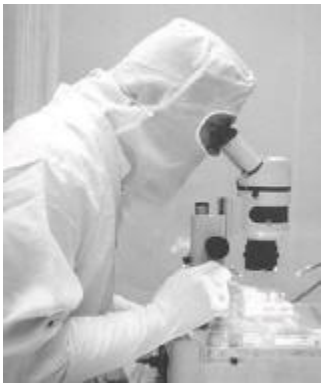
Pre-Contest Week - An In Depth Analysis



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Abstract

Four decades ago a team of Swedish researchers set out to investigate glycogen and its role in energy production (Bergström et al., 1967). What was discovered forever changed the world of applied exercise science. It was reasoned that if you could somehow expand an athlete's supply of fuel that it would proportionally enhance their performance. The question was, how could this be accomplished? It is this query to which this paper is centered. A query which not only led to the stated goal of the afore mentioned project, but also to the ability to exponentially expand a participant's muscularity on stage.

Goals Defined

This paper will begin by first defining the primary goals of the bodybuilder. That is, what the participant's objectives are for the day of competition.

Muscular size - The concept of mass is accomplished in the off-season. For optimal precision the athlete must photograph themselves from all angels possible, and then design a program which changes the shape, and contours of their structure accordingly. The current paper is not primarily concerned with this stage, but rather the after effects of it. For the process of gaining size is not a selective one. When an excess of calories are consumed, adipose, an unwanted enemy tags along.

Maximum Separation – Separation can be defined as a point, line, or means of division
(Websters). Each muscle in the human body can be thought of as a unit, and in fact within a muscle group there are distinct anatomical regions. These regions are known as compartments (Wilson, 2003). As an illustration, the trapezius is divided by connective tissue sheaths called " septum. " These sheaths effectively divide the muscle into superior, mid, and inferior regions. Maximum separation therefore,

entails the athlete to develop each muscle group in the body (there is no such thing as an unimportant body part), and then " clear " all obstructions, which might hinder a judges ability to see such development. Obstructions to separation can be divided into two broad categories.

1. Integument - Skin (integument) is classified as an " organ. " An organ is defined as two or more types of tissues, which work in tandem for a common goal. Relevant properties associated with Integument are as follows.

A. The skin is composed of two layers. The first is called the epidermis, which means on the skin. This is a layer of cells, meant to line body parts. The cells are called epithelium. They are characterized as being very tightly bound, and in this case water proofed. The reader should understand that the epidermis is not an enemy, as it is not a site for fat accumulation.

B. The second layer, deep to the epidermis is the " dermis. " This is a layer of connective tissue, and it has many vital properties to the bodybuilder. To elaborate, connective tissue is composed of various fibrous proteins. Of prime importance to the bodybuilder are the " elastic fibers. " These have the ability to stretch and recoil. This will be discussed further shortly.

C. The hypodermis is Greek for beneath the skin. Often you will hear the word " subcutaneous " and this term refers to the hypodermis. It is also known as the superficial fascia. The reader should recognize that this fascia is composed of adipose tissue as well as loose areolar tissue. Both of these contain numerous adipocytes, which are the cells responsible for the storage of fat! Beneath the superficial fascia is the deep fascia, which binds each of your muscle groups together. From this, it is easy to see why adipose tissue is the main area of obstruction to the physique centered athlete and the goal of maxed out definition as well as cuts.

It must be understand that body fat must be reduced to extremely low levels to see the muscle below. But it isn't that simple. Think of the skin, especially the dermis, as a type of wrap. The best analogy is to compare it to the type of gloves used by doctors for operations. These are elastic, however, if you were to put on a pair that was too large for your hands, you'd end up seeing several wrinkles and your knuckles would be obstructed. If however, you obtained a size that was too small, it would fit tight to your skin, and your knuckles, and all the features of your hands could be seen with near perfect clarity! The same concept can be applied to the integument, if its elastic properties are utilized properly. The first strategy is to slow down your dieting season. The quicker you cut up, the less tightly your skin will bind to the deep fascia below it. Therefore you will want to really plan your cut. One strategy is to cycle like so:

Two weeks dieting and high cardio
One week of low cardio and a bit higher calories.

Nothing extreme, but the point is, to keep the muscles full, and the skin tight. Lets say that you normally diet for 12 weeks. You might try a 16-week cut, in which a month is spread in one week jaunts as described above, with the goal of attaining a shrink wrapped look.

2. The above points had to be laid out, but those which lie below are what this particular paper is mainly directed towards. To be more specific, the focus is on the process an athlete must endure for peak conditioning, on stage the final week before the show.

Contest Week Goals

1. The first goals that must be attained are peaked muscular hardness and fullness.
2. The second is to clear the next site of obstruction away from the underlying musculature. This aspect refers to extra cellular fluid, which like fat, can and will blur the underlying musculature.

For a strategy to accomplish the above, a regimen is proposed which enhances each muscle cells ability to store glycogen, thus expanding their diameter noticeably, as air expands a balloon. Secondly, plan will be administered which increases intramuscular osmolarity, so as to " pull " extra-cellular fluid into the cell expanding it further, while simultaneously lowering this obstruction. Indeed, a participant can kill two birds with one stone. Finally, the process will be furthered, by lowering extra cellular solute, which has the tendency to pull water in its direction. All three of these techniques will increase muscularity, enhance separation, and effectively harden the physique.

Glycogen Supercompensation

Glycogen is a form of stored energy. To be more exact, it is the major source of carbohydrate energy during intense training sessions. A process known as glycogenolysis (the breakdown of glycogen), occurs to release the energy stored in this molecule. The energy is then utilized to synthesize ATP, which is the body's fuel currency (as gasoline is to a car). Glycogen's importance in athletic performance is well documented. For example, in the Canadian Journal of Physiology, biopsies (in the biceps) were examined in 8 bodybuilders across a typical arm-curl training session. After only one set researchers found that muscle glycogen stores in the Biceps had decreased by a whopping 12 percent (MacDougall et al. 1999)! Haff et al. (2000) noted that after three sets of leg extensions, the the vastus lateralis (outer quad sweep) was depleted of 17 percent of its glycogen stores. Tesch et al. (1998) found a 40 percent decrease in glycogen stores after 5 sets of 10 repetitions on concentric knee extensions (extensions minus the lowering phase) at 60 percent of the participants 1 repetition maximum. Even at only 45 percent of the participants max, concentric knee extensions resulted in a 20 percent drop in stored energy!

In another study Robergs et al. (1991) investigated skeletal muscle glycogen metabolism in eight male participants during and after six sets of 70 % one repetition maximum, and 35 % repetition maximum during a weight resistance leg extension exercise. Comparison of various leg extension conditions found that leg extensions performed at 70 percent 1RM, decreased muscle glycogen stores by 39 percent. Leg extensions performed at 35 percent found a 38 percent decrease in glycogen stores. The question now is, what happens when fuel is low, and how badly is performance hindered? Jacobs, Kaiser, and Tesch (1981) investigated the effect of depleting varying muscle fibers on strength levels. It was found that glycogen exhaustion from both fiber types in the vastus lateralis was associated with impaired maximal muscular strength produced during a single dynamic contraction,

as well as with reduced muscle fatigue patterns. When glycogen depletion was induced in slow twitch muscle fibers, maximum strength was not hindered. However performance was hindered during 50 consecutive repetitions. Such results have been confirmed over and over in scientific journals
(Hepburn, and Maughan, 1982)

It was knowledge such as this which led Bergstrom et al. (1967) to research any method possible that might increase the athlete's ability to store this important energy source. Bergstrom et al. (1967) utilized a protocol which in a six day span allowed athletes to increase muscular glycogen stores up to four times greater than pre-treatement values! In the realm of science however, experiments must be repeatable. The more repeatable, the more ground they have for acceptance. Perhaps no method has more backing. It has been shown over and over again to just plain produce, and is accepted as fact in countless scientific journals (Goforth et al. 1997).

Reasons for the importance of this method to the bodybuilder is as follows: Firstly, one must understand that a muscle cell is composed of protein filaments, various organelles, myoglobin, and vital nutrients. You have no doubt noted that when low carb dieting, your muscles appear extremely flat, and lose much of their dynamic appearance. Such a process is heavily due to the presence of muscle glycogen. You see, this molecule adds size to the cell - exceptional size! For every gram of glycogen stored in the muscle a whopping 2.7 grams of water are drawn into the cell! To show you just how drastic a size increase you can obtain in a week, consider this: On average, for every 100 grams of muscle, 1.7 grams of glycogen are stored. You can increase this to 4 to five grams. Remember 5 grams of glycogen recruits an additional 13.5 grams of water. The water pulled into the cell is due to a concept known as osmolarity(and electrical attractions etc.). I will discuss this concept, during the section on water depletion. Just realize that the attractive force the extra glycogen particles have on water, can literally draw extra cellular fluid into the muscle cell, thus increasing size, and diminishing obstruction at the same time! You will be fuller, harder, and more shredded than you had ever imagined possible! Also recall, that previous to contest week you dieted in such a way as to keep the skin extremely tight. As your muscles suddenly expand, they will pull your skin that much closer to the underlying muscles giving you the coveted shrink-wrapped look!

Steps Needed to Increase Glycogen Supercompensation

In order to grasp this concept, the participant must first understand how glycogen is synthesized. And in order to understand how a product is synthesized, they will need to understand that ultimately it is enzymes (catalytic machinery), which are responsible for such processes. Spetner (1999), one of the worlds leading experts on the " Information Theory " summarizes the concept as follows:

> The cell performs thousands of different chemical reactions. Each reaction consists of changing a molecule into one or more others. All the chemical reactions in a cell are mediated by catalysts. A catalyst always comes out of a reaction unchanged, and it can be reused indefinitely. The catalyst acts on the molecule that is the input to the reaction, and produces the output molecule(s). The input is known as the substrate, and the output is known as the product. The protein's most widespread role is as a catalyst in biochemical reactions, and in

> this role it is called an enzyme. An enzyme often speeds up chemical activity so much that it can make a reaction go that otherwise wouldn't. Each reaction has its own enzyme. An enzyme speeds up a reaction rate by a factor of at least a million [Darnell et al. 1986] .An increase in rate by factors of ten billion to a hundred trillion are not uncommon [Kraut 1988]. A factor of a hundred trillion means that what takes a thousandth of a second with the enzyme would take about 3000 years without it. Most biochemical reactions would take so long without their enzyme that, in effect, they wouldn't go at all. Because enzymes control nearly all chemical reactions in the cell, we can say that, to a large extent, proteins control the chemistry of life.

To further your comprehension, note that Spetner (1999) mentioned that enzymes are unaffected by reactions. In diagrammatical form, a catalytic process in the body can be shown as follows:

Enzyme + Substrate ----> Enzyme--Substrate Complex (they are bound to one another) -----> Enzyme + Product (the product is released)

Several enzymes are responsible for the production of glycogen. First glucose molecules are altered, and finally they are built in a chain like, branching structure, which you know as glycogen (see notes). Though many enzymes are involved, they normally rise and fall in tandem. Therefore we will focus on the most important, rate-limiting enzyme to illustrate the point. When I say rate limiting, I am referring to the protein responsible for the literal rate at which a biological process takes place. Glycogen synthase is the rate-limiting enzyme in the synthesis of glycogen. It therefore follows that the higher the concentration of this protein, the faster, and the greater the overall desired production rate will be. The reader should understand also that an enzyme is not used up in a reaction. The question therefore arises, " how is it that glycogen synthase is regulated? " The answer is phosphorylation. Phosphorylation is one of the chief mechanisms involved in regulating conditions. Take ATP for example. Energy is added in the form of a phosphate group to the molecule ADP to form ATP, a process called Charging (Knowlden, 2003). The addition of a phosphate group is known as phosphorylation. When the molecule is dephosphorylated (the phosphate group is removed) energy is released. Applying this knowledge, it can now be understand how this enzyme is regulated. When glycogen synthase is phosphorylated, it is rendered inactive, when it is dephosphorylated, it is activated).

> Notes: A. For those with an intense interest in bioenergetics, the writer would like to share an intriguing, and very recent discovery. Glycogen synthase essentially incorporates glucose into an already existing glycogen molecule. In fact, it needs what is known as a " primer. " That is, a small chain of glucose units already synthesized before it can build the molecule to its full size of numerous glucose molecules. For decades scientists wondered exactly how G. synthase could work, since it was itself the rate-limiting enzyme.
> Breakthrough: The answer lies in a fascinating enzyme known as glycogenin. This architectural wonder has the ability to build a chain of glucose molecules up to 8 units long, and essentially acts as a primer [51].
>
> B. It was mentioned that this molecule was Glycogen Synthase. Note

that most enzymes describe their role within their actual name. It can therefore be deduced that this enzyme synthesizes glycogen quite easily.

Increasing Dephosphorylated Glycogen Synthase Concentration

What investigators have found, is that glycogen synthase increases as its product becomes depleted (Friedman, Neufer, & Dohm, 1991, Danforth, 1965). According to Friedman et. al " *Glycogen synthase enzyme exists in 2 states: the less active, more phosphorylated form which is under allosteric control of glucose-6-phosphate, and the more active, less phosphorylated form which is independent of glucose-6-phosphate. There is generally an inverse relationship between glycogen content in muscle and the percentage synthase in the activated form.* An overwhelming number of studies support the concept.

Halse et al. investigated glycogen synthesis and the activity of the enzyme glycogen synthase. The experiment consisted of a six hour incubation of muscle tissue without glucose which resulted in a 50 % decrease in glycogen content. The effect of reincubation of physiological concentrations of glucose found a rapid increase in glycogen synthesis and in the activity of glycogen synthesis. The affect was directly proportional to glucose concentration, and additive with the introduction of insulin. These results were only seen after glycogen depletion. Further, when signaling of insulin was inhibited a rapid rise was still seen in glycogen resynthesis. From this, it was concluded that these results indicate two distinct mechanisms that exist to stimulate glycogen synthesis in human muscle: one acting in response to insulin and the other acting in response to glucose after glycogen depletion, such as that which results from exercise or starvation.

Thus, it is clearly seen that the depletion is directly correlated to increased glycogen synthase activity. Additionally insulin is an important regulator of the enzyme, and that depletion combined with the presence of insulin has additive effects.

In a genius protocol Zachwieja et al. (1991) investigated what effect the degree of muscle glycogen depletion has on the rate of glycogen re synthesis. six male cyclists completed an exercise protocol that involved both one- and two-legged cycling. The participants consisted of six male cyclists. Participants completed 30 minutes of single leg cycling, followed by 10 one minute sprints. Finally both legs cycled for 30 minutes. Comparison of depletion among legs resulted in a greater amount of depletion in the leg which both single and double leg cycled(M = 93.9 % depletion) than the leg which cycled with only both legs (M = 43 %). Muscle biopsies were taken to analyze the rates of glycogen replenishment in both legs. Participants consumed a 24 % CHO solution every 20 minutes. Comparison of glycogen re synthesis in both legs found that glycogen re synthesis was significantly greater in the single to double leg condition than in the double leg condition. In addition, the activity of GS as expressed by the ratio of dephosphorylated to phosphorylated glycogen was greater in the single to double leg condition than the double leg only condition.

The above, as well as numerous other studies confirm that there is an inverse relationship between the extent of glycogen depletion and the concentration of active

glycogen synthase, as well as a muscles ability to super compensate. This is what Bergstrom et al. (1967) utilized in the 60's during their experiments. They effectively depleted muscle's stores for three days, thereby increasing the cells ability to synthesize glycogen. The effect was so dramatic, that after proper loading the following three days, it allowed athletes to quadruple their stored carbohydrate content.

Depleting Vs. Not Depleting: Their Effects on Supercompensation

The effect of depleting glycogen stores compared to not depleting is a vital topic. Roedde (1986) investigated whether or not tapering coupled with carbohydrate loading for six days, is as effective as a depletion stage followed by a loading phase. The participants consisted of 4 highly trained cyclists and 4 untrained controls. Participants began by tapering training while simultaneously consuming a diet high in carbohydrates or conducive to supercompensation. Following the carbohydrate loading stage participants depleted glycogen stores for 3 days utilizing exhaustive cycle Ergometer exercise at 73 percent V02 max, followed by sprint work. Finally a three day
period of high carbohydrate dieting took place.

Comparison of various glycogen loading strategies among conditions found greater glycogen storage in the depleted condition (> 150 % of tapering) than the tapering condition. It was concluded that " a regimen of exhaustive exercise, followed by a period of carbohydrate restriction and a period of high carbohydrate intake, results in substantially higher muscle glycogen storage than can be achieved by a reduction in training in combination with high carbohydrate intake."

Training to Deplete Glycogen Stores

Training regimens are extremely complex. In fact, when done the wrong way, this process will not yield even a fraction of the results compared to optimal training.

First, as the above studies have indicated, intense training does severely deplete glycogen stores. Interestingly enough, muscle glycogen stores can be spared quite effectively in the absence of training (Harold et al., 1997), a subject which will be detailed shortly. The " classic " protocol for complete depletion calls for one day of insanely exhaustive training, followed by three days of further depletion style workouts, [Bergström et al. 1967, Harold et al., 1997). The current writer prefers a slight variation to this theme, which will be explained shortly.

For now, the specific style of training needs to be addressed. It is now been shown that specific contractions can actually hinder optimal glycogen replenishment. This is the exact opposite of what is needed. The type of contraction referenced is the eccentric in nature. Widrick et al. (1992) had participants train one leg concentrically and one leg eccentrically on a leg extension apparatus. Glycogen resynthesis rates were then measured over the following 72 hours. Comparison of glycogen resynthesis 18 hours after training in various exercise conditions resulted in 15 percent lower glycogen levels in the eccentrically trained condition, than the concentrically trained condition. This number increased to a 24 percent deficit in 72 hours indicating that glycogen accumulation is impaired in eccentrically trained musculature.

Doyle and colleagues stated that " *Eccentric contractions appear to reduce muscle glycogen replenishment during the 1- to 10-day period after exercise* [14]. " In order to test this, they had 10 cyclists train one leg concentrically for 10 sets of ten repetitions, while training the opposite leg eccentrically for the same number of reps / sets. There results revealed that " glycogen replenishment was 25% lower in muscle that had undertaken eccentric contractions 48 h earlier than in concentrically exercised muscle[14]. " In the Journal of Applied Physiology Costill et. al had 8 men perform 10 sets of 10 repetitions, again either concentrically or eccentrically with opposite legs. They found that " *In both groups, however, significantly less glycogen was stored in the EL than in the CL [24].*" Such results have been confirmed over and over again [39, 4]. The reason for this is complex. However it can be broken down to the fact that eccentric training causes a higher amount of myofibrillar damage, muscle membrane disruption, and inflammation [13, 40, 54]. Such consequences can slow glucose transport(as compared to concentric training), as well as glycogen synthesis [4,22].

Note: Eccentric exercises have been shown to induce greater myofibrillar hypertrophy in several studies (Higbie et al. 1996, Wilson, 2003). The main point is simply that, this form of training requires a bit more recovery time. It also shows the vital importance of post workout high glycemic carbohydrates, which study after study shows drastically enhances glycogen re-synthesis (Burke, Collier, & Hargreaves, 1993, Roy & Tarnopolsky, 1998, Costill, 1998, Ivy et al., 1988, Carrithers et al., 2000, Zawadzki, 1992, Tarnopolsky, 1997, Roy et al., 1997), allowing the athlete to overcome much of the problem faced.

According to Harold et al. (1997) " *Glycogen supercompensation is best achieved when the exercise is largely concentric and the mode of exercise (e.g., cycling) does not disrupt the mechanisms of glycogen synthesis*. " Aside from the fact that exercise increases glycogen synthase activity (Friedman et al., 1997), it is also a well known fact that it also increases GLUT 4 receptors (Roves et al., 2003, Ren et al., 1994). Roves et al. (2003) stated that we find a " *proportional increase in glucose transport capacity* " with an increase in GLUT 4 receptors. In other words, the higher the concentration of GLUT 4 receptors in skeletal muscle, the greater the absorption of glucose. Here we find a topic of prime importance to any and all competitors. The term " GLUT " stands for " Glucose Transporter. " The script " 4 " is simply related to the sequence that this transporter was discovered(there are other GLUTS in differing tissues). A muscle cell is an extremely complex structure. It has what is called a cell membrane, which essentially controls what enters or leaves the cell. This membrane (sarcolema) has a high lipid content (phospholipid bilayer). Lipids are fats. An example of a lipid is an oil. Recall what occurs when you pour oil in water. It rises to the top. This is because lipids are hydrophobic (water fearing). Glucose on the other hand is hydrophilic (water loving). These simply do not mix (another way to describe this is that glucose is polar, while lipids are non-polar). Thus, just as oil and water cannot mix, the glucose (it is lipophobic) cannot cross the lipid bilayer. The cell therefore requires an extremely efficient " transport system. " GLUT 4 receptors act as passive transport systems. That is, they do not require energy to transfer glucose across the cell, but rather rely on concentration gradient. Recall that molecules always diffuse from areas of higher concentration to areas of lower concentration. The cell is constantly synthesizing glycogen, which keeps glucose levels low, and favors an environment conducive to the afore mentioned mechanism.

Glucose transporters have the following mechanisms of action:

1. They have a specific site for glucose to bind to them
2. When glucose binds to the transporter, it goes through what is called a " conformational change " which turns(translocates) the transporter to face the inside of the cell, so as to release the glucose into the cytoplasm(intercellular compartment)
3. GLUT can then change its conformational shape, back to its previous shape, and face the extra cellular environment again so as to continually repeat its job.

Once a cell synthesizes (makes) these transporters they are stored in tiny cargo holders known as vesicles. Insulin stimulates these to translocate to the cell surface. Muscular contraction also stimulates the translocation of these cellular machines. There are numerous fascinating finds in regards to this subject, when depletion, combined with training takes place. Roves et. al (2003) investigated whether prevention of skeletal muscle glycogen supercompensation after exercise results in maintenance of the increases in GLUT4 and the capacity for glycogen supercompensation. They found that GLUT four mRNA was increased three fold and GLUT four membrane concentration increased two fold 18 hours after exercise. They found that with normal carbohydrate feedings, this reversed to pre-exercise levels within 42 hours. However, when the rats were starved of carbohydrates completely, these levels remained high for 66 hours. Such results seem to indicate, that while you are carb depleting and training, that consecutive exercise sections(i.e. three days straight of carb depleted exercise) can have additive effects on the concentration of GLUT 4 receptors, which combined with enhanced glycogen synthase levels affords an environment conducive to tremendous(and stupendous) levels of glycogen supercompensation.

Seven Day Training Split and Sample Workouts

As you no doubt realize, depletion is highly dependent on the body part trained. In other words, and athlete looking for supercompensation, will deplete the desired body parts. In this sport that means everything! I propose the following split

Saturday: Straight posing - Style of Posing discussed in sample workout in appendix

Sunday: Full Body trained, legs in the morning and upper body at night. Repetitions discussed in sample workout

Monday: Full Body trained, legs in the morning and upper body at night. Repetitions discussed in sample workout

Tuesday: Full Body trained, legs in the morning and upper body at night. Repetitions discussed in sample workout

Wedsday: Full Body completely trained in the morning - No workout at night

Thursday: Rest, can pose but very lightly. Your preparation should be mostly mental at this stage.

Friday: Same as above

Workouts can be found by at the appendix at the end of the article.

The point is to deplete glycogen stores in days one through four (aside from posing on Saturday). On the first three days, you will have an extremely restricted carbohydrate diet (see below). The reason why the athlete will perform a workout to begin their first carb up day (Thursday) is based on the post workout window principle. Traditionally, the carb depletion protocol, as mentioned, begins four days before carb up day. However, workout four has been transferred to the first high carb day, because it allows the participant to take full advantage of the hour following an exercise regimen. To elaborate, glycogen replenishment after training occurs in a biphasic pattern. Jentjens et al.(2003) in the Journal of Sports Medicine states that after exercise " *there is a period of rapid synthesis of muscle glycogen* " which " *lasts about 30-60 minutes*. " It is further stated that " *after this rapid phase of glycogen synthesis, muscle glycogen synthesis occurs at a much slower rate and this phase can last for several hours*. " And finally that the " *highest muscle glycogen synthesis rates have been reported when large amounts of carbohydrate are consumed immediately post-exercise* [28]. " Thus, bi-phasic refers to the fact that glycogen replenishment is a two stage process, characterized by an early " window of opportunity " followed by a slower period of synthesis.

Ivy et al. (1988) investigated the time of ingestion of a carbohydrate supplement on muscle glycogen storage postexercise. Participants consisted of 12 male cyclists. The apparatus consisted of a cycle Ergometer. Two experimental conditions were utilized.
In the first condition participants exercised continuously for 70 minutes at 68 % V02 max, which was interrupted by 6 2 minute intervals at 88 % V02 max. Upon completion of
exercise participants consumed a 25 % carbohydrate solution. In condition two, the same exercise protocol was used. However, the CHO drink was delayed for 2 hours.

Comparison of muscle glycogen resynthesis among conditions found that the rate of glycogen storage was greater in the immediate condition following the induction of the
CHO solution than in the delayed condition by 45 percent. Therefore a slower rate of glygogen storage occurred in the delayed condition, even though insulin levels rose significantly.

This is one of countless examples showing why the window of opportunity must be met. And it must be met (if you want optimal replenishment that is) by high glycemic carbohydrates. Burke et. al. (1993) investigated the effect of the glycemic index (GI) of postexercise carbohydrate intake on muscle glycogen storage. Participants consisted of five trained cyclists. Two experimental conditions were utilized. In the first condition,
participants exercised on a cycle Ergometer for 2 h at 75% of maximal O2 uptake followed by four 30-s sprints. Participants consumed 10 g of Hi GI carbohydrates per kg of body mass, evenly distributed between meals eaten 0, 4, 8, and 21 h postexercise. In the second condition, the same exercise and feeding frequencies were instituted with the exception of low GI consumption. Comparison of glycogen resynthesis after each meal between various GI feeding conditions found greater

glycogen resynthesis in the high GI condition than the low GI condition($P < 0.05$). After 24 hours the high HI condition averaged 106 +/- 11.7 mmol/kg wet wt of glycogen storage, while the low GI condition averaged 71.5 +/- 6.5 mmol/kg of glycogen storage.

> **Outline of Exercise Depletion Plan:** Deplete Four Workouts, thereby increasing glycogen synthase as well as glut four receptors. On the fourth workout, you take advantage of the rapid window of opportunity. By combining these factors, a synergistic effect of the combined results of muscular contraction and its role in increasing glycogen synthesis will be realized, with the results attained from three days of previous depletion. In short, you maximize your efforts!

On your recovery days, you will not lift weights. The highest extent of your training will be light, non exhaustive posing to keep the muscles sharp. However, you will want to avoid anything which depletes glycogen stores!

Diet The Week of The Contest

A classic regimen depletion diet is spread throughout four total days[5]. We will utilize a tapering effect as well.

Saturday: Today, you simply begin lowering carbs to approximately .5 grams per pound of bodyweight. Therefore if you weigh 200 pounds, you would take in 100 grams of carbohydrates. Remaining calories will come from protein(approximately 1.5 grams per pound of bodyweight) and fat(discussed in meal plan).

Sunday: Carbohydrates are cut down to .4 grams per pound of bodyweight. Therefore this day you would consume 80 grams of carbs at 200 pounds

Monday: Shoot for .25 grams per pound of bodyweight

Tuesday: repeat

That ends the depletion stage. Wednesday through Friday participants will load. During this stage participants will consume 0.5 grams of carbohydrates per pound of bodyweight, per meal, and spread that out over six total feedings. Thus, if you weigh 210 pounds, the athlete would consume a total of 630 carbohydrates, spread throughout six total meals. These recommendations are based on several studies which show that carboydrate supercompensation is best achieved at an intake of 525-650 g CHO/day [21 23, 11]. For example Costill(1981) examined athletes who consumed as low as 88 grams of carbohydrates for glycogen resynthesis and continued escalating that number. He found that the relationship between enhanced glycogen stores and increase CHO intake continued in a positive and proportional manner, and reached its peak at approximately "648" carbs in a 24 hour period[11]. This formula will bring each athlete within this range.

The meals plans will be laid out, after sodium depletion is discussed, as this is a vital aspect of the regimen. The question now is, what types of carbohydrates should one consume over these three days for maximum glycogen synthesis? Jozsi et al.(1996)

in investigated the effect differing forms of carbohydrates on glycogen replenishment. Here is a summary of their work:

1. Male Cyclists were fed approximately 3, 000 calories after training. The breakdown ratio was 65 % carbohydrate, 20 % fat, and 15 percent protein intake.

2. Participants were provided their carbohydrates from one of a number of sources. A. Glucose (straight up blood sugar, very high GI!) B. 100 percent waxy starch Amylopectin and C. 100 percent resistant starch Amylose. Amylopectin is rapidly absorbed and easily digested.

3. Comparison of various carbohydrate feeding conditions found the greatest glycogen synthesis in the Glucose condition (197.7 +/- 31.6 millimoles per kilogram of dry weight)
followed by the amylopectin condition (+171.8 +/- 37.1). The least amount of glycogen sysnthesis was found in the resistant starch group (90.8 +/- 12.8 millimoles).

4. Conclusion: " *In summary, glycogen resynthesis was attenuated following ingestion of starch with a high amylose content, relative to amylopectin or glucose[29].* "

Their conclusion is consistent with Burke et al who also showed that less resistant, high GI rated CHO markedly replenished glycogen superiorly to low glycemic, resistant G.I. index carbs. This was again confirmed by Coyle et al. in which it was found that high glycemic index foods replenished carbs faster than lower glycemic. However, they also noted that intermediate glycemic foods augmented synthetic rates comparably to high glycemic. Thus, we can conclude from the above studies that moderate to high glycemic carbohydrates produce a greater rate of glycogen replenishment in skeletal muscle.

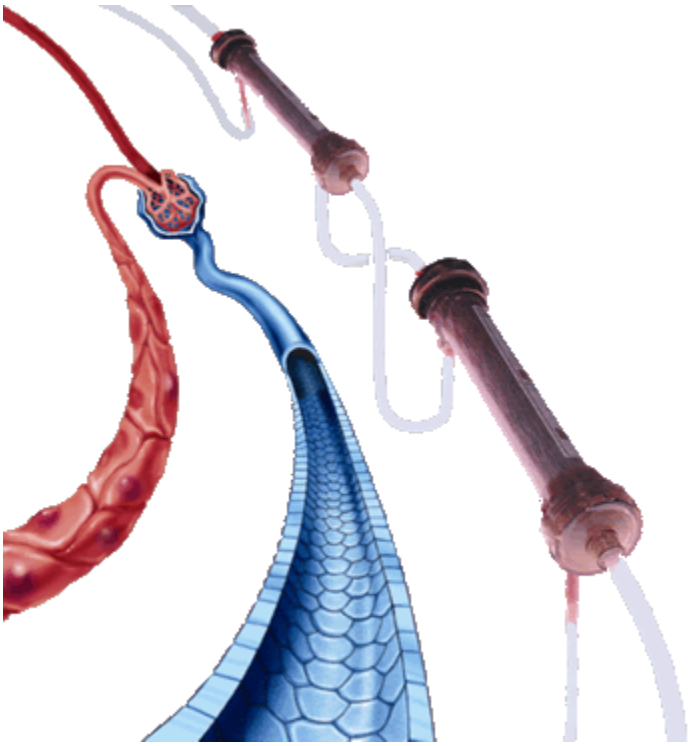
> On a side note: it is vital for the athlete in general to utilize his or her weapons properly. Yes, high GI carbs replenish faster, and they should be utilized in this situation. However, for reasons such as maintaining insulin sensitivity, low GI carbs are a powerful weapon in normal dieting. One must take advantage of times when insulin sensitivity is peaked, such as post workout. By wasting these opportunities to utilize high glycemic carbs participants are missing out on tremendous, and extremely(scientifically) backed gains! For a full review on the subject of post workout nutrition see Knowlden (2004)

When discussing high glycemic, aside from the post workout it is recommended to stick with starch-oriented foods, such as rice, and pasta's. Of course during the post workout meal, participants will utilize Knowlden(2004) and Venom(2003) methodods laid out in their papers on post workout nutrition. During periods of intense glycogen replenishment, it is wise to steer clear of fructose-saturated foods such as strawberries. It is a well-established fact, that such protocols are completely and utterly against everything an athlete wants to accomplish during these periods. In the journal of Nutrition and Metabolism Conlee et al. (1987) investigated the effectiveness of glucose and fructose feeding on restoring glycogen content after glycogen was decreased by exercise (90-min swim) or fasting –24. It was found that *" After 2 h of recovery from either exercise or fasting there was no measurable*

glycogen repletion in red vastus lateralis muscle in response to fructose. " However, when supplying glucose there was a significant increase in glycogen storage in both the fasting and training groups. They of course concluded the obvious: " *that fructose is a poor nutritional precursor for rapid glycogen restoration in muscle after exercise*. " There are several reasons for the above results. One of which is that once fructose is absorbed it must first be escorted to the liver before being converted to glucose. This slows its ability to be utilized tremendously. Further, it first enhances liver stores, rather than muscular glycogen stores. Any protocol, which utilizes this for glycogen replenishment, is done so despite the vast amount of evidence against it.

Diets can be found in the appendix at the end of the article, along with the workouts.

Water Depletion Analysis



As a review water(in your body that is) can be divided into three compartments: The Blood Plasma, the Tissue Fluid, and the intracellular fluid. The two former are known collectively as ECF or extra cellular fluid, and the latter(ICF) is self explanatory. The tissue fluid, which surrounds a muscle, much like fat, blurs a judge's ability to see what lies below, it is therefore an obstruction that must be dealt with. Participants will want to maximize intracellular fluid, while minimizing extra cellular fluid. As discussed, Osmolarity is a measure of how concentrated a solution is with particles. The more concentrated it is, the more water will flow to the area. By enhancing glycogen stores, you effectively increased the osmolarity of the muscle cells cytoplasm(the intracellular compartment which holds water, and

dissolved nutrients etc. again, this is also known as the sarcoplasm-see anatomy of a muscle). The goal of this increase was to pull extra cellular fluid inside of the muscular compartment (recall that for every gram of carbohydrate stored an additional 2.7 grams is pulled into the ICF).

The next step is to focus on the main solutes, which reside in the ECF, and increase water content within the region. These two solutes are sodium (Na+), which is a cation
(a positively charged ion), and chloride Cl- which is an anion(a negatively charged ion). Sodium is the most abundant cation in the ECF, and Chloride is the most abundant anion in the ECF. It is also important to note that Sodium is actively transported by cellular pumps out of the cell, so that its concentration is much higher outside than on the inside (Wilson, 2003). Finally, the reader should realize that higher levels of Sodium tend to cause the retention of extra cellular fluid. That is, fluid that would otherwise be excreted is reabsorbed into the blood when it has a higher Sodium content. Your goals are as follows:

1. Understand the mechanisms which increase sodium and water retention. This includes all hormones, and dietary habits
2. Understand the mechanisms which decrease sodium and water retention. This includes all hormones, and dietary habits

We begin our discussion with the concept of homeostasis(click - here and here for explanations) as applied to water and sodium regulation. To be in balance, what the body consumes(i.e. what you eat) and produces(various proteins, glycogen stores, muscle etc), must equal what is used(burned as fuel) and excreted(gotten rid of as waste). The kidneys are a major player in this regard, and our focus will center on them.

Let us discuss how and why this is so. Extra Cellular Fluid is composed of water and solutes(i.e. sodium). By increasing the water content, you decrease the osmolarity of the plasma, and by increasing the solute content, you increase its osmolarity. Materials can enter or leave this environment through three specific places.

1. It can gain or lose water or solutes to and from the gastrointestinal tract (that's right I said lose! It seems contradictory, but it is a fact, and will play an integral role in sodium depletion). Here is what is important, under most conditions the gastrointestinal tract absorbs nearly all of what you put into it. In other words, if you were to compare what is absorbed when you eat, to what is lost, it is minute and extremely small! You have to realize that your intestines are designed with absolutely incredible absorptive mechanisms, beyond comprehension. Our main control therefore during contest week is " manual " rather than automated.

2. It can gain or lose water or solutes through the lumen of the renal tubules. The kidneys are an extremely complex organ. As an overview they are composed firstly with a filtration system. Think of a coffee grinder, and how it is able to filter water and tasty solutes, without filtering the beans. The principle is similar. A structure known as the
" glomerulus " is a bed of capillaries which water, glucose, sodium, and other nutrients are filtered through(see notes). However, large proteins, and blood cells are not filtered(like the coffee beans). What is filtered is known as " filtrate. " Where does it go? Surrounding the capillaries mentioned is a capsule, known as

Bowman's capsule(named after its discoverer). It is a special container designed to capture the filtrate. At this stage what is in Bowman's capsule must be modified. This is accomplished by the filtrate leaving the capsule and entering a series of tubes known as renal(referring to the kidney) tubules. There are various tubules, and each has a specific job in modifying the filtrate. The tubules are divided in to the proximal(closer to the B. Capsule), descending Loop of henle, ascending loop of henle, distal tubule and finally into what is known as the collecting duct.

How is fluid recovered? As the filtrate travels down the tubules, a majority of the filtrate is reabsorbed into the peri(above) tubular capillaries. Recall that capillaries are blood vessels, which exchange nutrients. At no other place does this occur. Water and solutes are transported into the peritubular fluid and then they diffuse into the capillaries, which takes the materials and sends them back into general circulation (the blood via veins, returns them to the heart and they re-pumped etc. etc.).

The Proximal Tubule - Most of the water and nutrients are absorbed here. Sodium is absorbed by active transport mechanisms (pumps). Recall that this is the most numerous solute. As it is pumped out of the renal lumen (tube) into the peritubular fluid(remember directly outside of the tubules lies a tissue fluid space which contains this fluid, solutes and fluid then diffuse into the capillaries etc.). As it is pumped, the osmolarity of the peritubular fluid increases, which attracts water! That is important! The more sodium you consume, the greater this water retention will be(if not regulated)! Additionally, remember that active transport uses energy. The membranes of the cells which line the renal tubules can actually harness a secondary energy source from the pumped sodium, and use it to transport other materials such as glucose, but that is another story. The points I want you to know are: **A.** Sodium reabsorption is always active (in the basolateral membrane not really important to go into detail here)! **B.** Sodium when absorbed creates a " concentration " gradient. Or in other words increases the osmolarity of the peritubular fluid, which attracts more water to it. **C.** Therefore, one method of control, will be for the kidneys to simply lessen sodium reabsorption. Just like a faucet, it can be turned off, by lowering transport proteins(a process mainly done in the distal tubules discussed latter, but you see the point). **D.** The Proximal tubule is the main site of reabsorption of materials (approximately 70 percent of water and sodium are reabsorbed here, but guess what, over 180 liters of water are filtered, so there is still quite a bit left!) **E.** Recall that sodium is positively charged and chlorine is negatively charged. Thus it can be said that wherever sodium goes, chloride is sure to follow.

Descending and Ascending Loops of Henle(named after discoverer) – King(2003) states that *" The thymus is truly amazing! I would go as far as to say it's a totally hardcore gland. "* This statement can be applied to the descending and ascending loops of henle. Through complex mechanisms, brought about by amazing cellular machinery, the kidney tubules create an osmotic gradient outside of the loops, which allows water to be absorbed on the way down, but not on the way up! Imagine that the loop looks like this: :::U::: The down loop on the left side of the U is the descending loop. As stated, there is a large amount of solute outside of the U(I used the dots to diagrammatically represent the solute. As the reader knows water always goes to areas of higher osmolarity. Therefore as water, which has not been reabsorbed in the proximal tubule flows down the loop it is absorbed at a high rate. Also realize that as water is absorbed, the solute in the tubules becomes more

concentrated(what has a higher concentration of solute, a half a cup of water with 1 gram of salt or a whole cup of water with 1 gram? Obviously the former, the case is no different here.). When the water goes up the loop the process would reverse if it could. But it cannot! The ascending loop is not permeable to water(amazing design - we are " fearfully and wonderfully made " Psalms 139:14 [1])! This allows the kidneys to concentrate Urine.

Distal Tubules and Collecting Ducts - This is the main aspect of the renal system I need you to grasp! Sodium is actively transported here, and is the main site of regulation for this solute by a hormone known as " Aldosterone. " This is also a main site of absorption for remaining water. How much so? A disease which hinders water reabsorption in this region can lead up to a 20 liter a day loss! What do I mean hinders? The latter part of the distal tubule and collecting ducts (urine collects here and is then escorted for elimination from the body by more complex processes) are impermeable to water unless specific water pores are inserted into these regions. However, an Osmotic gradient is once again established in this region. Thus, if these pores are inserted, water is easily absorbed. Further, the higher the concentration of pores, the more water is reabsorbed. Therefore the kidneys can excrete highly concentrated Urine, or copious and dilute amounts of Urine. The hormone responsible for this process is called ADH(antidiuretic hormone). The hormone which opposes the two former is called ANP(Atrial Natriuretic Hormone).

Now that you know how the kidneys regulate water, we will review what controls that regulation. Namely, the three former hormones mentioned, and how you can manipulate them to lose much of the muscle obstructing water, before the pre-contest. You will be shredded!

Note: I want to give you a brief note on filtration. As you know water moves from areas of higher pressure to lower pressure. The capillaries in the kidneys are the only one's that find themselves in between two arterioles. Arterioles are blood vessels, which can increase or decrease BP. Thus, fluid loss can also be regulated by how much is filtered, and this is controlled by the hormones discussed above as well.

Hormonal Control

For a review of hormones see Endocrone Insanity I and II (King, 2003). The present discussion begins with ADH

A = Anti - As in against the action of the next word D - Diuretic - Refers to that which causes water loss H - Hormone is self explanatory as that is what ADH is.

Type of Hormone - ADH is a peptide hormone. If you recall from Endocrine insanity, these are fast acting hormones (most are). They bind to the cell membrane and cause immediate actions. Click Here to see how this process works.

Actions - **(A**) Water pores called Aquaporin-2 are stored in vesicles in a cell. These cannot bind to the distal tubule or collecting duct unless they are stimulated to do so by ADH, and thus it is this hormone, which is responsible for max water reabsorption. **(B)** The second action is slower, and therefore is an aim in our manipulative strategies. ADH is largely responsible for the stimulus to synthesize aquaporin-2 channels. If it is suppressed (the hormone that is) overall synthesis is

lowered, and in turn, even if ADH acts quickly, it will not have as many channels to activate.

Causes For Increases In Secretion - The body has various receptors, which generate what are known as receptor potentials. This means that neurons are sensitive to a certain stimuli, and essentially generate electrical impulses along the length of the cell, so as to communicate with other neurons, directly with the spinal cord, brain, or target organ. The specific receptor we are concerned with are " Baroreceptors " These are receptors which are sensitive to " stretch. " Baroreceptors are located in specific arteries(aorta and carotids). When blood volume increases, blood pressure rises. Why? There is a physiological law, which is known as " Starlin's Law. " It states that increased venous return to the heart, increases stroke volume(amount of blood pumped per beat). The reason is that cardiac cells are designed to contract harder when stretched(they reach optimum filament overlap when stretched), and the heart has the highest concentration of an elastic protein called " Titin " which, like a rubber band can store potential energy, and lots of it (Lindstedt, 2003)! Thus, increased blood volume naturally means more blood returns to the heart, thereby increasing cardiac output, which baroreceptors are sensitive to(action potentials or electrical impulses increase in frequency as the arteries are stretched). Also, the increased blood volume naturally expands arteries in the first place. When blood volume decreases, the action potentials lessen by way of the Baroreceptors, this in turn stimulates increased secretion of ADH(also known as vasopressin) from the posterior pituitary gland. Smith et al(2002) induced lowered blood pressure(known as hypotension), in six people. They found that: ADH rose significantly in response to hypotension . What is an easy way to decrease plasma volume? The answer is dehydration. Stricker et al. (2002) states that there are " *two prominent responses to dehydration: secretion of the antidiuretic hormone, vasopressin (VP), and thirst*.

Causes For Decreases In Secretion - Acute hypervolemia inhibits vasopressin or ADH secretion (Stricker et al., 2002). Robertson et al. (1986) illustrated that ADH is inhibited by both hypervolemia and hypertension (above normal BP). Hypervolemia refers to increased blood plasma volume, which is stimulated by excessive water consumption. The reason is simple. Recall that the body must maintain homeostasis. When an excess of water is consumed, it is absorbed into the plasma, thereby expanding its volume. If the plasma has an osmolarity of 300 milliosmols, and you add low solute water, you will lower the concentration of the plasma. Now, intracellular fluid also has an osmolarity of 300 milliosmols. At this stage the extra cellular fluid has a lower osmolarity then the ICF. Water now will enter those cells and can cause them to possibly lyse(explode). Therefore ADH decreases, which decreases water reabsorption, thereby handling the problem!

Utilizing this knowledge, during the carbohydrate depletion stage you will " water load. " This means you will drink copious amounts of water so as to lower ADH secretion. You will not have high blood pressure, because you will be Urinating copious amounts of water away, as a result of decreased ADH. Water will be progressively lowered the final 72 hours before the show. With ADH suppressed, you will not have as many aquaporin channels, and will be able to effectively shed water. I will discuss this in more detail shortly.

Aldosterone - This is a steroid hormone(steroid hormones are slower acting than peptide hormones Click Here to read about how slow acting hormones exert their actions). As you recall, sodium is always actively transported. Aldosterone enters

into the cytoplasm and binds to cytoplasmic receptors(receptors for aldosterone which are located inside the cell), and stimulates the synthesis of Na+ K+ Atpase pumps.
This is the mechanism used to transport the sodium into the blood(coupled with a few more mechanisms but the point is clear). What occurs is ATP is catalyzed (broken down) to ADP + P and the energy released is harnessed to power the pump. The pump secretes potassium(K+)out into the renal tubules for exchange with Na+. One cannot occur without the other. Thus Aldosterone, by increasing the synthesis of this machinery, increases their concentration in cell membranes, and with it, the excretion of potassium and the absorption of Sodium.

Causes For Increases In Secretion - If sodium is lowered then Aldosterone secretion increases. We need to discuss a specific mechanism however first.

Renin is an important factor in Aldosterone secretion. Low sodium causes an increase in Renin. This is due to the fact that cells of the distal tubule called the macula densa cells are sensitive to sodium concentrations. Another factor is potassium. Aldosterone is responsible for the secretion of Potassium. There is a condition known as HyperKalemia in which K+ levels rise to a level above normal concentrations. The results can actually lead to death! An increase in aldosterone, increases secretion of K+.and therefore, an increase in K+ leads to an increase in Aldosterone secretion. Walcott et al. *(1984)* states that " *increases of plasma potassium directly stimulate aldosterone secretion. This effect of potassium on aldosterone serves as a protective mechanism against the development of hyperkalemia*. "

Causes For Decreases In Secretion - When sodium is in excess, aldosterone and renin are suppressed (Singer, 1981). With there suppression, is a subsequent higher level of sodium secretion. It is for this reason that we will utilize a technique known as sodium loading during the carb depletion phase of pre-contest week. How well will it work? Fortunately there is ample experimental evidence on the subject. In the journal of
Physiology, Dr. Rasmussen and colleagues increased the sodium intake of eight individuals. They found that: " Significant natriuresis occurred within 1 h. " Natriuresis is defined as a high level of sodium excretion by the body. Why did this occur? Check it out: " *A 6-fold increase was found during the last hour of infusion as plasma renin activity, angiotensin II (ANGII) and aldosterone decreased markedly. Sodium excretion continued to increase after NaLoading.* " By suppressing aldosterone for three days, the synthesis of sodium/potassium ATPase channels will markedly decrease, and it will take up to 72 hours before they kick back into gear. During this time participants will sodium deplete, thus decreasing subcutaneous fluid, which obstructs muscle markedly!

One final point in this regard! How is it that you should sodium load? The answer is critical and here is why! Andersen et al. (2002) in the journal of Applied physiology tested two solutions with high amounts of sodium. The first solution was hyperosmotic to the ECF, and the second solution was isoosmotic. Recall that hyper refers to the fact that the solution has a higher concentration of solute than the ECF, but the iso means that it has the same concentration, even though it contains the same amount of sodium particles. The difference is simply that the former had less water than the latter. They found two key points that you must take into account!

1. " *Plasma renin activity, ANG II, and aldosterone decreased very similarly in Iso and Hyper.* " This was shown to be true earlier and you understand the mechanisms behind such experiments, but the next result has just as much significance.

2. " *plasma vasopressin increased with Hyper* " This result means that increased osmolarity increased ADH. The exact opposite of what we want! However, I have good news for you, look at this: " *plasma vasopressin decreased after ISO* "

The reason for the above is this: ADH responds to low blood volume with an increased secretory rate. The hyperosmotic solution mimics low blood volume because when you are dehydrated, you have less fluid in the plasma, which means the concentration of that plasma goes up. ADH also responds to this. However, ADH also responds to increased Plasma Volume. When the participants received an isoosmotic solution, with high levels of sodium, they increased Na+ levels, without decreasing blood osmolarity, which in turn killed two birds with one stone. I.E. it decreased both ADH as well as the sodium retaining trio. Thus, when sodium loading, you will want to drink plenty of water. Do not have salty soup, without also drinking enough water with it.

ANP

A - Atrial - This is secreted by cells in the Atrium of the heart(where this organ receives blood) N - Natriuretic - Causes Natriuresis or high levels of sodium secretion P - Peptide - You guessed it, ANP is a peptide. Atrial Natriuretic Peptide increases sodium excretion by " directly " decreasing sodium absorption, as well as increasing glomerular filtration rate(more Na+ is filtered out). It literally opposes the above hormones discussed(Jespersen, 1997). It is interesting to note that ANP has been shown to decrease the secretion of both renin and aldosterone.

Causes For Increases In Secretion - This hormone increases for the same factors that decrease ADH, and the big three sodium retainers

Causes For Decrease In Secretion - This hormone decreases for the same factors that increase ADH, and the big three sodium retainers

In Summary, the Kidneys regulate fluid and sodium levels. Water retention which is outside the muscle cell will be lowered by loading with sodium and water, and then while hormonal levels are favorable for excretion we will decrease them.

One Final Strategy On Sodium Depletion

Above I stated that nutrients could be gained or lost via the gastrointestinal tract. Recall that the laws of diffusion state that molecules or atoms always move from areas of higher concentration to areas of lower concentration. Distilled water has no sodium in it. If you were to consume this liquid, it would obviously have less sodium in it then your ECF. Thus, sodium would diffuse into the GI tract and could be lost in this manner. This is one of the main reasons athletes, while training are recommended to consume water with a small amount of sodium in it, so as to avoid sodium depletion [12, 3, 25, 36, 37, 38, 56]. However, if the goal is sodium depletion, then this can help. When training intensely this should be avoided. And

in fact, as you notice, you are not lifting heavy during replenishment days, but rather only utilizing slight posing. Your main focus should be mental as well as aesthetic(focusing intently on tan, and rest).

Day of The Contest

On the day of the contest, you will only sip water, to keep your mouth somewhat moist, or when thirsty. Again, this will only come in the form of sips. As far as diet, you do not have to worry about losing your glycogen supercompensation effect. Dr. Harold and colleagues showed that on a moderate carbohydrate diet, stores remained supercompensated for 72 hours after the loading phase[21]. To further my point S. F. Loy et. al tested what effect a 24 hour fast has on glycogen stores, and found that it has " no effect of muscle glycogen stores[46]. " The key is to understand the difference between stored glycogen levels in the muscular and liver(as explained in that article). This is why glycogen depleting exercise is necessary in phase one of this program. Therefore you will only want to consume 2-3 small, low sodium, moderate carbohydrate meals that day, aside from your pre-event carb. The latter should be extremely high on the GI scale. If you notice before pumping up, athletes take in a few sips of wine, jelly, or syrup. I recommend any of the various " energy gel " packets. These are packed with fast burning carbs. Consume one serving of this before pumping up and you will see a notable increase in your muscular pump and vascularity. The reason for this phenomenon is that insulin stimulates the dilation of blood vessels which brings more blood to the musculature[60]. This is in accordance with what is known as Poiseuille's equation, which states that blood flow, or the flow of any material for that matter is proportional to vessel radius. This is actually so drastic that any increase in diameter = a four fold increase in flow. This is why such an insulin spike brings out vascularity, as literally more blood is flowing through them. Combined with the pump you receive in the " pumping room " this effect will be synergistic, as has been shown in University studies(Tipton et al.).

Conclusion

Contest day represents year after year of battling the most brutal of adversaries, and overcoming that which people fear most. Pain, and lots of it. Only those with an insatiable fire can withstand the forces of this sport. When it all comes down to it, those who understand the complexities of the human body will have a thousand fold advantage over those who lack the guts to obtain such a prize. This article was meant to propel you that much further ahead in your mission. However, it is only the start of a series of like articles, which will be centered around making you, the best of the best.

Yours In Sport

Jacob Wilson
President Abcbodybuilding / HYPERplasia The Magazine

Appendix

note the following: This is not an everyday dieting process, and is only meant to be performed for the week of the contest. Most experts agree to limit it to once or twice a year. This will be discussed in subsequent issues.

The following will provide both a sample training split, and diet for the contest week.

14 Days Out Prep

1. At this time you should be utilizing your mind to go through your routine at least twice a day. I recommend lying in bed, with your eyes closed, while mentally performing your on stage technique. For more on how to utilize the mind muscle connection, click here.

2. During this week, all the supplies for pre-contest week should be purchased. You will need a good source of sodium. The American National Research Council recommends a dietary intake of at least 500 mg / day(variations in recommendations range from 500 to 1,000 a day). However the typical out of shape, couch potato diet utilizes in the upwards of 5, 000 mg / day. For the first three days you will consume sodium as our pizza eating, beer drinking comrades do. This means your intake will be approximately 5, 000 mg / day that are planned. Good sources come in pre-packaged soups. For example, one can of chicken broth normally contains near 1,000 milligrams of sodium. Another excellent source are the dried soup packages, and they are convenient as well. Therefore I would recommend salting your food, and consuming at least 4, 000 mg / day of sodium from soup or pre-packaged soup powder. Simply mix it in water and drink, in three to four servings throughout the day, at about 1, 000 mg a pop. The soup needs to be relatively carb free of course. And as the studies above indicate, you must drink copious amounts of water with each salty serving you drink. Table salt contains approximately 40 percent sodium, and can be measured in grams. 1 gram of table salt, therefore contains 400 mg of sodium.

3. Purchase several gallons of distilled water. I prefer at least a 10 gallon supply, for good measure.

4. You will want to purchase flax seed oil as well as safflower oil. Take a jar and pour one cup of flax in it and one cup of safflower in it so that they mix. This will give you the proper amount of EFA's needed. Or you can purchase a pre-made EFA combo.

5. I prefer to control my macros on this diet. Purchase lean turkey meat, and skinless chicken breast. The meat should not be pre-seasoned, as this is high in sodium. When carbo-loading, and sodium depleting you will want to consume very low Na meals. No salt can be added, and no pre-salted food can be eaten.

6. I prefer cream of wheat, potatoes(any form), brown rice, and wheat pasta for the carb up. On the PW shake, you will utilize recommendations from Mr. Knowlden and Venom. Thus, you will be required to have both dextrose as well as maltodextrin in your house.

7. Purchase the " energy gel " for the contest, tanning oil, etc before Showtime. Also pre-plan your routine to maximize a pump for the day of the contest.

Sample Diet For Carb Depletion

Saturday - Carbs Should be .5 grams per pound of bodyweight this day, and should come from " resistant " starches, such as oatmeal, legumes, vegetables etc. The following meal plan is for a 200 pound BB. Sodium loading will begin today, via two cups of soup or dried soup powder equaling approximately 2, 000 mg of sodium, additionally all meat dishes should be salted. This should amount to at least 3, 000 to 3, 500 mg of sodium easily for the day. You will drink 32 cups of water today, so be prepared! As stated, it must be distilled.

Note: 100 grams of carbs will be spread over Four meals, thus you will consume 25 grams per meal, with the remaining two consisting of protein and flax / safflower mixture.

Breakfast: Oatmeal, spoonful of flax / safflower mixture and 50 grams of whey protein. - Four cups of water

Salt snack - Consume 1, 000 milligrams of sodium via low carb high sodium soup. Consume four cups of water aside from the water used to make the soup.

While Training Four Cups of water, with a small sprinkle of sodium should be consumed so as not to deplete sodium.

PW Shake(taken after training of course) - You will utilize a shake that in no way replenishes glycogen stores. This is the one time I would recommend such an anti-progress meal. Whey Protein, flax / safflower mixture, and oatmeal. This is extremely conducive to depletion. Three cups of water.

Meal Three: Skinless Chicken, leafy green salad with broccoli and the safflower mixture again. Three cups of water

Salt snack: Consume 1, 000 milligrams of sodium via low carb high sodium soup. Consume four cups of water aside from the water used to make the soup.

Meal Four: Whey and one to two spoonfuls of flax / safflower mixture and Three cups of water

Meal Five: repeat meal four but with four cups of water

Meal Six: Repeat meal three

Water intake will equal 32 cups today.

Sunday: Repeat the afore mentioned day, but lower carbs to .4 grams per pound of bodyweight

Monday: Repeat the afore mentioned day, but lower carbs to .25 grams per pound of bodyweight and add one sodium spike. PW will be carbless here.

Tuesday: repeat Monday's regimen, but add 1 one sodium spike

Sample Carb Up Diet

Carbs will equal .5 grams per pound of bodyweight, per meal! These will consist of moderate to high glycemic foodstuffs. I wrote what I preferred above. You will eliminate all food which is high in sodium, and you will eliminate all seasonings which contain salt(I prefer all seasonings eliminated all together). Water will be tapered back to 24 cups, each of which will be consumed between meals. This is so as to keep osmolarity low, so as to draw sodium out of the ECF and into the digestive tract for elimination.

Wedsday:

Meal One: After training consume the post workout meal as Old School describes! You should dilute the solution as Venom describes. The rest of your water will be consumed separate from your meals for reasons already stated. If you consume four cups of water PW, the remaining
20 cups will be spread in 5-four cup servings.

Between Meal - four cups water

Meal Two: Baked Sweet Potato, Skinless broiled chicken, and Brown Rice

Between Meal - four cups water

Meal Three: Cream of Wheat, Whole wheat toast, and Whey protein

Between Meal - four cups water

Meal Four: Plain Pasta, and diced Chicken

Between Meal - four cups water

Meal Five: Rice and Lean Baked Turkey. Again, it must be fresh and cannot be pre-prepared by the store! You are to limit sodium!

Between Meal - four cups water

Meal Six: Repeat meal three

As stated, .5 grams of carbs per pound of bodyweight, per meal!

Thursday: Repeat The former day, except you will not be training today. Therefore no PW. Replace your first meal with cream of wheat etc.

Water is to be lowered to 10 total cups

Friday: Repeat the former day, but limit water to 4 cups.

Contest Day

Eat very small snacks to keep energy even. You only want to maintain stores, which is relatively easy. Water should only be utilized to keep the mouth from being to dry. It should be very limited. Follow above instructions on energy gel before pumping up.

After The Contest

You have your own ritual I'm sure, and you should enjoy what you have earned!

Sample Seven Day Workout Schedule

During contest week the full focus must be on the obvious: " The Contest. " Too many athletes blow it by treating this week as if it were no different from others. This is one of the main reasons why they lose. They get stressed out, the last few days due to horrible prep, catabolic hormones which are counter to glycogen supercompensation mount up, their poses don't flow on stage, and the crowd can sense their tension.
For seven days before the show, you need to do a massive amount of film work. Study other techniques, and perfect your own, mentally as well as physically. You should have done a personalized routine at least 100 times in your head, and in practice before hitting the stage. You need to lower outside distractions as well, and your entire week must be pre-planned! There are two methods that I recommend. The first is traditional cardio combined with cyclic training of body parts. The second is full body workouts combined with straight posing four days straight. Most carb depletion strategies utilize cardiovascular training, that is non impact to deplete for reasons clearly outlined earlier. Therefore we will simulate cardiovascular style training with the weights to limit micro trauma, and to also target each body part. The stationary bike will deplete only the legs, you need all stores, in each body part low for supercompensation to conspire. We will focus on the latter style, beginning with Saturday.

Saturday

Afternoon Session - Posing For 30 minutes straight

Here the goal is to begin depleting each body part. You will alternate body parts here during the posing section. This means poses should go like so: Emphasis on Biceps - Hold Pose for 30 seconds, then move onto Back for 30 seconds, then quads and tibialis for 30, followed by pecs ect. Your goal is to flush each body part with blood by the end of the 30 minutes. The goal is to not only begin depletion but also to strengthen your mind muscle connection before the show.

Night Session - 30 minutes dedicated to Your routine. This means working on choreography, flowing to the music etc. You should have plenty of time to perform your whole routine several times here. Work on tensing the whole body. In other words, when performing a double biceps pose, be aware that your quads are also flexed and look in peak condition. That is the difficulty in posing, you must bring the whole body under your control, much like a form of martial arts.

Note: you may also train in the morning, and evening, rather than afternoon / night.

Sunday - Your entire body will be worked today, with legs in the morning and upper body at night.

Note that 65 percent of your one rep maximum should be enough to deplete the FT IIb fibers . Explosive repetitions will also deplete these fibers, and also note that a bit higher repetitions will increasingly recruit muscle fibers as the set continues. Interestingly studies indicate that as low as 30 percent 1 rep maximum variations can actually deplete fast twitch IIa fibers, but do little for IIb fibers in a lower repetition range. The latter will yield very little micro trauma, and I would not go above the former as it should be sufficient for depletion. I have mixed a combination of high rep as well as intense posing work for the ST fibers, and explosive work to deplete the FT IIa and b fibers. We are also keeping micro trauma low, and I must emphasize that you should not emphasize the eccentric portion of the repetition. Many athletes prefer to have their partner take the eccentric portion of the rep during this phase.

Afternoon Session

Phase 1: You will perform 3 sets of 25 repetitions on no weight, feet wide out, toes pointed at 45 degree angle squats, a bit lower then parallel. Reps should be rhythmic, and you should spend little time on the eccentric portion of the rep. Finish this squatting session with two, timed sets of 30 seconds a piece, in which you explode as if sprinting each rep. This is an excellent way to deplete glycogen stores in FT muscle fibers, with little microtrauma.

Between sets flex your lower body for 60 seconds and then repeat the next set

Phase Two: Perform 5 sets on the leg extension with extremely light weight. I.E. only 25 pounds, nothing overly taxing.

reps: 40, 35, 30, 25, 20 - Flex between sets

Phase Three: Perform 3 sets of 20 repetitions of standing calf raises supersetted with reverse calf raises. (done with bodyweight). Perform 2 sets of 12 repetitions done very explosively. The first three however are rhythmic and do not emphasize the eccentric ever!

Between sets flex quads, hamstrings and calves. Try and tie them together. For example, begin with a flexation of the thighs which ripples down to the calf in a dramatic fashion. Be spontaneous and have fun.

Phase Four: 3 sets of 50 crunches, 3 sets of 25 alternating crunches, three sets of 20 reps on leg lifts. The reps should be easy, and fluent for the first two sets, and explosive and quick for the last set.

Phase Five: Practice routine for 15-30 minutes

Night Session

Phase One: Three sets of wide grip lat pulldowns at 25 repetitions a peace, the first two are rythmic and the last is explosive for 30 seconds to deplete FT fibers. Use a

very light weight, and do not focus on eccentric. Follow this with three sets of close grip pulldowns, same protocol.

Flex your back between sets

Phase Two: One arm dumbbell Rows at 20, 18, 15 reps a piece for 3 sets

Only rest as your switch the arm being worked

Phase Three: Three sets of 25 pushups performed explosively. This should be easy, but if not then 3 sets of 20 barbell bench presses.

Flex your back between sets

Phase Four: Incline dumbbell bench press at 30, 20, and 15 reps respectively, first two rythmic, last explosive, do not emphasize the eccentric! And yes, I am drilling this one. Its vital for your success.

Again flex

Phase Five: Close Grip Upright rows 3 xs 15, 12, 20 repetitions -rhythmic

Phase Six: Superset easy curl bar curls with triceps cable press downs at 5 total sets for 40, 35, 30, 25, and 20 repetitions each respectively.

flex between sets

Phase Seven: 50 light weight wrist curls supersetted with the same number of reverse wrist curls

Practice your routine for 15 minutes

Monday

Afternoon Session - Flex body part being worked between sets

Phase One: Boot strappers for 5 xs 50 repetitions

Phase Two: Leg Press: Feet close on the pad, and far down, as well as pointing forward. You should bring legs as far back as possible to create separation between all four heads of the quads. 5 sets of 40, 30, 20, 15, and 10 repetitions respectively

Phase Three: Seated calf raises (3 Xs 40) supersetted with seated plate raises (3 xs 40)

Phase four: Scissors for the lower abs 3 xs 50 and one set of 50 straight crunches(performed quick)

Phase Five: Side laterals supersetted with dumbell shrugs four 4 sets of 20, 15, 12, 10 for side laterals and 40, 35, 30, and 25 repetitions a piece for shrugs respectively

Phase Five: Work on routine for 15 minutes

Night Session - Flex body part being worked between sets

Phase One: Five sets of dumbell flys X's 40, 30, 20, 15, 12 repetitions

Phase Two: Five sets of Incline barbell bench - 60 percent max, two sets of explosive reps, and I would reccomend having your partner take the eccentric portion of the rep. (18, 15) respectively

Phase Three: Bent Over rows supersetted with bodybuilding Deadlifts 20 a piece for 5 total sets - Again, Explosive on the last two sets for FT fibers, rhythmic on the first two.

Phase Four: Three sets of straight cable pull downs supersetted with straight arm dumbbell pullovers at 25 repetitions a peace

Phase Five: Five sets of cable biceps curls at 12 reps a peace supersetted with Five sets of French Presses. Perform quickly, to deplete FT fibers

Phase Six: Flex Upper Body, intensely for 15 minutes

Tuesday

Repeat Day One, except on Back, replace one arm dumbbell rows with five sets of 50 repetitions on good mornings to tighten the erectors, should be done lightly.

Wednesday

This is your last session and you will perform it in the morning and sleep the rest of the day! It is meant to hit the entire body.

Phase One: Two sets of on no weight, feet wide out, toes pointed at 45 degree angle squats, a bit lower then parallel. The first set of explosive for 30 seconds, and the second is rhythmic for 50 reps. Reps should be rhythmic for leg extensions, and you should spend little time on the eccentric portion of the rep. Superset this with 2 sets of leg extensions

Phase Two: Two sets of 40 reps of hamstring work

Phase Three: Three Sets of Lat Pulldowns supersetted with Dumbbell Flat Bench at 20 reps a piece

Phase Four: Two sets of upright rows supersetted with side laterals 20 reps a piece first set, and 15 a piece second

Phase Five: Seated dumbbell curls supersetted with Rope pressdowns at 40, 30, 20, 10 repetitions a piece

Phase Five: 50 crunches supersetted with 50 leg lifts

Down Your Post Workout Meal and get ready to carb up! You will rest the entire day after this

Thursday

Rest

Friday

Rest

Saturday

Tear the stage up!

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