carbohydrate rich meal right after the resistance workout. By providing glucose immediately after the workout you are supplying the mitochondria with exactly what it needs most at exactly the time it needs it the most. This will more quickly teach the beginner’s sedentary muscles how to perform work and recover from work. The high carbohydrate post-workout meal will provide the sedentary mitochondria with a “crash course” in energy uptake.

Due to the lack of efficiency in the “un-educated” mitochondria, the beginner’s post-workout carbohydrate intake, as well as the total post-workout calories, should be relatively low. Otherwise, the depleted muscle will be bombarded with more blood glucose than its sedentary mitochondria are capable of using. This excess insulin-carried blood glucose will then bypass the muscle, and be eventually stored as fat.

After about 2 weeks of consistent “fat conversion training” (discussed in detail later), gradually increase the carbohydrates and total calories in the newly “educated” client’s post-workout meal. This meal should, in the future, always contain plenty of complex carbohydrates. Since fat is used for recovery energy to convert blood glucose into stored muscle glycogen between workouts, the more carbohydrates the muscle is able to take up, the greater the fat utilization and rehydration during recovery.
Fat Conversion

Resistance exercise obviously has more to offer than just size and strength increase. The National Federation of Professional Trainers in cooperation with the Fitness Clinic, a subsidiary research facility conducted a (2) year, limited independent research study. The study involved 40 subjects between the ages of 18 and 35. Among these subjects were resistance and aerobic athletes, general fitness enthusiasts, and overweight housewives and businessmen. Each subject participated for a period of 30 days. The subjects were randomly placed into two groups. Group #1 performed aerobic activity exclusively, every other day for 30 minutes, at a target heart rate of 70% of maximum. Group #2 performed resistance exercise exclusively, every other day, also for about 30 minutes at 70% average intensity, using a pulling, a pushing, and a leg pressing movement. The sets were of 20-25 reps to unassisted positive failure, performed in a circuit routine. This (3 station) circuit routine was completed 3 times per session.

Both groups were placed on a total caloric intake based on their individual resting metabolic rates (RMR). Each participant's diet consisted of the same percentages of proteins, carbohydrates, and fats.

Through body composition testing, it was determined at the end of this 30 day period individuals on the exclusive resistance exercise program lost up to 4.5 times as much fat as individuals on the exclusive aerobic exercise program. In addition, some of the individuals on the resistance exercise routine also experienced an increase in total lean weight. In fact, one individual gained 15 lbs of lean weight in this period. This occurred even while on the above restricted caloric intake. Later it was deduced that this increase in lean weight was most likely due to the movement of fluid into the muscle which is common with resistance exercise.

In any case, the average computer sorted results upon completion of the 30 day monitored period, based on body composition testing, are provided here.

**Aerobic Group #1:**
- total weight change... 6.43 lb. loss
- lean weight change... 2.94 lb. loss
- fat weight change... 3.49 lb. loss

**Resistance group #2:**
- total weight change... 1.23 lb. loss
- lean weight change... 10.72 lb. gain
- fat weight change... 11.95 lb. Loss

**NOTE** - It is important to point out that those in group #1 not having prior involvement in aerobic activity experienced faster results than those who had. Likewise, those in group #2 with more conditioned muscle experienced a more conservative and gradual conversion rate.

In laymen’s terms, when the muscle tissues’ energy stores have depleted, the replacement of these stores becomes a priority to the body. During recovery, while on a regular and frequent high complex carbohydrate diet, extra muscular fat must be released and used by the muscle tissue for the necessary ATP production required to fill muscle energy stores back up using the ingested, Insulin-carried complex carbohydrates (glucose). The key to resistance exercise and this “fat conversion” is to perform high rep sets at low intensity, over longer periods, with greater frequency. Use basic compound movements because they involve more muscle tissue. This will maximize the depletion of energy, forcing a greater recovery fat release.
The fact also remains, there is a degree of cardiorespiratory enhancement experienced when performing this resistance activity through shortened recovery periods between sets, and by gradually adding to the training volume (adding more circuits.) Incorporating this “resistance” activity into your total fat loss program, will prevent significant lean muscle tissue loss.

As a reminder, it is always best to approach your fat loss program with the intention of maintaining or even increasing your lean muscle weight. And for this to happen, as this study shows, resistance exercise is absolutely required.
Unique Dietary Considerations

Different Energy Pathways

As a fitness professional, you need to completely understand the basic principles and definitive applications of the three major classifications of activity and their relative energy pathways. The three classifications of activity are low level activity, aerobic activity, and anaerobic activity.

In this chapter we will briefly define the above classifications of activity and explain the method of energy provision unique to each.
**Low Level Activity**

Activity that does not significantly tax the cardiorespiratory system, while raising the exercise heart rate to no more than 50% of maximum \((220 - \text{age} = \text{MaxHR}) \times 0.5\).

Low level activity energy comes almost exclusively from fat, but requires longer exercise duration to equal the caloric expenditures of aerobic exercise. For example, walking a mile takes longer than running a mile, but the caloric expenditure upon completion will be equal. Low level activity should be passive to perform, require little blood-sugar, be non-taxing to body systems, and frequently done for long periods with minimal risk of overtraining and/or injury.

Where fat loss is the overweight client’s goal and available time to exercise is not a limitation, low level activity is the safer method of choice over aerobic activity. While aerobic activity does burn fat calories and burns calories at a more efficient rate than low level activity, there is still a significant amount of glucose used and cardiorespiratory conditioning may be something that your overweight client may not yet be ready for. By comparison, there is a lesser amount of total fat used per unit of energy expended during aerobic activity than during low level activity. Low level activity is a complement to any overall fitness program, and is generally healthy and safe for everyone.

Furthermore, the performance of low level activity can and should be prescribed exclusively, in place of aerobics, to a beginning client who has been sedentary and practicing poor eating habits for prolonged periods. Then, gradually increase the intensity **(pace)** while decreasing the frequency.

The above approach constitutes a cautious method of initiating the aerobic phase of a total fitness prescription for the general fitness client. Progression should continue while ultimately striving towards the recommended aerobic activity parameters discussed in the following section.

Using low level activity to initiate the aerobic phase of the fitness prescription is a judgment call that will minimize the risk of complication and/or injury to a client you feel to be predisposed. When in doubt, minimize intensity. As a reminder, it is an absolute must for you to encourage and/or require a potential client to undergo medical screening in advance of acting upon any recommendations you provide.

**Aerobic Activity**

Aerobic activity is defined by two ways. First, any activity that raises the resting heart rate to 70% of maximum \((220 - \text{age} = \text{MHR})\). Secondly, any activity performed at this heart rate for a minimum of 20-30 minutes per session, thereby achieving what is commonly known as a ‘steady state’ of accelerated metabolic function.

Activity must satisfy the two above requirements in order to technically be considered aerobic. It is under these conditions that aerobic energy pathways (fatty acids & oxygen) are functioning optimally. It is suggested the above aerobic activity be performed 3-4 times per week in order to maintain cardiorespiratory health and efficiency.

Unlike during low level activity, which requires fatty acids and very little in the way of oxygen, it takes time for aerobic metabolism (oxygen and fatty acid use for energy provision), to kick in. Initially then, the aerobic activity participant is calling upon liver glycogen, muscle glycogen, fatty acids, and blood sugar, with the gradually increasing assistance of oxygen, for energy.

The commonly experienced “second wind” occurs when the energy pathway has in effect, progressed through the first and second stages of energy provision, anaerobic glycolysis (the use of sugar in the absence of oxygen), and then metabolic oxidation (the use of sugar in the presence of oxygen), and then finally on to aerobic metabolism (the use of oxygen and fatty acids).
Anaerobic Activity
The energy pathway for resistance exercise is clear. Muscle energy stores. In its purest form, anaerobic activity involves “0” oxygen and pure ATP. However, there exists 3 steps that take place based upon the duration of a muscle contraction as it relates to energy production and use. When a muscle contracts it has an immediate supply of ATP to last it for 3-5 seconds. Without the immediate availability of ATP, which is the only form of energy produced in the body, our muscles would not be able to initiate any movement whatsoever. When this ATP begins to exhaust Creatine Phosphate takes over for the next 20-25 seconds. When the muscles supply of Creatine Phosphate begins to exhaust, muscle glycogen is converted into Pyruvate (muscle glucose). It is at this stage when the muscles are using “anaerobic glycolysis” (pyruvate without oxygen), for energy production. As relaxations occur, oxygen and blood sugar can enter the muscle and assist in energy production. In the presence of oxygen, with glucose still the energy substrate being used, the energy for longer intermittent contractions are provided through “metabolic oxidation” (glucose and oxygen). Seldom will resistance exercises involve a substantial supply of fatty acids as there is not enough oxygen being provided to “ignite” the fatty acids. While it seems like a simple process as described, it is not. As resistance is applied to muscle there is a constant mixture of these substrates working from the initial ATP, then blended with Creatine Phosphate, then blended with Pyruvate, and then on to blood glucose and oxygen.

Carbohydrates and Aging
The liver, among its approximate 64 other functions, must insure the provision of glucose for brain function. Glucose is the brain’s only source of energy. During periods of reduced carbohydrate intake, the liver is stimulated by the hormone glucagon from the pancreas to release stored glycogen in the form of glucose at a rate of about 26 calories per hour. This process is known as glycogenolysis. With this in mind, at rest, the minimum daily carbohydrate intake should be no less than 156 grams if amino acids, blood proteins, and energy reserves are to be spared from being converted and used for brain function. Whenever too few carbohydrates are ingested, the liver must in turn convert amino acids and other proteins into glucose to provide for energy demands. This process is called gluconeogenesis. There is a resulting toxin, ammonia that results when amino acids are used for energy. This ammonia must be further broken down into urea for excretion which is stressful for the kidneys. Either reducing the duration and/or intensity of exercise, or increasing the protein sparing carbohydrate intake will easily keep the liver from deaminating amino acids and cannibalizing body tissue.

Aging Considerations
As was touched on in the introduction of this text, with the aging process, our muscles slowly forget how to take up sugar, while our fat cells become more and more proficient. Along the entire length of muscle tissue fibers, there exists Insulin Receptor Sites (touched upon earlier). These receptor sites are similar to “doors” that must be opened to allow the passage of blood glucose and amino acids into the cells. While muscles are sedentary they require very little blood glucose, and after prolonged sedentary periods, these doors are not actively functioning, as they should be. This sedentary state results in muscle loss (atrophy) which is common with aging.

Too many carbohydrates in the diet of an aging sedentary individual whose receptor sites are not functioning will...
result in increased fat stores. This is because the insulin carried glucose (carbohydrates) is bypassing the non-functioning receptor sites and move directly on to storage in fat cells. Exercise depletes muscle energy (glycogen) requiring these receptor sites to open during recovery allowing for glucose uptake. This keeps the muscle fibers and these receptor sites active and functional even in the elderly.

Replacing some dietary carbohydrates with proteins in these instances is beneficial because the aging body’s conversion of ingested protein to glucose is so slow the resulting sugar is not as readily deposited in fat cells. As earlier mentioned, some carbohydrates should always remain in the diet for brain function (26 calories/hr).

**Senility**

In addition, the by-product of wasting muscle tissue, a build up of ketone bodies, is toxic to brain function and possibly contributes to senility. All of this is common in the elderly, and, in theory, can be best delayed through the performance of various forms of safe and effective RESISTANCE exercises. This will result in the muscles’ continued ability to maintain functional receptor sites, and prevent the wasting of tissue. For the sedentary elderly to take on a low to moderate amount of resistance exercise may be productive in “re-educating” receptor sites resulting in the more efficient uptake of blood glucose by the muscles.

**Proteins & Aging**

As we age, our muscles slowly forget how to take up sugar while our fat cells become more and more proficient. Too many carbohydrates in the diet result in increased fat stores. Replacing some carbohydrates with proteins is beneficial because the aging body’s conversion of proteins into sugar is so slow it is not readily deposited in fat cells. Some carbohydrates however should always remain in the diet (624 calories daily) for brain function.

**Nutrition & Aerobic Athletes**

Nutritional needs of an aerobic athlete are demanding indeed. It is important that you understand how food is used for aerobic energy, and the bodily processes occurring during the breakdown and use of these foods. It is your comprehension and application of simple nutritional principles that will greatly improve aerobic performance.

It has been typical for nutritionists and other fitness experts to recommend complex carbohydrates almost exclusively for aerobic energy. They assume that since aerobic energy is best provided for through the consumption of slowly released sugars (complex carbohydrates), that they should be the mainstay of the aerobic athlete’s diet. Also, these same experts say that since there is limited tissue breakdown during aerobic activity, there is no need for a significant intake of protein. These are both false assumptions.

First of all, since aerobic athletes are notorious for overtraining, protein intake becomes essential. The over-trained aerobic athlete may typically be diagnosed as suffering from anemia (reduction in the concentration of red blood cells). This occurs for two basic reasons. When overtraining is due to insufficient total calories & too much aerobic activity, blood proteins (red blood cells) are cannibalized and used for the balance of energy not provided in the diet. Since the red blood cells are responsible for transporting oxygen to the working muscles, your aerobic performance will suffer. In some cases your client may even notice extreme tiredness, fatigue, and unusually long recovery from illness.
Secondly, even if you are not over-training, protein ingestion still provides the aerobic athlete with several benefits. The liver has the ability to change ingested protein into sugar for energy. This process takes even longer than the absorption of complex carbohydrates. And, the longer and slower sugar is released into the blood, the more prolonged and efficient the aerobic use of these nutrients most importantly during long-term sustained aerobic events.

It is most crucial to ingest an appropriate amount of carbohydrates within 30-60 minutes after completion of all forms of aerobic activity. The more prolonged and/or intense, the more carbohydrates you should ingest. You need to provide the body with what it needs when it needs it the most, or it will eat away at itself for the recovery calories needed. The more intense the aerobic event, the more complete proteins one should ingest (replace blood proteins discussed above).

How do you know how many calories you can ingest prior to and after aerobic exercise? It is a simple matter to find tables that indicate the rate of calorie expenditure related to wide varieties of activities to include aerobic events. Use these commonly found tables to estimate calorie expenditure prior to performing a chosen exercise. Ideally, this should be planned before each aerobic session. Once you have calculated the number of calories, ingest approximately ½ of these calories 2-3 hours prior to exercise. Eat the remaining ½ of these calculated calories within 30-60 minutes after you complete the aerobic exercise.

Furthermore, in the case of the aerobic athlete, it is of the utmost importance that liver glycogen stores are full, and blood sugar is at its peak at the onset of the chosen event. As stated elsewhere in this manual, the liver can store between 300-400 calories of glycogen and the blood has the capacity to carry about 80 calories of glucose at any given time.

Taking into account the above considerations, this means that in a fully recovered state, as many as 480 calories of complex (some simple sugars), carbohydrates should be ingested about 2-3 hours prior to an aerobic activity while remaining totally inactive. Not only will digestion have been completed in this time, liver glycogen and blood glucose will be at optimum levels offsetting the exhaustion of aerobic energy. It is not the exhaustion of fatty acids that ultimately terminates aerobic activity, it is the exhaustion of glucose.

What High Protein Diet is Safe?

Over the years there has been huge controversy over the safety of high protein diets for weight loss and for muscle building. Although high protein diets have been around for a very long time, the Atkins Diet has seemed to attract more attention than most and has re-invigorated the debate over how much protein and what source of protein is healthiest.

The American Heart Association (AHA) jumped into the fray advising against diets that call for a large percentage of calories consumed as dairy and meat products, stating that these eating habits would lead to serious illnesses such as heart disease, diabetes, and kidney damage. This AHA position, while founded in fact and research, does not address the issue of protein intake, only advising against particular sources. Pose the following question to the AHA. How does it feel about large percentages of calories consumed from healthy protein sources?

Two studies were published in the New England Journal of Medicine in May of 2003, adding more fuel to the fire.
of controversy. In one of the studies, 132 patients were divided into two groups and were followed as they ate a low carbohydrate diet and a low fat diet respectively. After six months, the results were assessed and the findings concluded that when the subjects followed the plan successfully, the low carbohydrate dieters lost more weight. To researchers this should not be news and has nothing to do with protein intake. To our knowledge, this research did not even include a protein consumption requirement, only a low carbohydrate requirement and/or a low fat requirement. The low carbohydrate dieters could have been consuming large quantities of fat: while the low fat dieters could have been consuming large quantities of carbohydrates. This does not address the protein controversy. Further, in this first study, to our knowledge, participants were hospital patients. Where they “apparently healthy individuals?” Probably not, or they would not have been patients. Judge for yourself the value of this first study in regard to whether or not high protein intake is safe.

In the second study, the Atkins Diet was used and the participants not only lost weight, but they also raised their levels of the good, HDL cholesterol that prevents atherosclerosis. Like it or not, professional or layperson, these reports warrant more research, not just blanket warnings against high protein diets (AHA & American Kidney Fund approach, later stated). Furthermore, the research study states that unfortunately of the 63 people in this study’s inception, only half stayed with the program for the full six months. How valid can a research study be when, as a part of its own findings, admits failure of participant compliance? Furthermore, after one year some of the Atkins dieters had regained about a third of the lost weight, offering critics the argument that short-term weight loss is not worth the risk of heart disease. Should we pick on Atkins though? Isn’t it typical among dieters that when they go off their diets they regain the weight? Therefore, this is not a valid argument to use by critics against Atkins and his high protein/fat approach to dieting.

Before seemingly defending Atkins, let’s be clear on a few things. Keep in mind that the Atkins Diet is controversial more so because of its high fat allowances than its high protein recommendation. His recommendations in the fat department are outrageous and indefensible by any stretch of a health professional’s imagination. However, as you have read above, when put to the test, it seems to work. In most of the high protein diets marketed for weight loss, protein makes up 25 to 30 percent of the day’s meals. Statistics show this to be about two times the protein that a typical non-dieter might consume.

Here comes some very important biology that provides an explanation. The fat burning is jump-started by eliminating almost all carbohydrates and replacing them with proteins. The body works overtime to metabolize and convert ingested as well as body proteins for energy in the absence of sufficient carbohydrates (glucose). This process is known as gluconeogenesis on a small scale, but is more commonly referred to as cannibalism when on a larger scale. During cannibalism, large quantities of ingested protein and body tissue (all existing as amino acids once in the blood) are “deaminated” and changed into needed glucose with toxic consequences. So much so that the bi-products (Ketone bodies) can kill if total calories dip too low. In addition, realize as well that ingested fats and body fat are preferred and easier for the body to convert to energy than ingested protein and body protein.

The body’s preference for fat burning over protein in the absence of carbohydrates is the key to success with high protein diets. This may have a direct link to
the research that favors the Atkins diet because given the option; the body will opt to use ingested fats and body fat even more than ingested protein with one, not too alarming, exception. With a prolonged negative energy balance common to ALL low calorie diets, there eventually comes a slowed metabolism and the body reacts by protecting its fat stores for perceived starvation energy storage and will opt to cannibalize body tissue… muscles. It is at this time that serious regular resistance exercise needs to come into play, if it is not being practiced already.

Moreover, if we combine what Atkins has taught us with a lower fat intake, then the body will opt to use even more body fat in the absence of significant dietary fat. The real issue here is the toxins (ketone bodies). These substances must remain at low levels if organ and tissue damage is to be avoided. No high protein diet should be coupled with low calorie practices. Metabolic Acidosis will result and if symptoms are left unchecked, can kill!

While on high protein diets large quantities of water must be consumed in order to eliminate ammonia and urea toxins before the body resorts to the production of ketone bodies. Dieters are urged to drink a gallon of water or more per day to pass urea and in order to avoid dehydration, constipation, and abnormal heart rhythms.

High protein diets can cause kidney-scarring, cautions the American Kidney Foundation, as a result of the extra waste that has to be processed. Blood levels of uric acid are elevated due to extremely high protein consumption, and this can lead to the development of a painful form of arthritis known as gout. Uric acid crystals actually deposit in the joints as a result of eating meats, poultry, eggs, shellfish, seeds, and nuts in abundance. At one time in history gout was known as a disease of the rich because only they could afford to eat the foods that would promote uric acid deposits.

The American Heart Association has outlined specific guidelines for consumers regarding healthy protein intake. According to the AHA, the diet should be 15 to 20 percent protein and only 10 percent of all fats from saturated sources. All of the popular high protein diets—Atkins, The Zone, Sugar Busters, and Stillman exceed these protein recommendations. In the fat department, Atkins allows up to 26 percent saturated fat and up to 68 percent total fat. These figures make the Atkins Diet unacceptable according to AHA publications. Has the AHA researched high protein diets or just published a guideline for healthy protein consumption across the board? The safety and effectiveness of high protein diets is the issue, not which proteins are safe. Once again, the AHA has not addressed the issue.

It would be advisable to investigate ways to keep protein levels relatively higher with an element of safety by maintaining a reasonable total caloric intake along with moderate portions of fruits and vegetables which are low in carbohydrate calories, while focusing on utilizing alternative protein sources that are low in saturated fat. Why not use an Atkins-like model, but consume soy protein, fish, whey protein supplements, nuts, and healthy fats like olive and flax oil? Then add a few pieces of low carbohydrate fruit daily along with plenty of low carbohydrate vegetables. Plenty of water, a high quality vitamin and mineral supplement, and regular exercise round out the program and lean, good health is a certainty. The key is to eat in moderation to satisfy physical needs and working out the stresses of life at the gym.

Conclusion: Protein from a variety of low fat sources is good. Low carbohydrates, around 100 grams per day, from vegetable, fruit, and whole grain sources is good. A moderate fat intake of good quality fats (avoid all trans fats), is good. Drink plenty of fluids and perform a regular total-body resistance exercise routine.
The Metabolic Continuum

Just as it is for resistance exercise, glycogen is converted to glucose and used for energy during average to high intensity aerobic exercise. Regardless of conditioning level or the duration, intensity, etc., a small portion of energy used during aerobic exercise, will always come from glucose. The bulk of this glucose is coming from a different place during aerobic activity than during resistance activity. During aerobic-based exercise glucose is taken directly from the Liver and blood (of course a small degree of glucose will always be used from intercellular “glycogen” stores in the working muscles). The liver stores, with the right pre-workout meal, can provide anywhere from about 300 to 400 calories of glycogen for conversion to glucose and gradual release into the bloodstream during aerobic activity. Be aware that muscles generally reserve their internal stores of glycogen for heavy intense muscular work not common to most aerobic activity.

Through the body’s use of oxygen, liver glycogen (muscle glycogen during intense segments), along with fatty acids in circulating blood, and adipose tissue, the muscle energy needs are met during aerobic activity.

The contribution of the primary substrates (sources) of that energy may differ significantly depending on the effort necessary to meet the imposed demands of that activity. The higher the intensity (greater effort) of an activity, the more the body will depend on stored carbohydrate sources for energy. The lower the intensity (lesser effort) of an activity, the more the body depends on greater percentages of stored fat sources for energy.

Realize that at any given time, energy is being provided from both primary energy sources (carbohydrates and fats) and some proteins, but for the sake of argument, just concern yourself with carbohydrates and fats.

When you begin any activity of significant effort involving a reasonable amount of participating musculature over and above resting metabolism, the energy required to perform that activity will first be supplied by anaerobic (carbohydrate) metabolism, as it takes several minutes to mobilize fat in sufficient quantities to sustain an activity. As less than intense activity involving large volumes of musculature is continued for a sufficient amount of time, the body “catches up” as oxygen uptake slowly increases to allow greater utilization of oxidized carbohydrates and fats for energy.

This transition from an anaerobic metabolism to an aerobically dominated metabolism is dependent on two major factors, intensity and duration of the activity. Obviously, if an exercise requires near maximal effort, such as weight training, which cannot be sustained for long periods of time, your exercise metabolism will remain primarily dependent on carbohydrate sources without a need for a significantly increased oxygen uptake to perform the activity (anaerobic). Performing an activity which is of low intensity, such as a fast walk or a slow jog maintained for long periods of time, allows for the increase in oxygen uptake and the more efficient utilization fat stores as the primary energy sources (aerobic). As aerobic intensity is increased, a growing percentage of energy comes from carbohydrate sources. As the aerobic intensity decreases, a growing percentage of energy comes from fat sources.
Nutritional Priorities & Fat Begets Fat

For years there has been an unfounded and inconclusive assumption among several health and medical professionals that the over-ingestion of fats is solely responsible for overweight conditions among otherwise apparently healthy individuals (not diseased). Moreover, some contend that body fat increases linearly to fat ingestion. These may very well be incorrect and unsubstantiated claims. Some of these sources even go so far as to say that large quantities of protein and carbohydrates can be ingested without contributing to fat deposit at all. To respond… a calorie is a calorie, is a calorie.
The belief that fat begets fat is long-standing, but not conclusively researched by leading scientific and medical organizations. Due to the widespread acceptance of health related publications, and broadcasts re-enforcing the previously unquestioned fat begets fat nutritional assumption, the collective attitude of the American people now mirrors this nutritional falsehood.

Although fat is not a preferred source of calories, it is just that - a source of calories - just as carbohydrates and proteins are sources of calories. The body has a (3) step priority sequence concerning its nutritional needs.

**1st Nutritional Priority…**

Its first priority is to be provided with enough total calories (regardless of source) for conversion and use in meeting energy demands (to be discussed below).

**2nd Nutritional Priority…**

Secondly, after this first priority is addressed, the body then sorts through these calories looking to apply different macro-nutrient calorie sources to its needs, example - using carbohydrates for brain function, blood sugar maintenance, and liver & muscle glycogen replenishment; using proteins for tissue repair, blood protein synthesis, and catalyst formation; using fats for membrane formation, hormone production, synovial fluid, arterial insulation, and energy storage.

**3rd Nutritional Priority…**

Third and lastly, the body will seek out and extract valuable micro-nutrients from the ingested calorie sources. The more natural the calorie source, the more rich the nutrient content and the less need the body will have to draw from its own enzymatic resources (common with empty calorie ingestion).

The above has been a brief and simplified description of the body’s nutrient priority system.

It is certainly true that ingested fats are more easily converted to their storage form than proteins and carbohydrates. However, consider that fat cells are extremely active metabolically. This simply means that fat cells are constantly storing and releasing fatty acids & glycerol all day long. Therefore, fat stored at one point in time will be released for energy needs at another point in time they will be stored for future energy needs. A diet, even if consisting entirely of fat, still satisfies step (1) of the nutrient priority system which effects total body weight as outlined in the above “priority” contention. It is true this type of diet is viewed as being extremely unhealthy as it does not satisfy steps (2) & (3) of the body’s nutrient priority system.

What this all boils down to, is that the human body, undesirably, can actually survive on a maintenance caloric intake consisting almost exclusively of fat calories so long as these calories provide the body with its energy needs. Cases in point-Eskimos have been considered some of the healthiest people on the face of the earth, practically absent of disease and/or obesity. To many of the above learned health professionals this represents a scientific phenomenon, since the mainstay of the Eskimos diet has always been whale blubber (fat). For the sake of argument, let’s consider fat begets fat a given, and assume also that the Eskimo shares the same internal body functions as the rest of us. By ingesting all this whale blubber, the Eskimos should take on an overweight, unhealthy appearance similar to that of the very beasts they traditionally feed upon. However, as discussed earlier, this is not the case at all. On the contrary, they are quite healthy and strong. This means that eating fat not always makes us fat.

It is the comparison of the number of total calories ingested to the number of total calories expended that reflects a true measure of weight gain or loss. This philosophy holds the answers to the dilemma of the Eskimo, and since we are all created equal, our own personal weight maintenance dilemmas as well.
The Eskimos, not unlike us, expend calories throughout the course of a day that need to be replaced through the ingestion of food stuffs. If the calories expended equal the calories ingested, there will be no long-term accumulation of fat storage. If the calories expended are less than the calories ingested, fat will be deposited. And lastly, if the calories expended are greater than the calories ingested, fat loss will occur. National Federation of Professional Trainers in no way advocates or condones high fat intake, as it has been clearly linked with cardiovascular diseases. In closing... a calorie, is a calorie, is a calorie.

Is Fat Friend or Foe?

There are several misconceptions concerning fat and the role it plays in maintaining the adaptability of the human body. For instance, if it were not for fat reserves the body would surely die. As a reminder, the body is an adaptive mechanism. Fat is actually transported and stored in different locations based on the exercise and activity needs imposed on the body.

Ingested fat is of 2 types, saturated which raises cholesterol; and unsaturated which lowers cholesterol in the blood. Both contribute equally to fat accumulation. It is also interesting to note that in the absence of dietary fat, excess carbohydrates and proteins are converted and stored as fat. The end result being the same, only the process is slower. For this reason, a calorie, is a calorie, is a calorie. A high total caloric intake, even low in fat, is more likely to contribute to fat accumulation than a low total caloric intake consisting of moderate to high levels of ingested fat.

Under temporary restrictive dietary conditions (pertaining to those individuals with average metabolisms), the body is deprived of its needed total calories in the first place, and it becomes desperate for ingested calories it can use for energy... even if they are fat calories. This was touched upon in the previous chapter. When the body’s demand for total calories is once again met, it then becomes important to restrict the now overabundant fat caloric consumption, because now these fat calories are surplus, and will be readily stored in fat cells. Simply put, in relation to low caloric diets, the body’s nutrition priority system places quantity first and then quality. If your metabolism is slow however, the quality of the low caloric diet becomes more important as it sooner reaches the endomorph’s lower maintenance caloric levels.

Even with this understanding, it is still obvious that avoiding excess fat intake is the healthy thing to do. There is no excuse for a healthy diet to consist of more than 20-25% fat with an acceptable macronutrient breakdown reflected in the “Nutrition Tables” section later in this manual.

Invisible
Overweight Condition

*Not yet scientifically proven

As personal fitness trainers you are professionals expected to know more than just what to do. Anyone can pick up a scientific journal and be informed as to what to do. Realize you are to your client a teacher. You are an educator. You need to know why it happens. You need to explain why it happens. Many little known facts will be presented in this chapter for your consideration that may significantly impact your future approach to designing fitness programs for yourself, and as fitness administrators, for your clients.
**Aerobics & Cardiorespiratory Conditioning**

The performance of aerobics can be counter-productive to lean weight gain. However, the most important and underrated role aerobic activity plays even in the gym is not fat loss at all, but cardiorespiratory conditioning. By making more efficient the movement of oxygen and nutrients to body tissues, more fat and less sugar during daily activities is used by these “aerobically conditioned” tissues. After all, caloric expenditures during aerobic activity dull by comparison to those calories expended 24 hours per day between effective resistance exercise sessions restoring energy and building new tissue.

Every breath we take and every calorie we ingest are ultimately provided to the millions and millions of tiny cells that make up what we collectively refer to as our bodies. In the healthy body, cells are constantly dying and regenerating with all having their own selfish and individual needs for oxygen, nutrients, exercise, and recovery. Life sustaining regeneration (cell division) depends upon the timely provision of oxygen, nutrients, exercise, and recovery. These cells all exist as separate singular living organisms feeding off the “support systems” (cardiorespiratory systems). On this cellular level is where oxygen and carbon dioxide are actually exchanged. The final destination of all nutrients derived from both endogenous and exogenous sources are ultimately these millions of tiny cells where they are finally broken down and used for cellular survival needs and regeneration.

Without the cardiovascular and respiratory systems’ provision and transport of vital nutrients & oxygen, not to mention their function in the removal of cellular metabolic wastes and toxins, our cells would literally stop regenerating and eventually die. If the cell death involves vital organ tissues, death may come to the host. Always be reminded that all cells of the body need the same basic components of nourishment in order to sustain the body systems that give life to the human organism.

**The Endomysium**

Now that we have identified the cells as being the primary benefactors of aerobic conditioning, let’s explore the aerobic benefits experienced on a cellular level, concentrating of course, on the muscle cell fibers. To do this requires somewhat of an explanation of relative intramuscular components. There is considerable doubt that you have heard much about the one most significant component in the intramuscular region relative to the efficiency of oxygen, nutrient & waste movement across muscle fiber membranes. This intramuscular component is Endomysial Fat. More commonly known as the Endomysium, this fatty layer of tissue surrounds the Sarcolemma (muscle cell membrane). The thickness of this fatty layer varies from individual to individual dictated by several factors, most importantly diet and exercise habits.

The presence of significant intramuscular fat deposits surrounding all of the muscle cell fibers inhibits the movement of oxygen, nutrients, wastes and toxins through this thick fatty tissue, constituting what could be referred to as an “invisible” overweight condition.

Imagine for a moment the significance of this realization. Any relative physiology textbook will identify and define the composition of the endomysium as being the fatty tissue surrounding the individual muscle tissue fiber. Furthermore, in conveying the significance of this mysterious fatty muscle fiber component, have you ever wondered why electrical impedance body fat testing devices sometimes reveal a drastically greater amount of measurable body fat than caliper testing? This is likely due to the fact that bio-impedance measures fat inside the facia...
(sheath that surrounds the intramuscular areas), as well as the subcutaneous fat that is visible to the eye. Many a proud lean athlete, visibly cut to ribbons, have suffered body fat measurement embarrassment and have adamantly proclaim the impedance method to bare falsely high readings and provided with nothing in the way of a physiological explanation. Generally, if those elite athletes just referred to were surveyed you would likely find their regimens at the time of impedance testing to have consisted of a high volume and frequency of low intensity, high rep resistance training along with an extremely high caloric intake while performing little in the way of moderate to intense aerobic conditioning. Any one or any combination of these factors practiced for extended periods will cause the advanced, heavily and lean-muscled, extremely well-fed, hard working athlete to have increased endomysial fat stores. We will refer to this conditioned athlete as being “invisibly” overweight. Have you ever personally known or heard about huge impressive looking bodybuilders who couldn’t run around the block? Is it possible there is too much endomysial fat separating the oxygen and nutrient rich blood and the working muscle. Also, coupled with the understanding that fat weighs considerably less by volume than lean tissues (that includes intercellular water), the presence of a substantial amount of intramuscular fat in a pre-contest conditioned bodybuilder of the same apparent size as one with little or no intramuscular fat will weigh considerably less. This generally results in a visibly larger bodybuilder falling into the weight class of a visibly smaller bodybuilder. You can see how a possible competitive advantage could be gained by the bodybuilder with the larger appearance. As a note to the “invisibly fat” bodybuilder, a starvation diet close to contest could prove disastrous as you will immediately shrink the muscle size by loosing the fat directly surrounding the muscles. Keep eating, just train harder and longer for more definition.

Interestingly, it is not uncommon for some visibly overweight (subcutaneously fat), individuals to run circles around suspected healthier and leaner individuals who are “invisibly fat”. This is simply because there is less restriction of nutrient movement into the muscles in the case of visibly heavy individual who is not “invisibly” overweight. The “visibly” overweight person simply is charged with the less demanding task of carrying around more extra pounds.

**How To Tell If Your Client Is “Invisibly” Overweight?**

Possible indicators of undue intramuscular (Endomysial) fat accumulation are

#1 Unexpectedly high exercise heart rate
#2 Unexpectedly slow recovery from exercise heart rate back to resting heart rate
#3 Unexpectedly high rate of respiration (fast breathing) during exercise
#4 Unexpectedly slow recovery of post exercise respiration back to normal resting respiration.
#5 Visibly lean, heavily-muscled athletes consuming 1,000+ calories over their measured maintenance intake requirement.
#6 The diminished ability of a weight training athlete to perform aerobic activity at 70% of maximum heart rate.

Apparantly healthy individuals absent of a visible overweight condition with no risk factors present and no relative family history, may still indeed display the above odd symptoms for otherwise unexplainable reasons. The true culprit may be endomysial fat accumulation. This condition does not simply apply to the resistance training athlete consuming too many calories. In most cases, look to the prolonged over ingestion of total calories,
usually consisting of a high fat content, as an indicator of the overabundant presence of intramuscular fat in the non-athlete. If poor dietary habits explained above are not being practiced, and this client continues to display these symptoms with no improvement while on a strict diet and performing regular aerobic exercise, a trip to the client’s general practitioner may be in order.

The most common dietary practice that is conducive to excessive endomysial fat deposits is clearly overeating. Fat storage locations are often times genetic with some people storing more fat inside the facia. The most common physical activity that predisposes one to excessive intramuscular fat deposits (generally accompanies prolonged overeating), is the absence of exercise altogether, and most significantly the failure to regularly perform steady state aerobic activity (20+ minutes 3-4 times per week.)

Minimizing Endomysial Fat

The value of reducing intramuscular fat and endomysial thickness is clear. The thinner the fatty tissue layer (endomysial fat) the better the movement of oxygen, nutrients, and wastes across the muscle fiber membrane. It’s just that simple. Moreover, the cardiorespiratory systems will improve dramatically when thinning the endomysial fatty layer.

How do you intelligently reduce this fatty tissue? Generally speaking, adipose (extramuscular fat) tissue cannot release and provide fat energy (fatty acids & glycerol), as rapidly to the working muscles as endomysial fat (intramuscular fat) during the performance of moderate to intense aerobic activity by the aerobically unconditioned individual since the endomysial fat is abundant and immediately available. Therefore intense aerobic activity will call upon a larger amount of endomysial fat due to its conveniently close storage location.

It can be stated that during low level activity the rate of release and provision of fat energy from adipose tissue (extramuscular fat) is sufficient to meet the muscles’ needs for energy. During the performance of aerobic activity, especially in the initial stages of an aerobic exercise prescription, the immediately available endomysial (intramuscular) fat will serve as the primary source of energy. Since overeating and lack of aerobic activity are the cause of intramuscular fat accumulation, cutting back on calories and performing aerobic activity are the keys to minimizing these stores. This should occur quite rapidly in the otherwise apparently healthy individual once implementing these measures. Endomysial fat is generally easier to lose than extramuscular fat mostly in part due to its close proximity.

It would be wise in cases where a client who admittedly over-eats, is visibly overweight, has no recent exercise history, and who is obviously at risk, to implement dietary control alone prior to initiating the performance of aerobic activity. By significantly restricting total calories alone, this endomysial fat will diminish rapidly, and offer a greater degree of client safety. Never suggest a diet under the client’s basal metabolic rate (BMR).
THE NFPT DIETARY ADVICE CHART

Selecting exact foods, combinations of foods, and portion sizes of specific foods as they relate to medical conditions is not within your scope of practice. In any of these cases, the involvement of a registered dietician is suggested.

The objective of this section of the manual is to provide a quality fitness administrator with an appropriate and standardized method of prescribing effective nutrition programs that complement the exercise prescription, are goal oriented, and within ethical parameters. This objective is most effectively accomplished through the application of the new Food Pyramid (in the rear of this manual), and two simple charts provided by the National Federation of Professional Trainers. Study and provide a copy of the Food Pyramid to your clients. This new graphic illustration of food group values and their recommended portions will be a great tool to help your clients make healthier food choices. Also, in the rear of this manual, there is a “master food list” for client menu ideas applying the macro-nutrient and dietary recommendations you make using the NFPT chart provided.
NFPT Charts & Tables are all goal oriented. Such is the case with the General Dietary Advice Chart. Let’s explore the application of the chart prior to expounding on its principles. The first column is simply a title column defining the entries in the columns to the right. The first entry in the second column is Weight Loss. To achieve this goal, the average client should adhere to the dietary breakdown in this weight loss column. Likewise, if the client’s goal is either Weight Maintenance, or Weight Gain, each goal has its own dietary breakdown column to be adhered to. Note also that the recommended protein, carbohydrate, and fat percentages refer to calories not grams. It is important to know that there are 4 calories in 1 gram of carbohydrates; 4 calories in 1 gram of protein; and 9 calories in 1 gram of fat.

Let’s move on to the basic principles represented by the General Dietary Advice Chart. Since you are not qualified to set up a client’s diet in its entirety, this chart will assist you in outlining dietary recommendations. This NFPT General Dietary Advice Chart will provide dietary parameters that are simple to understand and easily applied. Prior to making any type of dietary recommendations, beyond these parameters, a registered dietician should be consulted.

One of the most important factors in structuring a client’s diet is to have the capacity to determine lean body weight. It is suggested, therefore, that you purchase Skin Fold Calipers for this purpose. Skin fold calipers come complete with the necessary user charts and instructions. Once you have estimated the client’s lean body weight (LBW) through body composition testing, use the product of LBW x 11 as shown on the general dietary advice chart as one of the many acceptable alternative calculations in estimating your client’s caloric needs at rest. There is no more fundamental calculation than the one provided above. It is appropriate for calories to be calculated based on lean body weight as it is not desirable to provide calories to support fat weight.

These “calories expended at rest” are often referred to as BMR (basal metabolic rate) needs. BMR calories are the number of calories expended by the participant when lying flat on his/her back all day long while remaining awake. Use resources at your disposal to estimate calories expended in the performance of various types of prescribed exercise and call these calories “Activity Expenditures”. Then estimate the total number of calories expended in the participant’s daily activities (discussed below). Call these “Daily Expenditures”. When you add “Activity Expenditures” to “Daily Expenditures” you arrive at “Total Expenditures”. When you then add “Total Expenditures” to the “BMR” needs you arrive at the client’s “Weight Maintenance” calorie needs. This is indi-
cated in the middle column on the above provided chart. As you can see, it is suggested by this chart that a 500 calorie/day increase from this “Weight Maintenance” intake constitutes a recommended Weight Gain diet. In contrast, a 500 calorie/day decrease from the “Weight Maintenance” intake constitutes a recommended Weight Loss diet.

Consistent and proper use of skin-fold calipers will allow you to make appropriate adjustments from the recommended caloric intake to assure that weight gain consists primarily of lean muscle mass and not fat accumulation, and weight loss consists primarily of fat weight and not lean muscle mass.

For client safety and liability purposes, you should never, under any circumstances, recommend a diet below Basal Metabolic Rate. In the event a prolonged period of BMR calorie dieting and exercise does not foster the desired effect, rather than dangerously dropping an additional 500 calories from the client’s weight loss diet, you should opt to increase activity expenditures in the amount of 500 calories over and above the current exercise prescription. Generally, it is healthier for your client to perform more activity (preferably low level activity) than to diet to extreme.

It is important to note that the calculations in this NFPT Chart represent the norm, and that many metabolic factors come into play that are not all addressed here.

Proper diet is of tremendous importance to the effectiveness of an overall fitness prescription. As a fitness administrator, you need to have some control over how your client is eating. You can prescribe the perfect exercise program for a client, and if he/she is not following fundamental diet principles, the program will not be effective.

In order to determine dietary needs, it is essential to first estimate the number of calories one will expend during the exercise prescription you recommend. While it will be useful to apply metabolic calculations to the aerobic phase of your client’s exercise prescription, simple charts on various aerobic activities listing calorie expenditures are readily available. On the contrary, resistance exercise energy expenditures are another story. In determining resistance exercise expenditures, the NFPT has compiled an Activity Expenditure Chart for your use. As a personal trainer working in a typical health club setting equipped with both machine and free weights, you can use this chart to estimate your client’s resistance exercise expenditures based on a controlled recovery heart rate between sets, and resistance exercise phase duration. A brief introduction to this simple process and direct application of this chart located in the rear of this manual is in order.

Prior to administering the goal oriented resistance exercise phase of your client’s total exercise prescription, pre-establish movement selection and order of resistance exercise performance accordingly once again using the charts & tables provided in the rear of this manual. Next, determine the client’s desired between-set recovery heart rate based on both client goals, and the initial assessment of your new client’s level of conditioning using the “Activity Expenditure Chart”. As the chart reflects, select between 100 BPM; 115 BPM; 125 BPM recovery heart rates, each presenting a different caloric expenditure rate. Upon completing a set of a particular machine or free weight exercise, seat the client and monitor their heart rate. When this heart rate has lowered to the targeted “recovery heart rate” you have pre-selected (115 BPM for example), it is time for the client to continue by performing the next prescribed resistance exercise. Repeat this process until the resistance phase of your client’s exercise prescription is complete. Match the prescribed...
“Recovery Heart Rate” with the duration of the workout to arrive at the caloric “Activity Expenditure”.

As a suggestion, develop both the aerobic and resistance exercise prescriptions first, calculating your client’s proposed activity caloric needs. Determining this information first is extremely important, since activity calorie expenditure must be taken into consideration in order to establish total caloric needs.

**Daily Expenditures?**

Once you have determined the exercise expenditure above, add about 500 calories reflecting the average person’s “daily expenditures” also referred to elsewhere. Daily expenditures are calories your client will typically expend during his/her everyday functions to include employment & leisure activities. The average individual who is reasonably active expends approximately 500 calories per day. The least number of daily activity calories you should provide are 200 Ca/day. In the case of the extremely active client, you may wish to provide as many as 1,000 Ca/day. Also use professional judgment when making adjustments to caloric intake depending upon body-type as discussed earlier in this manual. Endomorphs need fewer calories than a mesomorph and the mesomorph needs fewer calories than the ectomorph. These body types were discussed earlier.

**Percentages of Nutrients**

In looking closely at the chart, specifically at the suggested percentages of total calories to come from protein, carbohydrates, and fats relative to the desired goals, it should be noted that the absolute amount of protein intake (in grams) remains exactly the same. Additions and/or reductions in total calories come almost exclusively from changes in carbohydrate intake.

**Number of Meals Per Day**

The value of eating more small meals throughout the day, as indicated in the General Dietary Advice Chart, instead of fewer large meals, cannot be overstated. To the body, digestion is considered work, and the more work you make the body do the greater the body’s metabolic rate even during weight loss dieting. Equally break down the total calories into the suggested number of meals, and attempt to maintain the same nutrient percentages in all meals. If fine tuning a serious athlete’s diet, it is generally accepted that meals can be planned throughout the day that consist of more carbohydrates in the morning and more protein later in the day. However, at the end of the day, the overall percentages prescribed should have been complied with.

Your use of the new Food Pyramid, combined with the provided NFPT Charts and “Master Food List” in the rear of this manual, should allow you to effectively teach your apparently healthy clients to develop their own goal oriented diet, while still not overstepping professional boundaries. Whenever faced with a new client whose ongoing results seem to defy the fundamental principles represented by the Food Pyramid and/or the NFPT Charts, consider the assistance of a registered dietician.
Fitness Training and Trouble-Shooting

Problem: How do you handle the weight loss client who isn’t losing weight?

Answer: Tell him or her, that when using resistance exercise for fat loss, you are not trying to lose weight you are trying to lose fat. For re-enforcement purposes, perform a body composition test. Through your computation, they will see that their lean body weight has increased. They will also see that there has been a dramatic decrease in total fat. Happiness and motivation will help them to continue with their regular exercise program. Decrease in total fat simply occurs because fat is released into the bloodstream during recovery between workouts. Fat is then taken up into the muscles and used for energy for recovery activities. The result of this fat conversion is a much heavier (energy replenished & hydrated) muscle fiber, and less stored fat. Hence, a total weight increase occurs. What used to be excess baggage is now increase muscular energy having the responsibility of carrying around less baggage. This is one of the many reasons why the NFPT feels resistance exercise is better for health and weight management than exclusive aerobic exercise. In aerobic exercise, nothing useful is being done with this fat loss. It is simply being lost through activity, doing nothing but leaving the muscle tissue exhausted and your energy stores depleted.
Problem: What if the weight gain client stops or isn’t gaining weight?

Answer: The obvious answer to this is that they are simply not eating enough. Complaints may include that they feel bloated and that eating as often as you have told them to just isn’t practical. All you can do is recommend the further use of high calorie protein drinks and carbohydrate loading drinks in addition to their current nutrition program. The rest is up to them. The other concern is if they are not gaining weight following your recommendations. Explain that a slow weight gain of about one pound per week is normal. Weight gain at a faster rate equals too much fat accumulation. You would also be correct in recommending against the performance of aerobic exercise, until the amount of weight gained is satisfactory to the client. Even then you should opt to recommend resistance exercise with aerobic effects over conventional aerobic exercises unless the client has a true need or desire for cardiorespiratory conditioning.

Problem: How do you answer a question like this? “I run all the time, and I’m already on a 1200 calorie diet, why can’t I lose this spare tire?”

Answer: Lack of calorie consumption is the source of their problem. You need to be able to explain this to them in terms that they will understand. The body views fat as the most efficient source of survival energy, and will store it more readily when it perceives a starvation situation. So, if the client is too active and not eating enough food, the body is actually starving. The body’s reaction to this perceived starvation is to break down muscles for energy and eventually slow down its metabolism. Fat, the most efficient source of survival energy, will continue to be stored. By eating more food, the starving client’s body begins to spare muscles from being eaten away and will in time no longer perceive starvation resulting in its use of surplus fat stores. Performing regular resistance exercise will convince the body to keep its muscles too. Also, when ingesting a few more calories and the perception of starvation is gone, the once horded fat reserves will be utilized as energy which is the body’s desired function to begin with. The body will use fat reserves and keep its muscle tissue especially with a regular full-body resistance routine in place. Therefore, once again, resistance training and a proper diet are the keys to solving yet another fat loss dilemma.

Problem: What can I do to convert a starvation dieter?

Answer: A client may insist on losing weight at a rate faster than one pound per week, which is not recommended. If the client decides to go on a below BMR, starvation diet, there are several things you should discuss with that client. First of all, the lower the client’s total caloric intake below BMR, the less activity that client can safely perform. There is a serious danger related to using muscle tissue for energy while on a starvation diet. Prolonged starvation diets lead to Keto Acidosis. This disorder can result in coma and death. The first signs of this problem may go unnoticed for several days. Some past and present conventional bodybuilding pre-contest preparation diets take the bodybuilder well into, and sometimes past the first stage of metabolic acidosis. Inform the starvation dieting client of the following early signs and symptoms: extreme dizziness, lightheadedness, faintness, loss of balance, confusion, restlessness, etc. If the client experiences these symptoms, he or she should ingest more
total calories, especially carbohydrates. There are two very objective approaches you can take in safeguarding the health of the starvation dieter. To start with, do strength tests on a frequent basis. If the dieter’s strength is falling off, too much muscle tissue is being used for energy, and the client must at least slightly increase his or her total calories. Secondly, and only as a last resort, teach the client the proper use of “Keto Stix.” This is a last resort because a client’s use could further encourage the client’s starvation dieter, thinking that monitoring makes starvation acceptable. When an extremely high amount of body tissue is used for energy there is a toxin that accumulates in the blood that spills over into the urine. This acetate can be detected using Keto-Stix. This is considered a self-test, and the proper application of the Stix is shown on the container. There is a color code, the darker the shade, the greater the use of body tissue.

Have your stubborn client use the Keto-Stix at a regular time of day. If there is the slightest color shade, it is a sign that there is too much body tissue being used for energy, and the client should slightly increase his or her carbohydrate intake until strip has no shade. This should keep him or her at a marginally safe intake. It is also important to note, for example, if a client has a high acetate reading while consuming 1,000 calories and performing no activity, that if the same client were eating 1,500 calories and performing a 500 calorie expenditure activity, he or she will still show the same reading. As a reminder, the lower the starvation dieter’s calories the riskier their activity becomes.

Problem: Is there any way I can speed up my metabolism?

Answer: Well, generally speaking, the performance of all types of resistance exercise results in either a long-term or short-term increase in BMR, while aerobic activity raises metabolism only during the performance of the chosen activity, and for a few minutes afterward.

Increases in BMR that are long-term, result from those types of resistance exercises that cause the greatest increase in lean tissue size. The greater the muscle weight, the more energy the body expends throughout the day. This reflects a long-term increase in metabolism.

Since digestion raises the metabolism it is important to eat many small meals throughout the day as opposed to eating infrequent large meals.

Increases in metabolism that are short-term, result from high rep, light weight, and frequent resistance exercises. Between resistance workouts, muscle energy is being replaced, and during this process the body functions faster. This reflects a short-term increase in metabolism.

Problem: What kind of food should I eat to keep from getting fat?

Answer: First of all, no more than 20-25% of your total caloric intake should come from fat. Eating more protein will force the body to convert amino acids into energy which results in a more gradual increase in blood sugar, which is beneficial to fat loss. Increasing protein slightly while somewhat reducing carbohydrates will minimize the availability of sugar since it’s not as easy for the body to use protein for energy (extreme approaches to carbohydrate limiting and protein increase should be avoided). Consuming carbohydrates that are absorbed into the blood stream slower will minimize fat accumulation that results when too much sugar is rapidly
introduced into the blood. Tell the client to consult a “Glycemic Index” and learn more about the “Glycemic Load” of foods mentioned elsewhere in this manual. This “Index-Load” reflects the rate that sugars from carbohydrates, are absorbed into the blood on a scale of 0 to 100, the higher the number, the more rapid the absorption. Instruct the client to choose foods that are low on the Glycemic Index.

Be reminded that although some very healthy foods rate somewhat high on this index, they can still be ingested, but inform the client to eat these high glycemic index carbohydrates in small quantities and in combination with low glycemic index carbohydrates. This will act to compromise the high GI food’s rate of absorption.
Supplements

The Need for Supplements

It is the position of the National Federation of Professional Trainers that widespread use of individual mega-dose sports supplements among average apparently healthy individuals, and noncompetitive athletes is not encouraged. Furthermore, it is NFPT’s contention that the use of many individual sports supplements as part of a properly prescribed, goal oriented diet and training regimen will represent a marginal contribution to overall progress. While the NFPT’s education division includes information on various useful sports supplements concerning their proper application, it does so in the best interest of your clients who will wish to use these supplements regardless of the NFPT position on the issue of supplementation.
### Supplement Table

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</tbody>
</table>

While the NFPT does not recommend the use of concentrated, individual nutrient supplementation for the typical personal training client, we realize that there will be those clients who use these supplements regardless of your recommendations to the contrary. With this in mind, the following information has been included to provide basic knowledge of those supplements, which have been determined to be of some value dependent upon the client's goals. As you can see, the table provides goal-oriented columns for Weight Gain, General Fitness, Weight Loss, Size & Strength, Intermediate Athletics, and Endurance. In these goal-oriented columns, the appropriate supplements to be recommended are indicated. The application of each NFPT recommended supplement would be discussed later in this chapter. It is by no means suggested that you should administer supplementation to every one of your clients. Simply make the client aware of the beneficial effects of different supplements and their costs, and let the client decide whether or not he/she wishes to use them. Before continuing, the argument for and against supplement use needs to be addressed.

It is thought in some circles that natural healthy foods contain bio-chemical substances (vitamins) in just the right quantities to provide the average person’s body with the enzymes needed to effectively assimilate that particular food’s nutrients. Sadly, not only is the average person’s diet rarely all natural, there are pesticides and preservatives used that destroy some of these natural bio-chemicals. To make things even worse, the average person does not participate in regular strenuous activities. Regular strenuous activities call for a greater caloric intake and greater nutritional needs as well.

**BCAAs**

Branch Chain Amino Acids (BCAAs) are the individual amino acids Leucine, Isoleucine, and Valine. These three amino acids are found to comprise about 50 to 60% of all muscle tissue. It is believed that these three amino acids are taken up into the tissue and used in the creation of cellular enzymes (catalysts) for energy production and to promote the sparing of nitrogen in muscle cells.

Cellular catalysts are depleted during physical exertion and therefore require replenishment. BCAAs should be supplemented within one hour prior to, and during prolonged, intense exercise, to replenish depleted catalysts. When sufficient BCAAs are present in the cell fiber for catalyst formation, other amino acids in the cell can be used for the more desirable purpose of protein synthesis (building and repairing muscle) and energy production.
**Free Form Amino Acids**

Taking Free Form Amino Acids with meals that are 3 to 4 hours apart and include incomplete protein food sources will assure that all the required *essential* amino acids are present at once (often a requirement for cellular uptake). In theory, this will assure continued uptake, tissue repair, and anabolism. Diets, deficient in protein, high or low in total calories can be complemented by the supplementation of these *Free Form Amino Acids*. This situation should be avoided through the proper use of the *General Dietary Advice Chart*, as a substantial portion of each meal is comprised of protein. It is also important to note that the heavier the training, the greater the tissue damage, and the greater the damage, the greater the need for protein. The subject of protein requirement is discussed in greater detail elsewhere in this text.

**Protein Drink**

A quality weight gain protein drink consists of an acceptable balance of carbohydrates, proteins, and fats. When and if your client is ever faced with missing a meal, this type of protein drink can be used as a replacement. Do not make a habit of it for there isn’t enough fiber in most of these drinks. There is no substitution for sound nutritional eating habits.

This infrequent “meal replacement” application will obviously be of value to all of your clients regardless of goals. The need for client discipline in the areas of meal timing, total caloric intake, and nutrient composition, is satisfied through the replacement use of a quality high caloric protein drink.

On the other hand, another effective application of the high calorie *Protein Drink* is relevant to those *weight gain* clients who have an incredibly high metabolism from inherited hormonal reasons. These clients will claim that they absolutely cannot eat enough to gain weight. This is ridiculous due to the availability of extremely high calorie foods (*refer to your Master Food List*), but nonetheless, a high calorie *Protein Drink* is more easily digested and should be added to the weight gain client’s existing high caloric diet. It is important to note that the amino acid breakdown and the caloric comparison between expensive weight gain supplements (protein drinks) and regular *Nonfat Powdered Milk* are very similar. The serving sizes of course differ, but using powdered milk offers a more affordable means by which to supplement your client’s needed calories and amino acids.

**Look close at that protein supplement...**

“Predigested” protein supplements derived through a process known as hydrolysis renders some amino acids unusable, and may contain toxins.

**B-Complex**

These vitamins are co-enzymes that are used in proportion to energy expenditure. Everyone who is relatively active should consider his or her replacement.

**Multi-Vitamin**

The next supplement is the ever-present under-rated *Multi-Vitamin*. This supplement’s value is by far greater than most, if not all other supplements. It is commonly overlooked because the money spent on *Multi-Vitamins* would take away from the amount of money that could have gone to buying a mega-dose supplement. The *Multi-Vitamin* is simply a form of insurance because it provides the body with at least some of everything it needs.

**Carbohydrate Loading Drinks**

Last are the *Carbohydrate Load Drinks*. Most of the glucose used in weight training comes from sources already inside the muscle cell fibers. The source of glucose for aerobic activity comes mainly from the liver. This under-
standing should shed a whole new light on the use of carbohydrate load drinks.

For the aerobic athlete, maintaining blood sugar levels during aerobic activity is of the utmost importance, so these slowly absorbed carbohydrates which act to maintain blood sugar levels, comes in very handy just prior to an event in loading the Liver stores.

For the resistance athlete, taking a carbohydrate load drink just prior to a workout would be unnecessary from the standpoint of supplying energy to fuel the workout, since energy comes primarily from inside the cells in resistance exercise.

However, there is a very useful purpose for carbohydrate load drinks in all types of activity; energy replacement. Simply put, regardless of the type of exercise, post workout carbohydrate intake is necessary to initiate replenishment of all glycogen stores and to prevent muscles from feeding on themselves for immediate post-workout recovery energy (catabolism). The immediate uptake of blood glucose after an energy depleting resistance exercise session will mean the difference between continued catabolism (break down) and the initiation of anabolism (rebuilding).

Vitamins

Vitamin A - RDA 4000-5000 IU

Functions - Maintain epithelium; chem. of eye, essential for good vision, specific function in rod vision (rhodopsin); bone growth in kids, bone replacement in adults; increase permeability of blood capillaries; better tissue oxygenation; health of skin and protective activities of mucus membranes

Sources - Mammals and saltwater fish; supplement. w/encapsulated fish liver oil; carotenes in leafy green and yellow vegetables. (converted by body to vitamin. A, stored indefinitely in fatty tissues)


Overconsumption - growth retardation, enlarged liver and spleen, hair loss, rheumatic pain, increase skull pressure

Vitamin C - RDA 60mg

Functions - Help iron absorption; promote tissue repair and growth; healing wounds; prevents fats from going rancid; natural antibiotic; maintain strength of blood vessel walls; essen. to formation, strength, and health of collagen; preservative in food; bone and tooth formation; burn healing; disease and infection resistance

Sources - citrus fruit, acerda cherries, rose hips, turnip greens, strawberries, cantaloupe, brussel sprouts

Deficiencies - bruise easily, bleeding gums, scurvy

Overconsumption - nontoxic under normal conditions

Vitamin D - RDA 400 IU

Functions - necessary for Ca and P utilization and absorption - promotes ossification of bones and teeth and intestinal absorp. of Ca to form strong bones; activity of Vitamin A
Sources - synthesized by body (skin) through sunlight; cod liver oil, halibut liver oil, egg yolks, fortified milk and margarine
Deficiencies - rickets in children; osteomalacia in adults (rare)
Overconsumption - Toxic - causes excessive bone reabsorption; mental and physical growth retardation, kidney damage, Ca mobilization from bony tissue and soft tissue deposits

Vitamin E - Not Stable
Functions - antioxidant protecting A and C and fatty acids from destruction and free radical scavenger; interacts with selenium; prevents cell membrane damage; healthy heart and skeletal muscles; oxygen conserver in athletes; health of veins in legs; prevents formation of internal blood clots
Source - whole wheat, grain oils, almonds, wheat germ, filberts, peanuts
Deficiencies - almost impossible without starvation; Muscular Dystrophy, liver degeneration, reprod. failure, exudative diathesis, encephalomalacia (degen. membranes)

Calcium - RDA 800mg
Functions - Normal action of skeletal and heart muscle (w/Mg regulates heart beat); blood clotting; strong bones and teeth (90% Calcium); metabolize body’s iron; alleviates insomnia; aids nervous sys. (trans. of nerve impulses)
Sources - milk and milk products, salmon, peanuts, dried peanuts, green veg.
Requirements - Ca:P desirable 1:1 to 2:1; vit. D necessary for proper absorption
Deficiencies - Children - rickets, Adults - osteomalacia, peridental disease, milk fever, eventual death; osteoporosis - bone thinning; 100mg/day - 8 wks of exercise increases bone deposition on victims
Overconsumption - possible side effects
Additional Facts - Ca+P - 70% of body ash (mineral part)
99% of Ca in skeleton and teeth, 1% plasma content
Ca:P - in bone 2:1, in body 1.7:1
Parathyroid gland - monitors Ca level in blood; secretes parathyroid hormone to gut to increase Ca absorption, if slow bone resorption increases Ca

Iron - RDA - men 10mg, women 18mg
Functions - transports O2 from lungs to working muscles; component of enzymes - cytochromes and catalase; production of red blood corpuscles (hemoglobin); red pigment in blood (myoglobin); promotes disease resistance; prevents fatigue; aids growth; helps in protein metabolism; prevents anemia
Sources - heart and liver, raw clams, red meat, peaches, oysters, egg yolks, nuts
Deficiencies - anemia - insufficient iron needed to form healthy RBCs causes lack of hemoglobin; weakness, aleness of skin, constipation
Overconsumption - excessive intake may be toxic!

Magnesium - RDA - men 350mg, women 300mg
Functions - activator of enzymes (ATP triggered, muscle contraction, refractory making proteins); essential to Ca and Vit. C metabolism; metabolism of K; Na and P; convert blood sugar to energy; effective nerve and muscle function; fights depression; keeps teeth healthy; promotes healthy cardiovascular sys.; prevents Ca deposits; kidney stones and gall stones; catalyst in the utilization in carbohydrates, fats, and proteins
Sources - liver, yeast, nuts, dark green veg., apples, grapefruit, lemons, seeds, figs
Deficiencies - hypomag. - poor growth (NH4 level may affect the cause), nervousness, muscular excitability, tremors, depression
Overconsumption - may be toxic in individuals with kidney malfunctions
Potassium - RDA 1875-5625mg

Functions - role in osmotic regulation in cells; principle cation in cells; works to control activity in the heart, muscle, nervous sys., and kidneys; assists conver. of glucose to glycogen

Sources - all veg. (esp. green leafy), oranges, whole grains, sunflower seeds, potatoes (esp. skin), bananas

Deficiencies - muscle paralization (impairs glucose metabolism), water pills or hormone products (cortisone and aldosterone) cause P loss and Na retension, poor reflexes, respiratory failure, cardiac arrest, nervous disorders, constipation, irregular pulse, insomnia

Sodium - RDA 1100-3300mg

Functions - with potassium - equalize acid -alkali factor in blood, regulate water balance, muscle contraction and expansion, nerve stimulation, with chlorine - improve blood and lymph health, purge carbohydrate dioxide from body, aids digest., nec. for HCI production in stomach; keeps minerals soluble (avoid deposits in blood stream)

Sources - virtually all foods, esp. seafoods, poultry, meat, kelp

Deficiencies - very rare; intestinal gas, weight loss, vomiting, muscle shrinkage, poor carbohydrate. conversion

Overconsumption - potassium lost in urine, fluid retention, dizziness, swelling, increased chances of high blood pressure

Vitamins + Minerals + the Athlete

Vitamins lost during exercise:
1) thiamin
2) niacin
3) riboflavin
4) pantothenic acid

Minerals lost during exercise
1) calcium
2) iron

40 Fundamental Nutrients

The nutrients below are listed in order of importance to the body. It will be interesting for you to see just where these nutrients fall relative to the body’s priorities...

1) Water
2) Carbohydrates
3) Amino acids (10)
4) Fats
5) Vitamins (13)
6) Electrolytes (3)
7) Minerals (12)

Why are vitamins so low on the list? Well, it probably has something to do with what our interpretation of a vitamin really is...

Vitamins are biochemicals found in healthy foods. They are used by the body to produce enzymes sufficient to aid in the digestion of host calories. In other words, healthy natural foods ideally contain sufficient vitamins to help the body assimilate that particular food’s nutrients. The ingestion of nutritionally deficient calories call on the body to produce the enzymes needed for proper assimilation. The use of multi-vitamins are therefore recommended in all cases as a form of insurance in case foods are deficient in nutrients.

Individual supplements are not generally recommended with the exception of diagnosed deficiencies. Generally speaking, individual supplements in mega-doses may cause a nutritional imbalance. The NFPT Supplementation chart does not include supplements that will cause imbalances. Because these supplements are listed does not necessarily mean they should be recommended in every case. Supplementation is dictated by client needs, and/or desired goals.

Supplements
The charts and tables are to be used as a primary guide. The charts and tables are arranged into sections that should help you take a given client, assess them, and then develop a program for them. Please see the website for preformatted workout according to the principles we have emphasized in the manual.

Section A: Tables For Exercise Recommendations

**Table A1: General Exercise Recommendations Chart – Starter through Advanced- Three Types of Goals**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Rep Range</th>
<th>Routine</th>
<th>Set Intensity</th>
<th>Duration</th>
<th>Recovery HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>4-6</td>
<td>3 day</td>
<td>90-100</td>
<td>30-60</td>
<td>100</td>
</tr>
<tr>
<td>Stamina</td>
<td>12-15</td>
<td>2 day</td>
<td>85-95</td>
<td>45-70</td>
<td>115</td>
</tr>
<tr>
<td>Endurance</td>
<td>20-25</td>
<td>Circuit</td>
<td>75-90</td>
<td>45-90</td>
<td>125</td>
</tr>
</tbody>
</table>

**Table A2: Suggested Movements and Total Sets Table**

<table>
<thead>
<tr>
<th>Muscle Group</th>
<th>Total Sets-low Intensity</th>
<th>Total Sets-High</th>
<th>Circuit Routine</th>
<th>Suggested Movements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest</td>
<td>8-10</td>
<td>6-8</td>
<td>4-5</td>
<td>Flat/ Incline Bench Press</td>
</tr>
<tr>
<td>Back- upper</td>
<td>10-12</td>
<td>8-10</td>
<td>4-5</td>
<td>Wide/ Close Grip Pulls</td>
</tr>
<tr>
<td>Back-lower</td>
<td>6-8</td>
<td>4-6</td>
<td>4-5</td>
<td>Hyperextensions</td>
</tr>
<tr>
<td>Shoulders</td>
<td>6-8</td>
<td>4-6</td>
<td></td>
<td>Upright Right Rows</td>
</tr>
<tr>
<td>Triceps</td>
<td>6-8</td>
<td>4-6</td>
<td></td>
<td>Tricep Ext/ Bench Dips</td>
</tr>
<tr>
<td>Biceps</td>
<td>5-7</td>
<td>3-5</td>
<td></td>
<td>Straight bar curl, preacher</td>
</tr>
<tr>
<td>Traps</td>
<td>3</td>
<td></td>
<td></td>
<td>Shrugs- Bar/Dumb-bell</td>
</tr>
<tr>
<td>Gluts</td>
<td>10-12</td>
<td>8-10</td>
<td>4-5</td>
<td>Squats, leg press-deep</td>
</tr>
<tr>
<td>Quads</td>
<td>10-12</td>
<td>8-10</td>
<td>4-5</td>
<td>Leg press/ leg extensions</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>3-4</td>
<td>3-4</td>
<td>4-5</td>
<td>Leg curls/ straight leg dead lifts</td>
</tr>
<tr>
<td>Ad/Ab-ductors</td>
<td>3-4</td>
<td>3-4</td>
<td></td>
<td>Side lunges, cable pull In/Out</td>
</tr>
<tr>
<td>Calves</td>
<td>3-4</td>
<td>3-4</td>
<td>4-5</td>
<td>Standing Calf Raises</td>
</tr>
<tr>
<td>Abdominals</td>
<td>1-2</td>
<td>1-2</td>
<td>4-5</td>
<td>Crunches, reverse crunch</td>
</tr>
<tr>
<td>Forearms</td>
<td>2-4</td>
<td>2-4</td>
<td></td>
<td>wrist/ reverse curl, hammer curl</td>
</tr>
</tbody>
</table>

**Table A3: Range Chart- Set Intensity effect on Performance/Tissue**

<table>
<thead>
<tr>
<th>Repetition Range</th>
<th>4-6</th>
<th>12-15</th>
<th>20-25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Intensity- 70%</td>
<td>Maintain Strength</td>
<td>Maintain Stamina</td>
<td>Some fat conversion</td>
</tr>
<tr>
<td>Set Intensity- 80%</td>
<td>Increase Strength</td>
<td>Increase Stamina</td>
<td>Moderate fat conversion</td>
</tr>
<tr>
<td>Set Intensity- 90%</td>
<td>Maximize Strength</td>
<td>Maximize Stamina</td>
<td>Maximum fat conversion</td>
</tr>
<tr>
<td>Set Intensity- 100%</td>
<td>Build White Tissue</td>
<td>Build Red, Fast</td>
<td>Build Red Slow tissue</td>
</tr>
<tr>
<td>Set Intensity- 110%</td>
<td>Tissue Damage</td>
<td>Tissue Damage</td>
<td>Tissue Damage</td>
</tr>
</tbody>
</table>
Table A4: Repetition ranges relative to percent intensity and point of contraction failure – Relative RPE (set intensity)

<table>
<thead>
<tr>
<th>Fitness Goal</th>
<th>70% intensity</th>
<th>80% intensity</th>
<th>90% intensity</th>
<th>100% intensity</th>
<th>110% intensity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective feeling</td>
<td>Somewhat strong- Borg 4</td>
<td>Hard- Borg 6</td>
<td>Very hard- Borg 7-8</td>
<td>Very, very hard- Borg 9-10</td>
<td></td>
</tr>
<tr>
<td>Strength</td>
<td>3 reps short of failure</td>
<td>2 reps short of failure</td>
<td>1 rep short of failure</td>
<td>Failure</td>
<td>Forced rep</td>
</tr>
<tr>
<td>Stamina</td>
<td>6 reps short of failure</td>
<td>4 reps short of failure</td>
<td>2 reps short of failure</td>
<td>Failure</td>
<td>Forced rep</td>
</tr>
<tr>
<td>Endurance</td>
<td>9 reps short of failure</td>
<td>6 reps short of failure</td>
<td>3 reps short of failure</td>
<td>Failure</td>
<td>Forced rep</td>
</tr>
</tbody>
</table>

Section B: Tables for Body Weight, Energy Balance and Body Composition

Table B1: Activity Expenditure Chart

<table>
<thead>
<tr>
<th>Recovery Heart Rate (between Sets)</th>
<th>Calories per hour- Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>115</td>
<td>750</td>
</tr>
<tr>
<td>125</td>
<td>1000</td>
</tr>
<tr>
<td>Add- BMR + Daily Expend + Activity</td>
<td>Total caloric expenditure (sum of 3)</td>
</tr>
</tbody>
</table>

Total Daily Caloric Expenditure and Activity Expenditure

Total Caloric Expenditure= BMR + Activity Expenditure + Thermic Effect of Food

Table B2: Basal Metabolic Rate Equation

Men=Body Wt (Kg) * 1.0 kcal/kg/hr * 24 hr
Women=Body Wt (Kg) * 0.9 kcal/kg/hr * 24 hr

OR

Men=Body Weight (BWt- lbs) * 11 = kcal/d
Women=BWt- lbs * 10.5 = kcal/ d

Table B3: General Activity Equations- 3 Different Methods related to Activity

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>BMR Factor</th>
<th>Activity factor (x BMR)</th>
<th>Energy Expend (Kcal/kg/day)</th>
<th>Example of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary</td>
<td>.25-.40</td>
<td>1.3-M 1.3-W</td>
<td>31 30</td>
<td>Seated and standing activities driving, lab work, cooking, easy household</td>
</tr>
<tr>
<td>Light Activity</td>
<td>.50-.70</td>
<td>1.6-M 1.5-W</td>
<td>38 35</td>
<td>Walking 2.5-3 mph, garage work, electrical, carpentry, restaurant, housecleaning, child care, golf, bowl</td>
</tr>
</tbody>
</table>

Continued on next page
Table B3: General Activity Equations (Continued)

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>BMR Factor</th>
<th>Activity factor (x BMR)</th>
<th>Energy Expend (Kcal/kg/day)</th>
<th>Example of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate activity</td>
<td>.65 - .80</td>
<td>1.7-M 1.6-W</td>
<td>41 37</td>
<td>Walking 3.5- 4mph vigorous garden work, cycling, skiing, tennis</td>
</tr>
<tr>
<td>Heavy Activity</td>
<td>.90 – 1.20</td>
<td>2.1-M 1.9-W</td>
<td>50 44</td>
<td>Walking with a load uphill, tree service, heavy manual digging, basketball, football, soccer, rock climbing</td>
</tr>
<tr>
<td>Exceptional Activity</td>
<td>1.30 – 1.45</td>
<td>2.4-M 2.2-W</td>
<td>58 51</td>
<td>Training in professional events or ultra-distance races, running, jumping</td>
</tr>
</tbody>
</table>

Use 2.2 lbs/kg for all conversions (160 lbs/2.2 = 72.7 kg)

Body Mass Index (BMI) = Wt (lbs)/ Ht (in) ^ 2 * 705

Table B4: General Dietary Advice Chart

<table>
<thead>
<tr>
<th>Goal</th>
<th>Weight Loss</th>
<th>Weight Maintain</th>
<th>Weight Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Daily Cal. intake</td>
<td>Total expend- 500 kcal</td>
<td>Total expend.</td>
<td>Total expend + 500</td>
</tr>
<tr>
<td>% Carbohydrate</td>
<td>50-60%</td>
<td>50%</td>
<td>50-60%</td>
</tr>
<tr>
<td>% Protein</td>
<td>20-25%</td>
<td>25%</td>
<td>20-25%</td>
</tr>
<tr>
<td>% Fat</td>
<td>25-30%</td>
<td>25%</td>
<td>20-25%</td>
</tr>
<tr>
<td># meals/ day</td>
<td>4-5</td>
<td>4-5</td>
<td>5-6</td>
</tr>
</tbody>
</table>
GLOSSARY

AHA- American Heart Association
Abduction- movement of an extremity away from the midline of the body.
Acetate- an organic substance produced by the liver to be used for energy using cannibalized fat and muscle tissue; occurs during both starvation and over-exertion; extreme levels are toxic to the brain
Actin- the smaller of the two contractile elements which sustain damage through applied resistance and are once again repaired through anabolism resulting in hypertrophy of the myofibril
Acute- rapid onset and severe symptoms of occurrence; usually referring to injury
Adipose- of a fatty nature; fat
Aldosterone- hormone regulating salt and water balance
Androgenic- contributing to the formation of male and/or female characteristics
Anemia- condition in which oxygen transport by the red blood cells is deficient
Anabolism- the stage of metabolism when damaged tissue is being repaired
Angina Pectoris- periodic severe pain in the chest radiating to the left shoulder and down the inner side of the left arm, usually precipitated by physical exertion or emotional stress
Anorexia- lack or loss of appetite for food
Antagonistic Multi-set- a slow “super set” involving the performance of two movements, back to back, targeting antagonistic muscle groups
Antagonistic Muscle- a muscle whose action opposes that of another muscle

Amylase- carbohydrate digestive enzymes.
Arteriole- a very small artery
Artery- a vessel through which the blood passes away from the heart to the various parts of the body
ADP- adenosine diphosphate; resultant molecule of splitting ATP for energy also used to regenerate ATP
ATP- adenosine triphosphate; chemical source of energy for all nucleated cells
Atrophy- a wasting away or diminution in the size of a cell, tissue, organ, or part
Ballistic- jerky or projectile movement
Beta Oxidation- energy producing process involving the breakdown of long chains of fatty acids into two carbon molecules which enter metabolic pathways to produce ATP
Bile- emulsifier of fat; breaks fat down into easily metabolized droplets
Biomechanics- mechanical movement of human anatomy
Bloodsugar- circulating glucose within the cardiovascular system
Cannibalism- the breakdown and use of body tissue for energy in the absence of nutrients
Cartilage- hard tissue located chiefly in the joints of major bones
Catabolism- the stage of metabolism when activity is being performed causing damage to cells later needing repair
Catalyst- a substance which changes the velocity of a reaction but does not form part of the final product
Cerebrospinal Fluid- fluid which surrounds and circulates throughout the central nervous system
Collateral- referring to fluid (blood) movement outside the main cardiovascular tree

Compensatory Acceleration- the increase in speed of a repetition as the leverage improves

Compound- the unity of two or more parts in the accomplishment of a task

Concentric Contraction- the occurrence of a contractile shortening of a muscle fiber or a group of fibers; the positive rep

Contraindication- outward signal of internal dysfunction, or adverse bodily activity

Cortisol- principle stress hormone released by the adrenal gland during times of physical and physiological stress, mobilizes fat and stimulates the liver to release tissue cannibalizing enzymes into the bloodstream

Chronic- gradual in onset and very slow in recovery, usually refers to injury which is long in duration

Chylomicrons- packaged form of fatty substances entering into the blood from digestion via the lymphatic system

Creatine Phosphate- acts as store of high energy phosphate in muscle tissue

Deamination- the undesirable breakdown and use of amino acids for energy, performed by the liver, results in the toxic ammonia; later broken down into urea for excretion

Dilation- the peripheral expansion of tissue; usually blood vessels

Eccentric Contraction- a controlled contraction of a muscle fiber of group of fibers from the fully contracted state to the starting position; the negative rep

Ectomorph- having a relative tendency to remain very thin

Edema- the presence of an abnormally large volume of fluid in the interstitial spaces of the body

Endomorphic- having a relative tendency to remain heavy or obese

Endomysium- a fine connective tissue sheath surrounding the individual muscle cell fiber

Enzyme- proteins in small amounts that speed up chemical reactions

Epimysium- a fine connective tissue sheath that surrounds the entire muscle group, also known as deep fascia

Equilibrium- the stage in metabolism when neither damage or repair is occurring; the cell is at rest

Ergometer- device normally used for sub-maximal aerobic evaluation (exercise bike)

Exogenous- imposing an affect on the body from the outside environment

Extension- when a joint functions resulting in an increase in the angle of the levers involved

Extracellular- all areas outside the tissue cell wall; usually referring to intramuscular areas

Fatty acids- the body’s desired source of energy during steady state aerobic activity, and low level activity; used for ATP production in muscle tissue during recovery glycogen replenishment

Fixators- any muscle or group of muscles that stabilize the body and/or its parts during the functioning of the prime movers

Flexion- when a joint functions resulting in a decrease in the angle formed by the levers involved

Forced Rep- performing repetitions of an exercise beyond concentric failure with the assistance of spotter

Glucagon- hormone released in response to low bloodsugar level; stimulates the liver to release stored glycogen in the form of glucose into the bloodstream, returning bloodsugar levels to normal

Glucometer- self-testing device used to measure blood glucose
Gluconeogenesis - the formation of glucose from noncarbohydrate sources such as protein or fatty acids
Glucose - the principle bloodsugar
Glucose polymers - chain of glucose molecules linked together
Gluco-Stix - blood blotting stick used in conjunction with glucometer testing
Glycemic Index - a functional list of foods rated according to their specific absorption rate into the bloodstream
Glycerol - component of triglycerides capable of conversion to glucose
Glycogen - the chief carbohydrate storage form of glucose
Glycolysis - energy production using glucose
Holistic training - training in various rep ranges in a single session to stimulate adaptation of all three motor units of the target muscle group
Hydrolysis - decomposition with the addition of water
Hyperplasia - an increase in the size of a muscle or organ owing to an increase in the number of cells
Hypertension - abnormally high tension; usually high blood pressure
Hypertonic - having an osmotic pressure greater than that of another solution with which it is compared
Hypertrophy - the enlargement or overgrowth of a part due to an increase in the size of its cells
Hypoglycemia - concentration of glucose in the blood below the normal limit
Hypotonic - having an osmotic pressure lower than that of a solution with which it is compared
Internal rotation - movement in which the anterior surface of the humerus (upper arm) turns inward toward the midline of the body.
Impermeable - not permitting for passage; usually fluid
Innervation - a nerve supply that stimulates a motor unit to contract regardless of the angle of resistance, so long as the action potential exceeds the motor unit’s contractile threshold
Insertion - place of attachment of a muscle to the bone which it moves; occurs at the end of the muscle furthest from the body
Insulin - hormone released during high bloodsugar levels, or at the onset of exercise, responsible for reducing bloodsugar to its normal level through its mediating affect on the uptake of sugar into various body tissues to include muscle and fat
Insulin Receptor Sites - pathways located on various body tissues, which in the presence of insulin, allow for the transport of nutrients into the cell
Intracellular - situated inside the cell
Intramuscular - areas which are situated anywhere inside a muscle group
Intercostal - situated between the ribs
Interstitial - pertaining to, or situated in the gaps between tissues
Isometric Contraction - static contraction; contraction of a muscle resulting in neither a shortening or lengthening of the tissues
Isolation - to single out and develop a part separately
Keto-Stix - self-test sticks used to examine urine levels of acetate, ketones
Ketones - bi-product of tissue use for energy; large amounts are toxic to brain function
Lactic Acid - accumulates in muscle fibers during strenuous exercise causing cramps and inhibiting contraction; Liver converts to energy
Leverage - an angle from which resistance is applied against a muscular contraction
Ligament - any tough, fibrous tissue connecting bone to bone
Lipolytic enzymes- fat digestive enzymes
Lymphatic Vessels- network of vessels that transport fluids from the interstitial areas back into the bloodstream
Lypase- one of the two principle fat burning enzymes
Mesomorphic- a relative tendency to remain muscular in appearance
Metabolism- the sum of all the chemical and physical changes that can take place in the body and enable continued growth and functioning
Mitochondria- cell organelles that most of the cell’s ATP; known as the powerhouse of the cell
Motor Unit- a group of fibers stimulated to contract simultaneously in response to an action potential of sufficient intensity to surpass its threshold of sensitivity
Multi-Set- a slow “super-set” involving the performance of two movements, back to back, targeting different prime movers
Myofibril- contractile proteins inside the cell comprised of actin and myosin
Myosin- the larger of the two contractile elements making up the myofibrils
Neuron- a nerve cell transmitting an impulse allowing for the contraction of a motor unit
Nucleolus- surrounds nucleus and houses RNA
Nucleus- the controlling organelle embedded in cell membrane and houses DNA
Oblique Muscles- located on either side of the lower abdomen
Origin- the attachment of a muscle at the end closest to the center of the body
Oxidative Phosphorylation- system of energy production involving the utilization of glucose or fat in the presence of oxygen
Peptides- short chains of amino acid molecules linked together
Perfusion- passage of blood through the vascular tissue into the interstitial space
Perimysium- connective tissue sheath surrounding each motor unit
Plateau- period of training in which no progress is identified
Prime Mover- A muscle group that is directly responsible for the movement of resistance in a given exercise.
Proteases- protein digesting enzymes
Pyruvate- converted form of intracellular glucose used for producing ATP energy with oxygen.
Ribosomes- elements located along myofibrils which act to manufacture and repair actin and myosin
Rough Sacroplasmic Reticulum- houses ribosomes and are located around myofibrils
Subcutaneous- beneath the skin
Symmetrical- opposite sides of the body corresponding with each other; usually refers to muscular development
Synergists- any muscle or group of muscles allowing balance during the contraction of prime movers
Synthesis- putting together parts to form a more complete whole
Tendon- fibrous cord of connective tissue in which the muscles end, and are where muscles attach to bone or other structures
Tropic- triggering or influencing an action
Valsalva’s Maneuver- increasing of intrathoracic pressure by holding the breath and straining against a closed glottis; typically associated with coughing, defecation, and weight lifting
Vein- vessel which moves blood to or toward the heart
Ventricle (left)- the chamber of the heart pumping blood to the aorta
NFPT Consultation Guidelines

The most valuable client service you provide is risk factor identification. Always recommend, verbally and in writing, clients consult their physicians prior to starting an exercise program or increasing the intensity of an existing program (included in optional “Informed Consent Waiver” provided). Always maintain CPR Certification.

Questionnaire Procedure

1st Appointment
Inform Client of Professional Confidentiality (a sample Disclosure Agreement Form is included in these Guidelines)

Major Health Risk Factor Identification
•Diabetes
•Clinical Obesity
•A Total Cholesterol to HDL Cholesterol ratio > 5:1
•Abnormal resting ECG

Client Personal Medical History
heart attack
bypass surgery
cardiac surgery
extreme chest discomfort
irregular heart beat
high blood pressure greater than 140/90
heart murmurs
rheumatic fever
ankle swelling
any vascular diseases
phlebitis
unusual shortness of breath
abnormal blood fats
asthma, emphysema, bronchitis
stroke
past history of diabetes
emotional disorders
recent hospitalization and cause
drug allergies
orthopedic problems, or arthritis
smoker over 35

Family history of Illness or Disease
Premature death of immediate family member under age 50

Acquire Cardiovascular Risk Profile Information
A score of 32 or higher constitutes a risk factor (a sample form is located elsewhere in these Guidelines)

Current Client Medication

Chronic illness, Injury or Range-of-Motion Limitation

Complete Par-Q & You form (a sample form is included in these guidelines)

Any concerns not listed that may affect your ability to start a fitness program

A response of “yes” to any of the above questions and a client must be required to get a complete physical and/or a “Physician’s Release” prior to exercise. Following the instructions on the Par-Q Form may require Physician’s involvement as well. (sample “Physician’s Release” & “Par-Q” forms are included in these Guidelines)
Prior to conducting client pre-exercise screenings where activity is required and/or before implementing any of your fitness prescriptions, even with a signed “Physician’s Release”, and completed “Par-Q” form, discuss and complete your “Informed Consent Waiver” (sample “Informed Consent Waiver” included).

Describe “contraindication to exercise” both prior to and during exercise performance. These include: Joint Pain, Dizziness, Nausea, Rapid Pulse, Excessive Sweating, Extreme Muscle Soreness, Cramping, Chest Pain. Upon occurrence of one or more of the above, the client should be instructed to stop exercising and consult with their personal physician.

If in the personal trainer’s professional judgment, a potential or actual client is at too high a medical risk for fitness prescriptions, or the trainer does not feel qualified, the personal trainer should refuse the client even if the client has obtained a medical release, completed a par-q and/or executed all waivers.

General Client Information
- age
- daily activities (occupation)
- sleeping habits
- most recent exercise program
- water intake
- has client been advised against exercise
- sex (M/F)
- stress
- weight
- long & short-term goals
- height

Client Eating Habits
Typical daily menu to include:
- food selection
- number of meals
- meal timing
- size of meals
- hunger between meals
- current supplements

Controllable Dietary Health Risk Habits
Lifestyle/dietary change if client has the below habits on a daily basis
- coffee
- chocolate
- soda
- salt
- sugar
- alcohol
- drugs
- tobacco
- red meats
- fried foods
- dairy products

Health Risk Habits & Dietary Lifestyle Changes
- Coffee: Contains caffeine which has negative effects on fluid balance, and stimulates nervous activity; caffeine having a diuretic effect.
- Soda: Too much sugar causing blood glucose problems; also caffeine in some drinks has same effects as coffee; caffeine having a diuretic effect.
- Chocolate: Same as soda and coffee above concerning caffeine and it’s diuretic effect, and too much sugar.
- Salt: Contains sodium causing fluid retention, potassium loss, and contributes to high blood pressure.
- Sugar: Too quickly absorbed causing rapid rise and fall of blood sugar; in frequent and or large quantities contributes to fat deposits.
- Alcohol: Suppresses nervous function, overworks the liver, and acts as a diuretic same as caffeine.
- Drugs: All drugs have their effects on the nervous, and endocrine systems which are very delicate and be seriously impaired.
- Tobacco: Nicotine constricts vessels contributing to high blood pressure, contains carcinogens that destroy respiratory tissues.
- Red Meat; Fried Foods; Milk & Dairy Products: All are foods of animal origin and contain saturated fat contributing to Cardiovascular Disease.
- Low Fiber Intake: Poor digestion, poor assimilation of foods.
Determine Client Goals
Fat loss (through diet & activity)
General fitness
(dietary, aerobics, muscle strength/endurance, flexibility)
Improved flexibility
(client age is a factor)
Aerobic conditioning
(beginner, intermediate, advanced)
Muscle endurance
(beginner; intermediate; advanced)
Muscle stamina
(beginner, intermediate, advanced)
Muscle strength
(beginner; intermediate; advanced)

Optional Diagnostic Tests to Perform
Depending on Experience and Acquired Trainer Skills
Accurate measurement of client weight
Circumference measurements
Body composition measurement
Blood sugar analysis (12hr fasted)
(normal range = 70 to 110)
Ketone testing (keto-stix)
Blood pressure testing
(below 140/90 OK)
Blood Lipid Profile
Muscle Strength (heavy weight)
Muscle Endurance (light weight)
Step Test Aerobic Capacity
Sit-and-Reach Flexibility Test

How to Compile Recommendations as an NFPT Affiliate
(All necessary forms are provided in these guidelines)
NFPT Affiliates are encouraged to use organizational website software when making recommendations. The calculations and software functions are designed around the NFPT Charts & Tables. Go to: www.nfpt.com/Software/

Dietary Recommendations
NFPT General Dietary Advice Chart
NFPT Activity Expenditure Chart
NFPT Master Food Lost
(provide a client copy)

Supplement Recommendations
NFPT Supplement Table
NFPT does not advocate the use of mega-dose individual supplements of any kind not recommended by the appropriate health professional; Be aware that ingredients found in some supplements could aggravate an existing hidden or unhidden risk factor.

Movements & Number of Sets to be Performed
NFPT Suggested Movements & Total Sets Table

Exercise Routine & Degree of Recovery
NFPT General Exercise Recommendations Chart

Goal Oriented Repetition Ranges and Intensity
NFPT Range Chart

Schedule Periodic Re-Evaluations
Perform appropriate optional diagnostic tests above
Re-Examine Client Goals
Make adjustments once again using NFPT Charts, Tables & Website Software
## Master Food List for Diet Preparation

*Proteins, Carbs, and Fats are in Grams. *F=Fiber *Na=Sodium *K=Potassium

### Sugars

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### Salad

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### Master Food List for Diet Preparation

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### Biscuit, Muffins, Rolls

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<td>ALMONDS</td>
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<td>FILBERTS(Hazelnuts)</td>
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### Beef

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<th>PRO</th>
<th>CARB</th>
<th>FAT</th>
<th>F</th>
<th>Na</th>
<th>K</th>
<th>CAL</th>
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<tbody>
<tr>
<td>69</td>
<td>HAMBURGER; Regular</td>
<td>8oz</td>
<td>40.6</td>
<td>-</td>
<td>48.1</td>
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<td>-</td>
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<td>0</td>
<td>147</td>
<td>406</td>
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<td></td>
<td>STEAK; Sirloin</td>
<td>7oz</td>
<td>31.1</td>
<td>-</td>
<td>49</td>
<td>0</td>
<td>124</td>
<td>569</td>
<td>576</td>
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<td>STEAK; T-Bone</td>
<td>7oz</td>
<td>25.8</td>
<td>-</td>
<td>73.5</td>
<td>0</td>
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<td>STEAK; Porterhouse</td>
<td>8oz</td>
<td>30.4</td>
<td>-</td>
<td>74</td>
<td>0</td>
<td>106</td>
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<td>ROAST BEEF</td>
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<td>33.5</td>
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<td>43.7</td>
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### Luncheon Meats, (& Sausage)

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<th>F</th>
<th>Na</th>
<th>K</th>
<th>CAL</th>
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<tbody>
<tr>
<td></td>
<td>HAM</td>
<td>4oz</td>
<td>19.9</td>
<td>3.5</td>
<td>12</td>
<td>0</td>
<td>1494</td>
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<tr>
<td></td>
<td>BOLOGNA; Beef</td>
<td>1oz</td>
<td>3.31</td>
<td>0.55</td>
<td>8.04</td>
<td>0</td>
<td>284</td>
<td>44</td>
<td>89</td>
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<tr>
<td></td>
<td>BOLOGNA; Pork</td>
<td>1oz</td>
<td>4.34</td>
<td>0.21</td>
<td>5.63</td>
<td>0</td>
<td>289</td>
<td>80</td>
<td>70</td>
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<tr>
<td></td>
<td>SALAMI, Hard</td>
<td>1/16” sl</td>
<td>2.29</td>
<td>0.26</td>
<td>3.44</td>
<td>0</td>
<td>186</td>
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<td>42</td>
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<td></td>
<td>PEPPERONI</td>
<td>1sl</td>
<td>1.15</td>
<td>0.16</td>
<td>2.42</td>
<td>0</td>
<td>112</td>
<td>19</td>
<td>27</td>
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<td>Page</td>
<td>Master Food List for Diet Preparation</td>
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<th>F</th>
<th>Na</th>
<th>K</th>
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<tbody>
<tr>
<td>28</td>
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<td>1 link</td>
<td>13.4</td>
<td>1</td>
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<td></td>
<td></td>
<td>1 oz</td>
<td>4</td>
<td>0.46</td>
<td>8.14</td>
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<td>248</td>
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<td>0.29</td>
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<td>BACON</td>
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<td>9.75</td>
<td>0.11</td>
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<td>0</td>
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<td></td>
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<td>1</td>
<td>20</td>
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<td>0</td>
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<td>346</td>
<td>345</td>
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<td>VEAL CUTLET</td>
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<td>18.1</td>
<td>0</td>
<td>10.3</td>
<td>0</td>
<td>63</td>
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**Poultry**

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<th>F</th>
<th>Na</th>
<th>K</th>
<th>CAL</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CHICKEN; White</td>
<td>4 oz</td>
<td>23.5</td>
<td>-</td>
<td>3.2</td>
<td>0</td>
<td>76</td>
<td>237</td>
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<tr>
<td></td>
<td>CHICKEN; White Skinned</td>
<td>4 oz</td>
<td>20.4</td>
<td>-</td>
<td>3.6</td>
<td>0</td>
<td>60</td>
<td>210</td>
<td>100</td>
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<td></td>
<td>CHICKEN; Dark</td>
<td>4 oz</td>
<td>26.7</td>
<td>-</td>
<td>7.33</td>
<td>0</td>
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<td>285</td>
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<td>4 oz</td>
<td>21.9</td>
<td>-</td>
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<td>93</td>
<td>241</td>
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<td>-</td>
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<td>-</td>
<td>3.33</td>
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**Seafood**

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<th>Na</th>
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<td>SHRIMP</td>
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<td>41</td>
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<td>-</td>
<td>318</td>
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<td>SMELT</td>
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<td>42.2</td>
<td>-</td>
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<td>-</td>
<td>1064</td>
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<td>89</td>
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<td>20</td>
<td>-</td>
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<td>38</td>
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**Miscellaneous**

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<th>Na</th>
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<td>MARS BAR</td>
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<td></td>
<td>280</td>
<td>510</td>
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<tr>
<td></td>
<td>SNICKERS BAR (King Size)</td>
<td>3.7 oz</td>
<td>15</td>
<td>52</td>
<td>24</td>
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<td>SNICKERS BAR (Regular Size)</td>
<td>6</td>
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<td>13</td>
<td>15</td>
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<td>59</td>
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<td>48</td>
<td>179</td>
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<td>POTATO CHIPS, Ruffles</td>
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<td>15</td>
<td>10</td>
<td>0</td>
<td>250</td>
<td>150</td>
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<td>585</td>
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<td>0</td>
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Physical Activity Readiness Questionnaire - PAR-Q (revised 1994)

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?</td>
<td></td>
</tr>
<tr>
<td>2. Do you feel pain in your chest when you do physical activity?</td>
<td></td>
</tr>
<tr>
<td>3. In the past month, have you had chest pain when you were not doing physical activity?</td>
<td></td>
</tr>
<tr>
<td>4. Do you lose your balance because of dizziness or do you ever lose consciousness?</td>
<td></td>
</tr>
<tr>
<td>5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?</td>
<td></td>
</tr>
<tr>
<td>6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?</td>
<td></td>
</tr>
<tr>
<td>7. Do you know of any other reason why you should not do physical activity?</td>
<td></td>
</tr>
</tbody>
</table>

If you answered YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want - as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active - begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal - this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.

**Informed Use of the PAR-Q:** The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction.

NAME: _______________________________________________________
SIGNATURE: __________________________________________________

SIGNATURE OF PARENT: ______________________________________
or GUARDIAN (for participants under the age of majority)
DATE: __________________________________
WITNESS: __________________________

Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

You are encouraged to copy the PAR-Q but only if you use the entire form

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Health Canada  Santé Canada

90
# Cardiovascular Risk Profile

**Name:**

**Comments:**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Female</th>
<th>Female Over 45 Years</th>
<th>Male</th>
<th>Bald Male</th>
<th>Bald Short Male</th>
<th>Bald Short Stocky Male</th>
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<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<table>
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<tr>
<th>Age</th>
<th>10 - 20 Years</th>
<th>21 - 30 Years</th>
<th>31 - 40 Years</th>
<th>41 - 50 Years</th>
<th>51 - 60 Years</th>
<th>60+ Years</th>
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<td>4</td>
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<td>6</td>
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<table>
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<tr>
<th>Heredity: Parents &amp; Siblings</th>
<th>No Family History Of CVD</th>
<th>One With CVD Over 60 Years</th>
<th>Two With CVD Over 60 Years</th>
<th>One Death From CVD Under 60 Years</th>
<th>Two Deaths From CVD Under 60 Years</th>
<th>Three Deaths From CVD Under 60 Years</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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<table>
<thead>
<tr>
<th>Personal History of CVD</th>
<th>Completely Benign</th>
<th>CVD Symptoms Not Medically Confirmed</th>
<th>CVD Mild: Medically Confirmed (BP Drugs)</th>
<th>CVD Moderate Occasional Symptoms</th>
<th>CVD Severe Frequent Symptoms</th>
<th>Hospitalized For CVD</th>
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<tr>
<td></td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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<table>
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<th>Diabetes</th>
<th>No Symptoms Negative Family History</th>
<th>Latent Positive Family History</th>
<th>Chemical</th>
<th>Mild Dietary Control</th>
<th>Moderate: Oral Drug Control</th>
<th>Severe: Insulin Control</th>
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<td>0</td>
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<td>2</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<table>
<thead>
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<th>Gout</th>
<th>No Symptoms Negative Family History</th>
<th>Family History</th>
<th>Elevated Uric Acid Level But No Symptoms</th>
<th>Onset of Gout Early Detection</th>
<th>Repeated Chronic Gout Attacks</th>
<th>Gout With Renal &amp; Osteo Complications</th>
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<td>3</td>
<td>4</td>
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<table>
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<th>Present CVD Symptoms</th>
<th>None</th>
<th>Occasional Fast Pulse and / or Irregular Rhythm</th>
<th>Frequent Fast Pulse and / or Irregular Rhythm</th>
<th>Occasional Angina</th>
<th>Exertional Angina</th>
<th>Frequent Angina Exertional and Nasting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>More Than 5 lbs Below Standard Weight</th>
<th>5 To 10 lbs Over Standard Weight</th>
<th>10 To 15 lbs Over Standard Weight</th>
<th>20 To 35 lbs Over Standard Weight</th>
<th>30 To 50 lbs Over Standard Weight</th>
<th>50 To 65 lbs Over Standard Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smoking</th>
<th>Non-Smoker</th>
<th>Occasional Cigar Or Pipe</th>
<th>Cigarettes 15 Or Less Per Day</th>
<th>Cigarettes 15 To 20 Per Day</th>
<th>Cigarettes 21 To 30 Per Day</th>
<th>Cigarettes Over 31 Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Intensive Job &amp; Recreational Exertion</th>
<th>Moderate Job &amp; Recreational Exertion</th>
<th>Sedentary Job &amp; Light Recreation</th>
<th>Sedentary Job &amp; Moderate Recreation</th>
<th>Sedentary Job &amp; No Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diet</th>
<th>Low Fat Diet &amp; No Sugar Intake</th>
<th>Below Average Fat &amp; Sugar Intake</th>
<th>Normal Fat &amp; Sugar Intake</th>
<th>High Fat &amp; Normal Sugar Intake</th>
<th>High Fat &amp; High Sugar Intake</th>
<th>Excessive Fat &amp; Sugar Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Systolic BP</th>
<th>Below 110 mm Hg</th>
<th>111 To 130 mm Hg</th>
<th>131 To 140 mm Hg</th>
<th>141 To 160 mm Hg</th>
<th>161 To 180 mm Hg</th>
<th>Above 180 mm Hg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diastolic BP</th>
<th>Below 80 mm Hg</th>
<th>80 To 85 mm Hg</th>
<th>85 To 90 mm Hg</th>
<th>91 To 95 mm Hg</th>
<th>96 To 100 mm Hg</th>
<th>Above 101 mm Hg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resting EKG</th>
<th>Normal</th>
<th>Borderline</th>
<th>Frequent PVC's</th>
<th>Conduction Defect</th>
<th>Ischemia</th>
<th>Infarction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stress</th>
<th>No Stress</th>
<th>Occasional Mild Stress</th>
<th>Frequent Mild Stress</th>
<th>Frequent Moderate Stress</th>
<th>Frequent High Stress</th>
<th>Constant High Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

(If you scored... 6 - 14 = Risk well below average 15 - 19 = Risk below average 20 - 25 = risk about average 26 - 32 = Risk moderate 33 - 40 = Risk Dangerous: You must reduce your score 41 - 55 = Risk Very Dangerous: Reduce score immediately 56 + = Risk Extreme: Seek urgent medical attention)
### GRAINS
Make half your grains whole

- Eat at least 3 oz. of whole-grain cereals, breads, crackers, rice, or pasta every day
- 1 oz. is about 1 slice of bread, about 1 cup of breakfast cereal, or ½ cup of cooked rice, cereal, or pasta

### VEGETABLES
Vary your veggies

- Eat more dark-green veggies like broccoli, spinach, and other dark leafy greens
- Eat more orange vegetables like carrots and sweet potatoes
- Eat more dry beans and peas like pinto beans, kidney beans, and lentils

### FRUITS
Focus on fruits

- Eat a variety of fruit
- Choose fresh, frozen, canned, or dried fruit
- Go easy on fruit juices

### MILK
Get your calcium-rich foods

- Go low-fat or fat-free when you choose milk, yogurt, and other milk products
- If you don’t or can’t consume milk, choose lactose-free products or other calcium sources such as fortified foods and beverages

### MEAT & BEANS
Go lean with protein

- Choose low-fat or lean meats and poultry
- Bake it, broil it, or grill it
- Vary your protein routine — choose more fish, beans, peas, nuts, and seeds

---

**For a 2,000-calorie diet, you need the amounts below from each food group. To find the amounts that are right for you, go to MyPyramid.gov.**

<table>
<thead>
<tr>
<th>GRAINS</th>
<th>VEGETABLES</th>
<th>FRUITS</th>
<th>MILK</th>
<th>MEAT &amp; BEANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat 6 oz. every day</td>
<td>Eat 2½ cups every day</td>
<td>Eat 2 cups every day</td>
<td>Get 3 cups every day; for kids aged 2 to 8, it’s 2</td>
<td>Eat 5½ oz. every day</td>
</tr>
</tbody>
</table>

---

**Find your balance between food and physical activity**
- Be sure to stay within your daily calorie needs.
- Be physically active for at least 30 minutes most days of the week.
- About 60 minutes a day of physical activity may be needed to prevent weight gain.
- For sustaining weight loss, at least 60 to 90 minutes a day of physical activity may be required.
- Children and teenagers should be physically active for 60 minutes every day, or most days.

**Know the limits on fats, sugars, and salt (sodium)**
- Make most of your fat sources from fish, nuts, and vegetable oils.
- Limit solid fats like butter, stick margarine, shortening, and lard, as well as foods that contain these.
- Check the Nutrition Facts label to keep saturated fats, trans fats, and sodium low.
- Choose food and beverages low in added sugars. Added sugars contribute calories with few, if any, nutrients.
Applicant/Participant Disclosure Agreement

This agreement entered into between “your personal training company name” and the personal training client, __________________________________________, of __________________________________________.

1. Participant requests to participate in a fitness service offered by “your training company”. As a condition of participation in the fitness program, Participant agrees to supply certain information concerning Participant, including Participant’s contact information (address, phone numbers, emergency phone numbers) and Participant’s physical and mental condition (“Health Data”) to “your training company”.

2. Participant’s Health Data will be supplied to “your company name” for the purposes of: (i) assessing whether the Fitness Program is suitable for the Participant; (ii) outlining a fitness program for the Participant; and (iii) assessing the Participant’s fitness progress.

3. “Your company name” agrees to hold the Participant’s Health Data confidential except as “your company name” may be required to disclose under any law or by order of a court and except as stated below.
   a. Participant agrees that “your company name” may provide such Health Data to 3rd parties in a form that does not associate the Participant’s name or contact information with the Participant’s Health Data.
   b. Participant agrees that “your company name” may use and publish such Health Data in connection with an assessment of the Fitness Program in a manner that does not associate the name or address of the Participant with the Participant’s Health Data.

4. “Your company name” agrees that the Participant’s contact information will not be used in a manner that subjects the Participant to solicitation for other products or services except those offered by “your company name”.

Agreed this ______ day of ______________________, 200____.

“Representative of your company”

Joe Smith
“Participant”
Your Fitness Program Title
Your Company Name / Fitness Program

Informed Consent Waiver, Release and Hold Harmless Agreement for Fitness Program Participant

I, the undersigned participant, am hereby enrolling in a program of strenuous physical activity including but not limited to aerobic dance, weight lifting, stationary bicycling, and various aerobic conditioning machinery offered by “Your company name”. I have been strongly encouraged to consult with my physician prior to starting an exercise program or increasing the intensity of an existing program both in this document and by “Your company name”. I assume this responsibility as indicated by my below signature and if I chose to, will act on this advice prior to the implementation of any recommendations made by “Your company name”. I hereby affirm that, to the best of my knowledge, I do not suffer from any condition that would prevent or limit my participation in this Fitness Program and have not withheld any related information from “Your company name”.

Or, in the event that through screening, I have been determined to be other than apparently healthy, I have been given a physician’s release, as required by “Your company name” to exercise. I am taking no medications that may adversely affect my fitness activities, and this release, with or without physician’s restrictions, has been given to “Your company name”. In addition, I acknowledge that if my health changes, it is my responsibility to recognize the change and seek medical advice to help me decide if my continued participation in the Fitness Program or any part of the Fitness Program is still right for me.

I fully understand that I may injure myself as a result of my participation in “Your company’s name’s” Fitness Program and I hereby release “Your company’s name”, its Board, employees and agents, from any liability now or in the future for any injury, including, but not limited to heart attacks, death, muscle strains, pulls or tears, broken bones, shin splints, heat prostration, knee/lower back/foot injuries and any other illness, soreness or injury however caused, occurring during, or after my participation in the fitness program offered unless caused by the trainer’s recklessness or intentional misconduct.

In consideration of my participation in “Your company name’s” Fitness Program, I, for myself, my personal representatives, administrators, heirs and assigns, hereby holds harmless “Your company name”, its Board, employees and agents, from any claims, demands, and causes of action, including reasonable legal expenses and attorney’s fees, arising from my participation in the Fitness Program unless caused by the trainer’s recklessness or intentional misconduct.

I hereby affirm that I have read, have been honest with “Your company name”, and fully understand the above information. I have been given the opportunity to present questions in all related matters.

____________________________________________________________________________
SIGNATURE OF PARTICIPANT

____________________________________________________________________________
PRINTED NAME                                                                      DATED
Physician’s Exercise Release

I have examined_______________________________________________________________

I have found the following:

☐ The above named may participate fully in a progressive physical activity program consisting of cardiovascular, strength and flexibility training without limitation.

— or —

☐ The above named may participate in a progressive physical activity program with the following limitations:

_____________________________________________________________________________

PHYSICIAN’S SIGNATURE                                                                 DATE
NFPT Policies & Procedures
(Affiliate Conduct)

Revised October 27, 2003
January, 2004 ESCS Standards of Conduct have been adopted
Go to www.escs.info to register for your ESCS “Seal Of Excellence”

All NFPT affiliates will conduct themselves professionally.

The determination for the need for board appointment is the responsibility of the current office of the President of the National Federation of Professional Trainers. Terms of suspension and requirements for re-instatement shall be determined by the office of the President of the National Federation of Professional Trainers. All suspension cases, unless otherwise stated below, are subject to the vote of a randomly appointed board of six (6) NFPT Affiliates in good standing with no prior knowledge of the individual in question. Said board members will be provided with all pertinent information and given five (5) working days to decide. The decision to suspend must be unanimous and final.

The following activities engaged in by NFPT Affiliates may be considered grounds for suspension:

a Conviction of a felony offense at any time after initial relationship between Affiliate and National Federation of Professional Trainers.

b An affiliate convicted of having been involved in the illegal use, sale, or distribution of anabolic substances and/or any other controlled substance will be suspended without the appointment of a Board and decided upon by the office of the President of National Federation of Professional Trainers.

c Performance of unethical activities or any activity so viewed upon by the office of our president as to bring discredit to the National Federation of Professional Trainers. To include but not limited to complaints regarding lude and immoral conduct, disrespectfulness, unprofessional behavior and conduct, inappropriate sexual advances, excessive profane language, may all be considered. If blatant, this suspension will be determined by the office of the president with NO board appointed.

d Allowing personal appearance (manner of dress or hygiene) to deteriorate to such an extent that while associating with persons as an Affiliate of the National Federation of Professional Trainers, discredits the organization. Written statements from peers may be acquired as documentation of these occurrences.

e Knowingly providing services to those who are flagrantly at risk without proper medical release and/or client not being apparently healthy and/or without the use of screening procedures consistent with NFPT Guidelines.

f Liable, slanderous, or damaging remarks or literature presented by an Affiliate to any individual or group of individuals that discredits the National Federation of Professional Trainers. If blatant, this suspension will be determined by the office of the president with NO board appointed.
NFPT Policies & Procedures

(On-Going Educational & Membership Requirements & Legal Liability) Revised October 27th, 2003

Membership & Support Service Renewal Fees Are Mandatory

An annual combined membership support service, renewal fee of $75.00 is payable upon the anniversary date of initial testing (certification expiration date will be reflected on NFPT Personal Trainer Certificate). The Affiliate will have access to Personal Trainer Today Magazine monthly upon the successful completion of certification.

Membership & support renewal notice will be sent to Affiliates annually. Affiliate must remit the $75.00 fee payable within 60 days from receipt of renewal notice. The timely payment of these fees will result in the Affiliate’s receipt of a new, current NFPT Certificate with a new expiration date of one year from payment.

If failure to comply with renewal fee payment is unavoidable, for whatever reason, a written explanation with the late fee payment must be sent to NFPT Headquarters for consideration. NFPT reserves the right to require re-certification testing.

As an NFPT Affiliate, if you allow 60 days to pass from the date of renewal fee notice, you will forfeit your certification status. Should you fail, or choose not to pay the required renewal fee of $75.00 within the allotted period above, you will be duly required by this organization to pursue the following course of action:

a. Refrain from associating yourself or your business verbally and/or in writing with the National Federation of Professional Trainers.

b. Discontinue and/or remove any and all NFPT marketing logos, certificate, symbols, and relative displayed NFPT literature from public view.

Note: Failure to comply with the above requirements will result in initiation of legal action to require removal and the award of any monetary damages to NFPT.

In months 6 (June) and 12 (Dec.), all Affiliates receive an “open-book self-test” in Personal Trainer Today online magazine content over the previous 6 month period. The affiliate simply logs on to the NFPT website, accesses back issues of the magazine, and takes the “self test” online. The “self test” is graded online and reported to NFPT Headquarters immediately for continuing education credit. Each completed test is worth 1 credit; therefore 2 credits are needed per year. If unavoidable, this magazine & self-tests can be sent to you in hard copy. The online CEU provision is intended for your convenience.

Note: It is required to complete the “self-test” starting with the first test following your one-year certification anniversary, and every 6 months thereafter. For example, if you are certified in March, 2003 your certification will expire in March, 2004, at which time you will be required to start taking the online “self test” in addition to the payment of the annual renewal fee.

Note: Use of documents included in these guidelines in no way issues or implies assurance against legal action. National Federation of Professional Trainers is in no way responsible for providing legal assistance or involvement of any kind regarding legal issues resulting from or regarding the proper or improper use of these guidelines and documents. Implement these materials at your own risk.
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