

Effects of Carbohydrate and Water Consumption on Appearance

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Carbohydrates and water are nutrients considered to be essential to the performance and appearance of the body. While both performance and appearance are usually of the utmost importance to those who engage in an exercise program, the latter will be the focal point of this article. As closely intertwined as these two objectives seem to be there are unquestionable differences that sway us more towards one than the other. These differences in nutrition protocol are why some people “look” like they are in shape while others are in shape but don’t look the part. This article however is not about nutrition for the purpose of getting lean and muscular but rather when you *are* lean and muscular, how you can make an even greater visual impact. Near the end of this article there will be recommendations given which relate specifically to those attempting to “Peak” for a bodybuilding competition but let it be known that the peaking method described is applicable to anyone who wants to optimize their appearance on a particular day for a particular purpose (i.e. photo’s, a beach vacation, etc.). Bodybuilders have long manipulated carbohydrates and water with great effect in enhancing their physical appearance. This article will explore exactly how these elements work individually and together to influence your appearance.

Water

Our need for water is only second to air since an individual can live for seven days or more without water but without air they can not live but for a few minutes. Though the need for water as a life force is common knowledge to most what is not as commonly understood or appreciated is the role water plays in one’s muscular appearance. However this role should really not come as much of a surprise when you consider that our muscles are comprised of 70-75% water! For this reason even mild dehydration will diminish the overall size and fullness of our muscles. Bodybuilders commonly refer to their muscles appearance [brought about by dehydration] as being “flat”. Not only will a state of dehydration, mild or extreme, negatively effect appearance but performance as well, which in the long will affect appearance even further. Water resides

inside and outside muscle fibers acting as a lubricant during muscular contractions and is also how nutrients and chemicals needed by the muscles are transported and absorbed. This will impact force production thus hindering the ability to train with a level of effort necessary for stimulating hypertrophy. This is yet another example how our appearance and performance are tied together however such effects are not typically seen immediately. Insufficient water consumption however *will* impact appearance in the present as has been observed countless times among competitive natural bodybuilders.¹ In a while this scenario will be explained further and how you can avoid it.

An examination of hydration and body composition can provide some insight as to why this “flat” appearance is so noticeable among serious bodybuilders. Consider first that fat-free mass compared with adipose (fat) tissue has approximately six times the total water and twice the extracellular water content per unit of weight.² This would mean that the more muscle mass an individual possesses the more noticeable the effect of water loss or dehydration will have their musculature. But to truly appreciate the visible consequence of hydration on a muscles appearance take a male bodybuilder whose bodyfat is <7%. At these extremely low levels the skin becomes very thin, seemingly transparent, and every major and minor muscle groups pops out. In this condition the effects of even the slightest intracellular dehydration are quite noticeable, as is the incorrect balance intra and extracellular water.

One study that demonstrated how body composition effects cellular hydration involved 30 obese premenopausal women [observed] before and after a 3 month weight reduction and 9 month weight maintenance program. The results of the study showed that the hydration of Fat Free Mass (FFM) increased from (74 +/- 1 to 77 +/- 2) during weight reduction and remained elevated during weight maintenance.³ Adding to this, extracellular water (ECW) increased by 1 liter. Based on this it would appear that muscle compartmentalizes more water in the absence of fat, however the absence of fat also results in an increase in extracellular water. While increased water in FFM is certainly a positive, increased ECW is not as far as *appearance* is concerned. However there is a simple solution to rectify this dilemma and that is to drink more water, as well as

¹ We highlight the effect of insufficient water consumption in the natural bodybuilder as opposed to the bodybuilder who relies on pharmaceuticals and compete in non-tested bodybuilding organizations for the simple reason that many of those individuals utilize prescription diuretics which will often mask the side effects of insufficient water consumption whereas the natural competitor is not allotted this luxury thus the effects are easily observed.

² Wang J, Pierson RN Jr. Disparate hydration of adipose and lean tissue require a new model for body water distribution in man. *Journal of Nutrition*, 1976 Dec; 106(12): 1687-93

³ Marken Lichtenbelt WD, Fogelholm M. Increased extracellular water compartment, relative to intracellular water compartment, after weight reduction. *Journal of Applied Physiology*, 1999 Jul; 87(1): 294-8

control carbohydrate consumption and maintain the proper sodium/potassium balance.

How much water needs to be consumed? It is a question *literally* without an answer. All studies on hydration needs have been inconclusive! Though 64 ounces a day has become the expected value however this number can be increased or reduced based on your activity level, the climate in which you live, or any disease or illness you may have. Even still this does not address the issue of appearance and the effect hydration. So once again we are left with the empirical evidence provided to us by those bodybuilders who have carefully observed and meticulously tracked the outcome of minor and major alterations in water and macronutrient consumption. The “accepted” minimum intake by bodybuilders is one gallon per day and upwards of 2.5 by the largest of individuals. The author’s intake [at 5’ 6”, 140-145lbs and 3-5% bodyfat] four to eight weeks out from a competition is 1.5 gallons per day. This high dosage serves a very important purpose which is the frequent elimination of excess water from the body, namely the water stored subcutaneously (under the skin) which helps in the attainment of a dry, tight appearance. With an overabundance of water continually being fed to the body there is no need to retain any which is what is partially responsible for muscles appearing smooth and soft.

Now I mention that inadequate water intake for the purpose of frequent elimination of excess water is only partially responsible because carbohydrates play a very important role in how the water is transported into or out of the muscles.

Carbohydrates

Before we discuss how carb influence the flow of water into the muscles let me clarify something about this much debated macronutrient. It is believed by some that carbohydrates are not necessarily *essential* to our health or performance. This belief is only partially true. Since the useable form of energy carbohydrates are broken down into—glycogen— can be converted from excess protein, we technically do not need carbs to supply the glycogen needed by every living cell in our body for every function we perform. Granted only carbs can provide this source of energy immediately but if there is no immediate need and the body is well acclimated to utilizing fat and protein to supply its energy needs then carbs can comfortably fall to the wayside with little to no ill effects. In fact many studies have shown that you are likely to burn more body fat on an

iso or hypocaloric diet that is lower in carbohydrates and higher in protein and fat.^{4 5 6 7}

Does this mean carbohydrates are useless? Hardly! There are micronutrients (and fiber) found in fruits and vegetables that cannot be found elsewhere which is why they *should be* a staple in one's diet for health related reasons *and* fat loss. For the purpose of optimizing the muscles appearance carbohydrates also play a vital role. Unlike the energy supply scenario described above, carbs cannot be replaced by any other macronutrients when trying to make the muscles look fuller, harder and more vascular. This is especially true for bodybuilders who, for the purpose of competition, need to perfectly time *when* they will display their best condition. Now I made mention of energy supply and fat-loss above simply to highlight a very important point; *what you do to get to the optimum level of leanness for displaying your musculature is vastly different from what will accentuate and enhance your musculature once you are lean enough.* Everything we are discussing here pertains exclusively to enhancing appearance after you are in position to do so (i.e. low body-fat percentage with maximum muscle retention).

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Being successful at utilizing carbs for enhancing your appearance is dependent upon a number of factors. The first factor is your degree of leanness. Even at a body-fat percentage as low as eight, it is difficult to appreciate the full effect of proper carb loading. Even a small layer of fat overlying the muscles can mask the (overall) effect of a well planned and executed carb load. In muscles groups where the layer of fat is very thin, such as the arms, fullness and increased vascularity is very apparent. However other areas (typically the legs, glutes, abs, and low back) that are retaining the remaining subcutaneous fat will appear unresponsive to the load. Generally speaking it is best to be at a bodyfat percentage of three to six, depending upon how muscular you are. At these

⁴ Farnsworth E, Luscombe ND, NOakes M, Wittert G, Argyiou E, Clifton PM . Effect of high-protein, energy restricted diet on body composition, glycemic control, and lipid concentrations in overweight and obese hyperinsulinemic men and women. *American Journal of Clinical Nutrition*, 2003 Jul; 78(1): 31-9.

⁵ Weigle DS, Breen PA, Matthys CC, Callahan HS, Meeuws KE, Burden VR, Purnell JQ. A high-protein diet induces sustained reductions in appetite ad libitum caloric intake, and body weight despite compensatory changes in diurnal plasma leptin and ghrelin concentrations. *American Journal of Clinical Nutrition*. 2005 Jul; 82(1):41-8

⁶ Clifton PM, Noakes M, Keogh J, Foster P. Effects of an energy reduced high protein red meat diet on weight loss and metabolic parameters in obese women. *Asia Pacific Journal of Clinical Nutrition*. 2003;12 Suppl:S10

⁷ McAuley KA, Hopkins CM, Smith KJ, McLay RT, Williams SM, Taylor RW, Mann JI. Comparison of high-fat and high-protein diets with a high-carbohydrate diet in insulin-resistant obese women. *Diabetologia*. 2005 Jan;48(1):8-16. Epub 2004 Dec 23.

extremely low levels there should be very little subcutaneous fat to obscure the 'filling out' effect of the carb load.

The second factor unsurprisingly is muscularity. The purpose of manipulating carbohydrates is to accentuate the size and look of the muscles. For that reason it is obvious that unless the individual in question possesses an appreciable amount of muscle the impact of carb manipulation will be minimal. That is because the muscle tissue is the site at which we store the largest amount of glucose. You cannot accentuate what is not there. Unfortunately many people—bodybuilders particularly—view carb loading/manipulation as a “magic trick”. Something that will make something appear that is not really there. For instance a bodybuilder who does not have well developed posterior deltoids will not suddenly develop fuller looking shoulders as a result of carb loading. As obvious a notion as this is it is mentioned for another reason as well. Many individuals lose some lean muscle tissue as a direct result of heavy dieting to lose body-fat. Hence it serves the best interest of the individual to lose body-fat at a slow rate so as to retain as much muscle tissue as possible and not “take away” from what a properly formulated carb load can provide.

The third factor is the amount of carbs consumed. Take in too few carbs and you will not fill-out, leaving your muscles looking flat. Take in too many (otherwise known as “spilling over”) and you will fill-out but look puffy and smooth. Take in just enough and you will find a happy medium that leaves you full, hard, vascular and dry. This is the biggest challenge of any carb-load and is ultimately what we are trying to achieve by manipulating carbs and water as well as sodium and potassium.

The fourth factor, which fundamentally works hand in hand with the amount of carbs, is the type of carbs. Carbohydrates are notorious for their secretion of insulin, the hormone responsible for shuttling glycogen to the muscles and fat cells. However different types of carbohydrates do this at vastly different rates or speed, the result of which can either make for a “perfect peak” or ruining of months of preparation [if competing]. It is very important to recognize that the muscles can only absorb so much glucose at one time. If trying to stuff the muscles with more glucose than they can handle at any given time the result will be glucose residing outside the cell. This scenario can be disastrous for the following reason. Every gram of stored carbohydrate holds 2.7 grams of water. As long as all the carbs you consume are stored in the muscles your muscles will appear large and full with tremendous separation. But if the muscles are at full capacity yet more carbs are entering the system the remaining glucose will settle outside the muscle cells and underneath the skin and consequently water will settle there as well. The result being full muscles minus the definition. The key to a “perfect peak” is to have just enough glucose

residing inside the muscle cells to have them appear full while having little to no glucose outside the cells so that there is nothing between the skin and muscle obscuring their separation and striations.

So what does all this have to do with the types of carbs you consume? Simple, the faster a carbohydrate is absorbed the less you are able to *control* the rate of absorption by the muscles and the greater the likelihood having “spill-over”. While the amount of carbs (grams) might be correct for achieving a filling effect it may be too much all at once or at least too fast for the muscles to fully absorb. Consequently, some glucose will wind up outside the cells. However if that same amount of carbohydrate has more time to be absorbed, less will wind up outside the cell. For this reason it is best to carb load with easier to control, slower to absorb, complex, low glycemic carbohydrates. Just to note, even complex carbs that have a higher glycemic rating (i.e. white potatoes, rice cakes, rice) can be okay for loading as long as they are accompanied by a protein and fat (which they should) since protein and fat slows absorption. However those who are extremely carb sensitive should still be cautious of using higher glycemic carbs even if accompanied by fat and protein.

This is not to say that faster absorbing carbs—particularly simple sugars—are of no use to us because in fact they are. Faster absorbing carbohydrates have a tendency to rapidly increase blood sugar and insulin. There is a significant correlation between increases in insulin and changes in blood flow, vascular resistance and sympathetic activity. Despite an increase in sympathetic vasoconstriction there is an overriding increase in skeletal muscle vasodilatation resulting from the insulin release following the ingestion of a carbohydrate meal.⁸ Though this may not be viewed as a positive from a health standpoint from an appearance standpoint it can be truly beneficial. Increased skeletal muscle vasodilatation is what enhances a bodybuilder’s “vascularity”. For the competitive bodybuilder about to step on stage or non-competitor who is about to take photos a sudden increase in insulin can help give your veins a little more ‘pop’. With veins protruding through the skin like thick ropes it gives the muscles a harder and more refined appearance. The key with faster absorbing carbs is to only utilize them immediately before taking photos or taking the stage and in small amounts; enough to “top off” the muscles and increase vascularity. This can be accomplished by sipping a sugary drink or eating a little candy.

Sodium & Potassium

⁸ Scott E, Greenwood J, Vacca G, Stoker J.B., Gilbey G., Mary D. Carbohydrate ingestion with transient endogenous insulinaemia, produces both sympathetic activation and vasodilatation in normal humans. *Clinical Science* (2002) 102, (523-529) Great Britain

A conversation about the influence of water and carbs on appearance is not quite complete without talking about sodium and potassium. Sodium is responsible for regulating extracellular water while potassium regulates intracellular water. A common mistake among competitors, aside from dropping water, is dropping sodium and increasing potassium in an effort to draw more water into the muscles while pulling subcutaneous water out. Although this procedure of dropping sodium and increasing potassium in conjunction with a decrease in water may seem logical considering the role these ions play, doing so is anything but. These ions must be properly balanced in order for fluid dynamics inside the body to remain stable. Read that statement one more time. They must be properly *balanced!*

Under normal conditions when sodium and potassium are balanced and water is in constant supply, most of the water is held inside the muscle cells while all excess water gets excreted. What makes eliminating sodium to further eliminate subcutaneous water wrong is that when sodium levels drop below normal the body releases the hormone Aldosterone. Aldosterone causes the body to reabsorb and prevent the excretion of sodium. The result of this is the retention of water outside the cells. Hence, what you are trying to do to eliminate subcutaneous water is precisely what causes you to retain it. The lower and longer sodium is dropped the greater the release of Aldosterone and the worse the situation develops. To compound the problem even further—if you didn't think it could get worse—increasing potassium way above normal levels or at least way above sodium will also cause a release of Aldosterone.

The key to achieving that dry, shredded look, while keeping the muscles full, is to maintain “normal” sodium and potassium levels. This means that your sodium intake should be in the range of 1-3 grams and potassium should be 1.5-2 grams.

The Synergistic Effect of Water, Carbs, Sodium & Potassium on Appearance

For all the complexities and nuances associated with the elements mentioned throughout this article (water, carbs, sodium/potassium) getting them to work together is not as complex as one would think. The idea is to simply manipulate these things *enough* to cause the right reaction and that reaction should not be anything too dramatic. When you attempt the dramatic you typically get the dramatic but not quite the dramatic you're looking for. The body works much like a pendulum in that when you swing it hard in one

direction it will swing back even harder in the opposite direction. By trying to radically disrupt homeostasis you put your appearance at jeopardy.

Quite possibly the most important factor involved in "Peaking" which we have not yet mentioned is timing. It is not uncommon for many competitive bodybuilders to find themselves peaking either a day early or a day late which is just another reason why the Peak needs to be a controlled manipulation and not a dramatic 'swing for the fences'. The main objective of your peak is to try to make your body fall into a "vicinity". As long as you are in that vicinity you will safely look your very best. Now if the idea of "playing it safe" does not appeal to you rest assured that you can still ruin everything you have worked for if you do not carry out the process successfully.

The biggest challenge for anyone trying to Peak is striking that perfect balance between water and carbs. However if we take a step back and contemplate the points made earlier, especially those made about water, what should become very clear is that water should never be manipulated to a large extent. Water should remain high at all times and its carbohydrates that need to be adjusted along with a very conservative manipulation of sodium and potassium. Most "old-school" carb loading methods have the individual gradually increase their carbohydrate as their event (i.e. competition, photos, a beach vacation, or any other specific day you want to look your best) draws nearer. The problem with this approach is that unless you have done an extensive amount of trial and error to figure out your 'carb threshold' you can not be sure at exactly what point you will spill-over. Typically, by the time you make this discovery it is too late.

Assume that no matter how hard you try to avoid a spill-over one will happen. The body is just too dynamic; a certain amount of carbs that one day results in a spill-over will on another, be barely enough to fill you out. Taking this into consideration the best way to approach a Peak is to start early. Instead of waiting three days before the event to start loading carbs and risk looking bloated and soft, start five or six days before. Again, you will spill-over! The difference now is that you have 2-3 days to get rid of any subcutaneous water while maintaining muscle fullness.

Essentially you should begin your Peak about 7 days from the date of the event. This where the bodybuilding term "Peak Week" comes from. Our Peak Week starts with a very modest carb-depletion followed by a heavy carb-load followed by a steady decline in carbs throughout the remainder of the week. Water intake will remain relatively high throughout and we will also do a mini sodium load/depletion in which we start slightly higher than normal and, as with carbs, taper our intake as the week progresses.

Day 1: This will be a *minor* carb depletion day. By minor we mean dropping your carbs 25-50 grams below your normal intake. Until now your carbs should have been fairly low for fat loss (0.5 to 1 g/lb of lean body weight) and so this reduction should be enough for depletion.

Water intake should be very high: 1.5 to 2.5 gallons and sodium should be in the range of 3,000 mg.

Protein intake should remain normal.

Day 2: Carbs will be raised to their highest point of the week; this is your “carb-load”. Depending upon body-type, metabolism and sensitivity to carbs your intake should fall between 0.75 and 1.5 g/lb of bodyweight.

Water intake remains high; 1.5 to 2.5 gallons and sodium will remain around 3,000 mg.

Protein stays normal.

Day 3: Upon waking this morning you should likely be very full but looking a little soft due to carbohydrate spill-over as well as holding some extracellular water from the high sodium intake. That is why today you start your gradual drop in both carbohydrates and sodium.

Reduce your carbohydrate intake by 20-35 grams from Day 2 and reduce your sodium intake to 2,500 mg. Water is still at 1.5-2.5 gallons.

Day 4: From the slight drop in carbs and sodium the day before you should already notice upon waking a slight decrease in the amount of subcutaneous water you are holding yet you still appear full.

Today you will reduce carbs again by 20-35 grams and sodium should be around 2,000 mg. Water is still at 1.5-2.5 gallons.

Day 5: As a result of your steadily declining glycogen levels and high water/lower sodium intake you should, upon waking this morning see a noticeable difference in how hard your muscles look.

Today you will reduce carbs again by another 20-35 grams and sodium should be reduced to about 1,500 mg.

Day 6: Upon waking you will likely be the hardest and most shredded you have looked to date but you may also be a little less full than days prior...don't fret we are going to remedy that later on this day or tomorrow morning (depending upon your body type, metabolism and carb sensitivity).

If you are endomorphic and very carb sensitive you will keep your carbs as low as they were on Day 5, maybe even slightly less.

If you are ecto or mesomorphic and fairly carb resilient you will have 30-40 grams of carbs with breakfast and no more until the late afternoon/evening (4pm-7pm) when you begin re-loading. The more resilient and faster the metabolism the earlier you will start re-loading (extreme cases will re-load throughout Friday). The less resilient and slower the metabolism the later you should wait. Endomorphs will not reload until the morning of Day 7.

When re-loading commences (for ecto's and meso's) consume 30-40 grams of carbs every two hours until bedtime.

Sodium should be 1,000 mg. for the day and water can be reduced slightly to $\frac{3}{4}$ to 1 gallon and should be finished by late afternoon, after that only sip water with your food.

One other thing you can do on this day is what's known as fat-loading. This may be a viable alternative to for the endomorph who cannot afford to take in many carbs or those still retaining a little water. The thought process behind fat-loading is that more interstitial fluid and subcutaneous water will be drawn away and brought to the digestive system to help with digesting the extra fat. Many bodybuilders have noted a significant "hardening" of their muscles using this method while others have noted nothing at all. Since fat is also stored in muscle it may aid in filling out. Fat-loading is something that may be worth experimenting with in future Peak trials but the first time out you may want to simply stick with carb/water/sodium manipulation only.

Day 7: In all likelihood you will not wake up this morning very full but you will be quite hard, shredded and dry. You will use the time from when you wake up [which should be about 5 am for competitors whose pre-judging starts at 1 or 2pm] till the time of your event to top your muscles off and fill out a bit more.

By having waited this long to complete your load you have greatly minimized your risk of spilling over.

Consume 30-50 grams of carbs every two hours from the time you wake up till the time of the event. This should essentially work out to about 3-4 feedings. A minimal amount of protein should be consumed (i.e. bites of chicken or steak) and fat should be moderate. As far as water and sodium goes, have only 4-6oz. of water with each meal and the only sodium you consume should be what is in your food, with the exception of your last meal which should contain 500-1,000 milligrams. Since you have been consuming large amounts of water up until now and sodium has slowly been depleted, your body will still be eliminating excess water. By the time your body recognizes that water has been cut and begins to retain it your event will be finished.

A Word on Carbs for Carb-loading

Not all carbs are created equal and this especially true when choosing the right carbs to load with. Keep in mind that by the time you begin loading your body will likely be in a depleted state and ready to store fat whenever possible. This fat can come directly from dietary fat or from carbs converted to fat which is why choosing the right carbs to load with is so important. You should not try to carb-load with junk. Most junk food is so high in both carbs and fat that it's likely both will wind up being stored since the body is not as efficient at processing junk food compared to 'clean' food.

Daily Appearance Enhancement

For those who are not preparing for a competition, photo's, etc. but rather would like to maintain a hard, shredded, muscular appearance on a daily basis or for a long stretch of time (i.e. throughout the summer) what needs to be done is far less complicated than the Peaking method outlined on the last two pages. After your body-fat has reached a comfortably low level, as long as you keep your water high each day [1 gal. or more] and maintain a moderately low carb intake [0.75 to 1 g./lb of bodyweight] you will appear hard day in and day out. As you notice yourself flattening out simply increase your carb intake by 50-100 grams for a day and then return to your normal intake or slightly lower if you want to eliminate excess water more quickly. As far as sodium and potassium is concerned simply keep them in their normal range [1.5-3 g. Na and 1.5-2 g. K]. Remember you need not make dramatic changes in your diet to make dramatic

changes in your appearance. It takes only the minor manipulation and balancing of carbs, water, sodium and potassium to make you as full, hard and vascular as you wish.