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## ABOUT THE AUTHOR

Richard Hargreaves has been personally training for 18 years. During this time he has won a Mr AUSTRALIA Bodybuilding Title (1984), owned two gymnasiums (FITNESS FACTORY, GYM 405), been Vice President of Victorian Fitness Industry Association, committee member of Fitness Institute of Victoria (government represented body responsible for self regulation of the fitness industry including training accreditation of Fitness leaders and minimum Industry Standards - Code of Ethics), is a qualified fitness leader and international physique judge. He writes for Ironman Bodybuilding magazine, Fitness Australia and has written for Blitz Martial Arts magazine. Richard is still personally training and is currently researching more sports supplements.

He has two Melbourne radio spots per week, one on morning community radio and the other on Monday nights on the Gavin Wood Radio Show 104.3 Gold FM, discussing fitness related topics – including Ironpower supplements.

Acknowledgements:

I would like to thank the following people for their support and assistance in my research:

Dr Henry T. O'Meissner BSc Msc PhD Nutritional Biochemist (Longman's Who's Who in Science)

Dr Chew Ming Yao BSc PhD Grad Dip Biomed Instr Dip RM

Dr David Powell MB, BS Medical Physician

Also my sister Ruth who spent many hours typing from my notes and retyping all my revisions.

## INTRODUCTION

In an effort to find a short cut that will reduce the time and effort required to become competitive or to meet the challenge of the moment, it has become a common occurrence in the history of man to try chemicals of various types to improve both mental and physical performance.

Examples of this range from students trying to obtain a better grade, to athletes trying to shave seconds off the time required to perform an athletic feat, to the military's use of chemicals to help soldiers perform heroic feats of endurance.

To an objective appraiser, it is likely that the greater majority of effects in dietary pharmacology are subtle, meaning hard to measure, but not necessarily trivial.

As pointed out by scientific research (Coyle 1984), by far the most effective means of improving physical performance is a good training program. Coyle estimates that in previously sedentary individuals, improvements in muscle strength can be improved by 50% following the appropriate training program.

There are very few reports of drugs improving performance by more than 10%, and in fact, the improvement in well-trained individuals shown by most studies is not even close to 10%. However, while it is true for most biological studies that a change of less than 10% is considered trivial, in many athletic events an improvement in performance by far less than 10% represents the difference between a winner and an also-ran.

For example, Roger Banister broke the 4 minute mile barrier in 1954 (3:59:4). Between Banister's performance and the 1981 performance of Sebastian Coe (3:47:33), 15 different athletes held the new best time. In many of these 15 different world-record breaking performances, the improvement in time was less than 1 second.

Thus, even if the effects of nutritional ergogenesis are subtle, the small improvement in performance could give an athlete a tremendous advantage.

The following handbook has been prepared specifically for Personal Trainers. Its aim is to provide accurate information on the relatively few proven and legal nutritional ergogens available - What they are, their relative safety and how they are best used for maximizing benefits while minimizing any side-effects.

In combination with correct training and nutrition, the information contained herein may be of assistance in tailoring a program which accelerates the attainment of your or your clients goals in areas such as fat loss, muscle growth, strength, power, speed and increased energy/endurance.

 

## SECTION I

### THE PHARMACOLOGY OF BIOENERGETICS - ENHANCING MUSCLE ENERGY SYSTEMS

- Caffeine
- Sodium Bicarbonate
- Creatine Monohydrate
- Potassium Phosphate
- L-Carnitine
- Ginseng
- Glycerol

This section explores the various mechanisms through which the above substances can effect human energy systems. It outlines dosages and procedures for specific results in enhancing physical performance.

## CAFFEINE

| | |
|---|---|
| Scientific Name: | Methylxanthine |
| Type of Nutrient: | Stimulant drug of Central Nervous System |
| History: | Used for hundreds of years in form of tea and coffee beverages |
| How Supplied: | Powder, Tablet, Liquid, Suppository |
| Natural Sources: | Tea, Coffee, Guarana, Kola Nut |
| Used for: | Reducing bodyfat and perception of effort. Increasing workload capacity, muscle fibre recruitment, exercise intensity, endurance, alertness, concentration, and oxygen uptake, Glycogen sparing |
| Cost effectiveness: | * * * * * |
| Safety: | Up to 600mg/day (7 cups of coffee) considered safe (Gilbert 1992) |
| Precautions: | Should not be taken by pregnant women (has been linked with reduced bodyweight of the newborn) or people with heart problems (excessive doses can cause extra beats of left ventricle). Can cause physical dependence at daily dosages of 350mg and above (about 4 cups of coffee). 5 grams and above can be a lethal dose (about 60 cups of coffee). |

Some Personal Trainers will be horrified at the thought of encouraging clients to consume caffeine. However, its effects on physical performance and bodyfat reduction are too great and well documented to ignore. Used prudently, caffeine's benefits can be made to outweigh possible risks.

### FAT REDUCTION

The most common beneficial finding of caffeine use is an increasing in burning of bodyfat as fuel (Costill et al 1978, IVY et al 1979). *For the use of Caffeine in fat reduction see Section III - Fat Loss.*

### INCREASED MAXIMUM OXYGEN UPTAKE (VO2 MAX) DURING ENDURANCE ACTIVITY

In two related studies (Costil et al 1978, Ivy et al 1979) nine competitive cyclists were exercised to exhaustion on a bicycle ergometer. After a dose of 330mg of caffeine, the cyclists improved their VO2 max by 19% over placebo. In the second study (Ivy et al 1979) the cyclists rode an adjusting ergometer. The resistance of the ergometer was constantly adjusted and an estimate of work determined. Each cyclist was given 250mg of caffeine and a further 250mg administered over several divided doses. The caffeine treatment resulted in a 7.4% increase in work production and a 7.3% increase in the maximum oxygen uptake.

## INCREASED ENDURANCE AND INTENSITY OF PHYSICAL PERFORMANCE

One recent study (Flinn S et al Int J Sports Med 1990;11:188-193) done here in Australia by Dr Lars McNaughton and colleagues at the Tasmanian Institute of Technology tested cyclists against themselves as controls under double-blind conditions, pedalling a cycle ergometer to exhaustion under progressively increasing workload. Caffeine at 10mg/kg bodyweight, or a placebo, were given as a flavoured drink three hours prior to the test. That is a dose of 800mg for an 80kg man.

Results showed that the caffeine increased time to exhaustion by 18% and exercise intensity by 24%. Thus, it allowed them to ride both longer and harder. In addition, caffeine increased the use of free fatty acids for fuel thereby sparing glycogen. It also raised the lactate threshold in relation to workload, suggesting that there was less build-up of lactic acid. This is the level of benefit you could expect with correct caffeine usage.

## INCREASED INTENSITY WITH REDUCED PERCEPTION OF EFFORT

Caffeine has direct effects on muscle contraction (Alles et al 1942). It acts on the skeletal muscle by increasing calcium permeability essential for muscle contraction (Foltz et al 1943).

Excessive amounts of caffeine are not required for effects. Researchers (Alles et al 1942) observed effects of caffeine on the muscle during exercise. Caffeine (50mg orally) given one hour before the experiment produced higher muscle tension at low frequencies of muscle stimulation, suggesting a direct effect on muscle contraction. This study showed that caffeine may be acting directly on the muscle in addition to the central nervous system in masking fatigue.

Even though values for heart rate and oxygen consumption during one study were similar the caffeine made the work ‘feel’ easier. It is likely that a lessening of the subjective ratings of effort was due to the effect of caffeine on neuronal excitability, possibly through a lowering of the threshold for motor-unit recruitment and nerve transmission.

## INCREASED CONCENTRATION AND ALERTNESS

Caffeine is reported to decrease drowziness and promote a more rapid and clearer thought process. Research reveals 85 to 250mg of caffeine increases the capacity for sustained intellectual effort and decreased reaction times.

Studies of changes in brain activity show that caffeine does have arousing effects. One way to measure this is to attach electrodes to a person’s skull and record the patterns of electrical activity of his or her brain. It has been shown that caffeine in a few cups of coffee causes the patterns to change from those typical of an awake and sedentary person to those of an alert and active person.

## CONFLICTING RESEARCH RESULTS

Not all research has been in total agreement of caffeine's performance enhancing effects.

Most of the work up till 1980 lacked the necessary controls to separate the effects of caffeine on sports performance from its effects in everyday life. The latest and best research shows they are quite different.

Numerous reviews lump together studies on sedentary people with studies on athletes and come to the conclusion that caffeine effects on performance are variable and inconclusive - and that a couple of cups of coffee before competition might help, or might not.

The first error of these reviews is assuming that a sedentary person coaxed into exercise reacts the same way to caffeine as an athlete - they don't (Bucci LR Nutritional Ergogenic Aids).

The second common error lies in confusing subjects who habitually use coffee, tea, cocoa, caffeinated soft drinks or chocolate with those who have a low daily intake of caffeine. Like giving an alcoholic a six-pack and expecting him to keel over! (Colgan). If your body has developed a tolerance to caffeine through prolonged use, then extra caffeine will not boost performance.

Two detrimental effects commonly cited by writers on sports nutrition about caffeine are that it is well established as a diuretic (makes you lose water) and that it is thermogenic (raises metabolic rate and body temperature) (Wager-Srdar SA et al Life Sci 1983;33:2431-2438).

Athletes are often warned that caffeine can make them dehydrate and overheat. But almost all the studies showing these effects were done with sedentary people. Recent research using athletes as subjects found no diuresis or thermogenesis. In fact caffeine ingestion has not been shown to alter fluid balance, sweat rate, total water loss, heart function, or blood electrolyte content during exercise (Can J Physiol Pharmacol 68:889, 1990; S Afr Med J 62:664,1982). Separate studies from Ohio State University confirm that caffeine ingestion does not alter body fluid/hydration and does not increase heart rate during exercise (Med Sci Sports Ex 26: Abstract 1146, 1994).

Sedentary people using caffeine would be advised to take a mineral supplement to safeguard against any deficiencies in iron, calcium, magnesium or sodium, and to drink plenty of water.

## PRECAUTIONS

The IOC (International Olympic Committee) permits an upper level of 12 micrograms per millilitre of urine. This would be the equivalent of 12 milligrams per litre of water in the body of an athlete. A male athlete who weighs 70kg and whose body composition contains 60% water will have about 42 litres of water in his body, as 0.6 x 70kg = 42, and a kilogram of water is one litre.

If you multiply 12 milligrams by 42 litres, you will find that this athlete may consume about 500mg of caffeine to reach the legal limit. But to allow for individualities and to play it on the safe side, I would recommend not exceeding 5mg/kg of bodyweight. This would be a dose of 350mg.

Depending on the individual, a range of 100 to 300 milligrams is considered a therapeutic dose. 350mg could be considered a very therapeutic dose.

Such doses meet the level for a stimulant effect and are still legal under IOC doping guidelines.

Excess caffeine can certainly mess you up. One study in the American Journal of Psychiatry reports anxiety, irritability, delirium and hallucinations, brought on by caffeine during exercise (Stillner V et al Am J Psychiatr 1978; 135:855).

Above a certain amount, more caffeine does not produce better effects, probably because its toxic side effects start to over-ride the benefits. So there is no reason to take so much it sends you crazy. 1000mg is over the top for most athletes, especially if they abstain from caffeine in everyday life.

Cyclists have been known to use 3000mg supporitories.

Symptoms of intoxication include insomnia, restlessness, sensory disturbance such as tinnitus (ringing in ears), and flashing of light. Large overdoses of caffeine can cause seizures. It can cause headache and involuntary muscle contractions.

Caffeine is capable of causing physical dependance in much the same way as other addictive drugs such as alcohol and nicotine.

However, caffeine withdrawal symptoms, though uncomfortable, are not life threatening.

To avoid physical dependence and minimize tolerance effects, caffeine dosages should be kept as low as possible and used intermittently; eg Don't use caffeine during every workout, and every fortnight have one week off. Also to maximise the benefits, avoid taking caffeine other than at training times. ie. Don't drink coffee, tea, coke or other food and drinks containing caffeine unless they are part of your program. The use of Grapefruit juice containing Naringin will also help stop the body from becoming de-sensitized to the effects of caffeine.

## SLEEPING HINT

Some people may experience difficulty getting to sleep if they train late in the day.

A simple but powerful solution to this is to use a mental technique that relaxes the body and calms the mind, making sleep effortless and natural.

Lying flat on your back in bed, arms to your side and legs slightly apart, place your attention on your breathing.

Do not try to control it - just focus your attention on it. Be aware of each breath in and each breath out. Feel your lungs fill and then empty. Feel your chest rise and fall. Feel the air moving through your nose and then out. As thoughts enter your mind, just let them go and bring your attention back to your breathing. Do not try to do or think of anything - just be aware of your breathing.

After approximately 10 minutes, you will enter a profoundly relaxed state. Your brain wave frequency will slow down. Instead of producing predominantly Beta waves (those which characterise an alert, awake state) your brain will start producing Alpha, Theta and Delta waves as you fall asleep.

## STANDARD CAFFEINE CONTENT VALUES

Recognizing that there can be significant variability in caffeine content for a given source, it is nonetheless useful to have representative values for each of the major sources.

**Coffee**

| | |
|---|---|
| Ground roasted | 85mg/150ml (5-oz cup) |
| Instant | 60mg/150ml (5-oz cup) |
| Decaffeinated | 3mg/150ml (5-oz cup) |

**Tea**

| | |
|---|---|
| Leaf or bag | 40mg/150ml (5-oz cup) |
| Instant | 30mg/150ml (5-oz cup) |

| | |
|---|---|
| Cola (except caffeine-free) | 18mg/180ml (6-oz glass) |
| Cocoa, hot chocolate | 4mg/150ml (5-oz cup) |
| Chocolate milk | 5mg/250ml (8-oz cup) |
| Caffeine 1g | 1000mg |

## FOR MUSCLE BUILDING, PHYSIQUE ENHANCEMENT

Example:

| | |
|---|---|
| SUBJECT: Male | Lifestyle: Active, trains 4 x week 2 years training |
| AGE: 25 | |
| WEIGHT: 80kg | Diet: High Protein, High Carb, Low Fat |
| BODYFAT: 12% | NO CAFFEINE |

| | |
|---|---|
| 1/2 hr before training | 250mg Caffeine |
| | 300ml Grapefruit juice |

(FOR FAT LOSS, PHYSIQUE ENHANCEMENT - See Section III Fat Loss under Caffeine.)

Taken before a run, a bodybuilder could expect to run with less perceived effort, burn more body fat, have greater endurance and a greater VO2 max, than without it.

Taken before a workout, a bodybuilder could expect caffeine to help him to increase the intensity; reduce perceived effort, increase the workload and help him concentrate better than without it.

Taken before a contest a bodybuilder could expect caffeine to make him feel more alert, get a greater, more vascular pump, and appear more defined due to diuretic effect, than he otherwise would have.

**Top 10 Benefits of Caffeine for Bodybuilders**

1. Increased Definition
2. Increased Vascularity
3. Greater Pump
4. Increased Fat Burning
5. Increased Workload Capacity
6. Increased Endurance
7. Increased VO2 Max (Oxygen uptake)
8. Increased Workout Intensity
9. Increased Alertness and Concentration
10. Less Perceived Effort

## FOR ATHLETIC PERFORMANCE, INCREASED ENDURANCE

Example:

| | |
|---|---|
| SUBJECT: Male | Lifestyle: Active, trains 2 x week weight |
| AGE: 30 | 3 x week runs 10 km |
| WEIGHT: 70kg | Diet: High Carb, Mod Protein, Low Fat |
| BODYFAT: 10% | NO CAFFEINE |

Event: 10 kilometre + race

3 hours before 700mg * Caffeine
300ml Grapefruit juice

5 minutes before 300ml Grapefruit juice

*__WARNING__: *This dosage (10mg/kg) has the potential to exceed the IOC's legal limit.*

Caffeine is known as an analeptic drug, or a substance that can restore strength, awake and invigorate.

## ALKALINE SALT

| | |
|---|---|
| Scientific Name: | Sodium Bicarbonate |
| Type of Nutrient: | Alkaline Salt |
| History: | First research regarding performance enhancement over 60 years ago. Little research however in following 45 years. |
| How Supplied: | Powder |
| Usual Source: | Baking Soda |
| Used for: | Reducing muscle and blood acidity (Lactic Acid buffer). Improving anaerobic performance (power and endurance) |
| Cost Effectiveness: | * * * * * |
| Safety: | 20 grams of Sodium Bicarbonate contains 5 grams of Sodium. Very unhealthy nutrition. Ten times more sodium than you need (Recommended Dietary Allowances 10th Edition 1989). Can send blood pressure sky high. |
| PRECAUTIONS: | CAN CAUSE EXPLOSIVE DIARRHOEA. USE ONLY FOR BIG EVENTS. |

### THEORY

If you did chemistry at school, you may recall that strong acids such as hydrochloric acid had the capacity to severely burn your skin. If such an accident occurred, the immediate response was to wash the acid off, preferably with a neutralising solution.

It probably is of little surprise to you that certain cells in your stomach produce hydrochloric acid to aid in the digestion of dietary protein. Also, many physiological reactions in your body result in the formation of acids that could have serious consequences if not neutralised. For example, uncontrolled diabetes can lead to the formation of excessive amounts of acids from fat metabolism, which may lead to a series of events involving acidosis, diabetic coma, and death (rather serious, don't you think?). In sports, lactic acid is related to the onset of fatigue in anaerobic events.

### BUFFERS

You might also recall that the substance which neutralises an acid is known as a base. Fortunately, your body produces bases that help to neutralise or buffer acids. These buffers that neutralise acids are often called alkaline. Much of your body's protein may serve as an alkaline base. For example, haemoglobin in the red blood cells is a protein that is an excellent buffer for certain acids in the blood.

Your body must maintain a certain balance of acids and bases. This is known as the 'acid-base balance'.

This balance may be represented by the pH, which represents the concentration of hydrogen ions in a solution. The more hydrogen ions in a solution, the more acidic it is. Water, which is neutral, has a pH of 7. Acidic solutions have a lower pH and basic solutions have a higher pH than 7.

Different parts of the body may vary in their acid-base balance because some enzymes function better in a basic environment. For example, gastric juices in your stomach are acidic (and may burn your oesophagus when you burp and get heartburn) and those in your intestines are alkaline. Of importance to us in this article is the pH of the blood and muscle cells.

Our blood has a pH of between 7.3-7.4, slightly alkaline appearing to be an optimal level. Serious disturbances in normal physiological functioning, particularly in the brain, could result should any deviation arise above or below this range for a long period of time. The diabetic coma resulting from acidosis (pH too low) is due to its effect on the brain.

Certain protein in your body cells and blood, your lungs (blowing off acid in the form of excess carbon dioxide) and your kidneys (which excrete acid salts) are amongst the numerous systems controlling the acid-base balance in your blood. Additionally, the blood contains a number of alkaline salts (notably sodium bicarbonate) which can be used to rapidly buffer acids secreted into the blood.

## SPORTS PERFORMANCE

The pH in the muscle cells is slightly alkaline while at rest. Normally, it is at this level that enzymes that produce energy via the lactic acid and oxygen energy systems perform at their optimum. Experts believe that if the concentration of hydrogen ions and acidity increases in the muscle cell, then the optimal functioning of these enzymes will be disturbed and energy production will decrease. Fatigue may result because of increased acid production within the muscle cell when the lactic acid energy system is used during high intensity exercise.

During rest and exercise, proteins within the muscle cell help to buffer metabolic acids. But beyond the initial buffering in the cell, during exercise, the lactic acid produced appears to be buffered almost entirely by the sodium bicarbonate in the blood.

Your body produces and uses plain old baking soda to protect its blood from acidity (Danforth WH. Control of Energy Metabolism, New York: Academic Press, 1965:287-298). Armed with this knowledge, for more than 40 years, coaches have sought to use bicarbonate supplements to reduce muscle acidity and improve performance. (Miller R, et al J Clin Invest 1988; 81:1190-1196).

Only a few top coaches have mastered its use through trial and error - and kept the results to themselves. Only in the last decade has intensive research put this information into scientific journals. The secrets of bicarbonate loading - how much to take, when to take, and what kinds of performance benefit are now available.

The underlying factor is that ingestion of salts during exercise is to facilitate the removal of hydrogen ions from the muscle cell so as to help maintain the muscle cell near its optimal pH for enzyme functions and energy production.

Dr GW Mainwood and colleagues in 1980 discovered that the less acidic blood becomes when filled with bicarbonate, the more it creates what is called a pH gradient between muscle and blood, which pulls acid out of the muscle (Mainwood GW et al Canadian Journal of Pharmacology 1980;58:624-632)

Muscle biopsy's on athletes have shown that after bicarbonate loading, the less acidic your blood pH, the less acidic your muscle pH. (Sutton JR et al Clin Sci 1981;61:331-338).

Several different terms such as buffer boosting, soda doping or soda loading have been used to relate alkaline salts as an ergogenic aid. The term soda is derived from baking soda (sodium bicarbonate), the most commonly used alkaline salt for ergogenic purposes. Others, including sodium citrate and potassium citrate can also be used.

Athletes who rely heavily on the use of the lactic acid energy system, such as bodybuilders, during exercise get the most benefits from alkaline salts in contrast to endurance athletes who find them not beneficial since purely aerobic athletic events do not produce lactate rapidly in the muscle cell.

Over a period of 50 years, research conducted in the USA and Germany relating to alkaline salts revealed significant physiological improvement with anaerobic exercise, treadmill and bicycle ergometer exercise tests to exhaustion. However, only a few publications and studies were known to support the ergogenic effect. Results of studies revealed no beneficial effects of alkaline salts upon performance in a 400 metre swim and a 1.5 mile run on a treadmill to exhaustion.

## PERFORMANCE ENHANCEMENT

Alkaline salts as a means of reducing acidity in the muscle cell and improving anaerobic exercise have had remarkable research interest in the last 15 years. Various experimental designs have been used involving differences in the exercise-testing procedures, salts administered and the physiological or performance measures recorded. Exercise tasks used in most studies are those that would stress anaerobic energy production via the lactic acid energy system with intermittent bouts of exercise and rest so as to see if salt could facilitate recovery.

Investigators researching the effects of sodium bicarbonate ingestion looked at a number of different measurements. This includes blood pH, blood lactate, the amount of work produced in a set time such as 30-120 seconds, the power produced in five seconds, the exercise time to the point of exhaustion and perceived exertion. Maximal exercise bouts were usually about 30-120 seconds long. Other studies used exercise tasks that were aerobic in nature in the early stages and increased gradually in intensity to become more anaerobic. Other types of salts were also given, some were alkaline.

The placebo was a neutral salt that would not change the acid base level but in some studies, acid salts were given to increase the acidity of the blood. Different alkaline salts and different dosages were used in some studies but the most commonly used was 200-300mg of sodium bicarbonate per kg of body weight. For a person of 80kg, this would amount to about five level teaspoons of baking soda.

A study done in 1993 looked at the effect of sodium bicarbonate ingestion (300mg/kg body weight) on isokinetic leg extension/flexion exercises. Sodium bicarbonate ingestion increased the blood pH level prior to exercise indicating metabolic alkalosis while post exercise, the blood pH decreased significantly indicating that metabolic acidosis had occurred. The exercise consisted of leg extension/flexion with the first set consisting of four reps at a speed of 60 degrees/second. Consequently, the second set consisted of 60 reps at a speed of 240 degrees/second; this set lasted about 85 seconds.

More work was performed by subjects using sodium bicarbonate when compared to the placebo/control conditions. Hence, sodium bicarbonate ingestion enhances isokinetic leg extension/flexion exercise lasting approximately 1.5 minutes.

## PSYCHOLOGICAL EFFECTS

The effects of these studies are generally in agreement. When workload was increased to above 80 per cent of maximal oxygen uptake, which makes it partly anaerobic for most people, the perceived effort was less when bi-carb was taken, indicating that the perceived workload was less strenuous.

## INCREASED ENDURANCE AND POWER

Improvements have been noted from studies of the amount of work accomplished in 30-120 seconds, exercise test to exhaustion of up to 10 minutes in duration and performance on anaerobic task after prolonged aerobic exercise. One well designed study by Dr D Wilkes and colleagues at York University, Toronto, reported a 2.9 seconds faster running time over a distance of 800 metres.

300mg/kg bodyweight of Sodium bicarbonate or placebo were taken over a 2-hour period, up to 30 minutes before an 800 metre race, (Wilkes D et al Medicine and Science in Sports and Exercise 1983;15(4):277-280). 2.9 seconds average improvement translates to a distance of 19 metres. In an 800 metre race, that's the difference between winning and coming no-where.

Dr David Costill and colleagues at the Human Performance Laboratory at Ball State University, Indiana gave athletes a lower dose of sodium bicarbonate (200mg/kg bodyweight).

The athletes then did five, one minute sprints on an ergometer bicycle, the last one to absolute exhaustion. The Soda loading improved the time to exhaustion of the last sprint by an incredible 42% (Costill DL et al Int J Sports Med 1984;5:225-231).

Other studies have also reported increased endurance, and increased power output after soda loading in maximal short term exercise. (Sutton JR et al Clin Sci 1981; 61:331-338. Rupp JC et al Med and Sci in Sports and Exer 1983; 15-115, McKenzie DC, et al J Sports Sciences 1986; 4:35-38).

Contrary to these results, an equal amount of studies have revealed no significant improvements in these areas but generally they have used lower doses of bicarbonate, or have used exercise duration greater than 5 minutes. (Inbar O et al J Sports Sciences 1983; 1:95-104, Horswill CA et al Med and Sci In Sports and Exer 1988; 20(6):556-569. George KP et al ERGONOMICS 1983;31(11): 1639-1645). However, an important note is that no study reported a decrease in physical performance.

The evidence indicates that both dose and exercise duration are critical.

A fairly recent study done here in Australia at the Tasmanian Institute of Technology (McNaughton LR, Cedaro R The Aust Journal of Sci and Med in Sport 1991; 23(3): 66-69) gave elite class rowers 300mg/kg bodyweight of bicarbonate or placebo. Ninety-five minutes later, subjects made a maximal effort for six minutes on a rowing ergometer. Compared with placebo, the

subjects rowed almost 50 metres further in the same time when receiving sodium bicarbonate.

That was greater than the difference between first and last at the 1991 WORLD ROWING CHAMPIONSHIPS.

## RECOMMENDATIONS

Because about half of the studies have revealed positive results, the other half no improvement, and no studies have found a decrease in performance, logic suggests bi-carb soda may be helpful to some individuals if used properly. Since bi-carb induces a metabolic alkalosis, it would make sense that people who perform activities that produce dramatic drops in pH would benefit from its ingestion. Soda loading works best as an ergogenic aid only at high doses (300mg/kg bodyweight) and only for short, almost maximal exercise (30 seconds to 6 minutes).

This would include anaerobic activities such as the 400 or 800 metre run, and if the type of weight training you do involves high volume, low weight, high reps, and short intervals, then performance could be enhanced.

There is no longer any doubt that in short events, sodium bicarbonate can provide a winning edge.

Bi-carb would appear to help athletes using lactic acids energy system in sports demanding all out effort for periods of about 30 seconds to six minutes although the lactic acid energy system may also be involved in activities of lesser and greater time periods than this range.

Sodium bicarbonate, citrate, carnosine, and creatine monohydrate may also be used. Creatine monohydrate is currently one of the hottest food supplements with some solid research to prove its efficiency. Much of the increased power evident when athletes load creatine monohydrate may be partially due to its intramuscular buffering capabilities.

Sodium bi-carb has certainly a price advantage over the other lactic acid buffers mentioned but can cause fluid retention because of its high sodium content. This is of major concern around contest time for bodybuilders. However, in off-season, it is not of such importance.

## MEDICAL CONSIDERATIONS

However, there is one big problem. Many of the subjects in the research studies experienced some form of gastro intestinal distress, about 60 minutes after ingesting the bicarbonate solution. This includes belching and diarrhoea. One investigator noted that several of his subjects had what he termed “explosive diarrhoea” (uncomfortable but not life threatening!). Such conditions could be debilitating to athletic performance. Two ways to solve the problem:

1. Take the bicarb every 20 minutes in divided doses, beginning three hours before the event, and ending one hour before the start.

2. Drink freely up to 30 minutes before the event.

Practise it well in training before you ever do it in competition. Furthermore, excessive consumption of alkaline salts may lead to the development of alkalosis (pH too high) with symptoms such as irritability, delirium and muscle spasms.

However, everyone is different. One man’s meat may be another man’s poison. Soda loading is definitely worth trying. You can judge for yourself the effect on your personal performance.

NOTES:

## DIRECTIONS ON HOW TO TAKE SODIUM BICARBONATE

An adequate dose would be about 300mg per kg of body weight mixed with around 400ml of liquid, eg a 90kg bodybuilder would take 27 grams on an empty stomach approximately 30-60 minutes before exercise. The bi-carb can be mixed with water or other beverages.

*In a nutshell, the theory behind soda loading is that by neutralising the acid (lactic) produced by muscle cells during anaerobic exercise, the pH level of the working muscle will be kept in an optimal range for peak performance longer.*

If gastro troubles are experienced, then the bicarb could be taken on future occasions as such:

| | | |
|---|---|---|
| 3 hours | before event | 4 grams Sodium bicarbonate |
| 2 hrs 40 min | before event | 4 grams Sodium bicarbonate |
| 2 hrs 20 min | before event | 4 grams Sodium bicarbonate |
| 2 hrs | before event | 4 grams Sodium bicarbonate |
| 1 hr 40 min | before event | 4 grams Sodium bicarbonate |
| 1 hr 20 min | before event | 4 grams Sodium bicarbonate |
| 1 hr | before event | 3 grams Sodium bicarbonate |

## CREATINE

| | |
|---|---|
| Scientific Name: | Creatine Monohydrate |
| Type of Nutrient: | Found in food (especially red meat) |
| History: | Used successfully by British track and field athletes at 1992 Olympics in Barcelona |
| How Supplied: | Powder, Tablet, Capsules, Liquid |
| Natural Sources: | High in red meat. Also formed in liver from the amino acids arginine, glycine and methionine. |
| Benefits: | Increased strength, Power, Mass, Delays fatigue (buffers hydrogen ions), Improves recovery. |
| Cost Effectiveness: | * * * * Not cheap, but worth the money |
| Safety: | Appears Good - still relatively new - supplement. |
| Precautions: | No negative complications in medical literature. However, some athletes report mild diarrhoea during loading phase. Will not improve endurance exercise performance nor submaximal exercise. |

Creatine is taken up by skeletal muscle where it forms phosphocreatine, the high energy phosphate compound. The immediate source of energy for muscular contraction is ATP with phosphocreatine serving as a back-up source of energy.

The length of time that maximum muscle work can be maintained is partially determined by the amount of phosphocreatine in skeletal muscle. ATP must be regenerated through the metabolism of glycogen, glucose, fatty acids, ketones and amino acids - once the phosphocreatine is used up.

Of the many causes of fatigue, one of the more important is the decrease in phosphocreatine in muscle. Some athletes use creatine supplements to try to increase phosphocreatine in muscle and thus increase intensity and the length of muscular contraction during short term, high intensity work.

## THEORY BEHIND CREATINE SUPPLEMENTATION

The possible mechanisms by which creatine supplementation may be effective during exercise are by:

1. Providing a transport mechanism to take the ATP generated inside the mitochondria out to the working muscle fibres.

2. Delaying the slowing of effort caused by the depletion of Phosphocreatine stores in the muscle since total stores are augmented.

3. Enabling a greater supply of “instant energy” by improving the capacity to regenerate ATP.

4. Buffering (Neutralising) Hydrogen Ions produced during anaerobic exercise, thereby delaying fatigue. Potentially improves buffering capacity by 7%. (See Sodium Bicarbonate for full explanation of Lactic Acid Buffers).

## RESEARCH FINDINGS - DELAYED FATIGUE; IMPROVED RECOVERY, INCREASED MUSCLE TORQUE

Recent research has revealled that oral creatine supplements not only increase creatine content in muscle (the increase is greatest in exercised muscles) (Harris et al, Clin Sci 1992; 83(3): 367-374) but delays fatigue (Balsom PD et al Scan J Med Sci Spor 1993; 3: 143-9), improves recovery (by increasing the rate of phosphocreatine resynthesis in muscle) (Greenhaft PL et al Am J Phys 1994; 266 (5 Pt 1): E725-30), and increases muscle torque during repeated bouts of maximal exercise. (Greenhaft et al Clin Sci 1993; 84(5): 565-71).

## INCREASED POWER AND WORK

Other studies show that creatine monohydrate increases both power output and the total amount of short term work (Birch R Eur J Appl Physiol Occup Physiol 1994; 69: 268-70).

## INCREASED BODY MASS

Oral Creatine supplementation may also independently result in increased body mass (Balsom PD et al Actu Phys Scand 1993; 149(4): 521-3), although much of this increase may be due to increased water retention. The water retention is a phenomenon known as “cell volumizing” or “cellular hydration”.

A “hydrated” muscle cell (holding more water) is bigger, fuller and rounder. The cell is literally blown up like a balloon. Great for bodybuilders. Cell volumizing means more water inside muscle cells, not the type of water retention which occurs outside muscle cells and under the skin - giving the appearance of puffiness (unwanted).

## HOW TO TAKE

The usual “loading dose” prescribed in scientific literature is 5-7 days of 0.3g/kg bodyweight (ie 20-30 grams) per day taken in 5 gram doses throughout the day. Supplementing with creatine monohydrate can increase muscle creatine and creatine phosphate content by 20% depending on initial creatine stores, but there is a maximal level of muscle creatine content that can be achieved. So taking mega doses will be a waste of money. The excess will be excreted in the urine.

Once the muscle cells are “saturated” with the first week’s ‘loading’ dose, a maintenance dose of 0.03g/kg bodyweight per day (2-3 grams) is taken in a single dose. A lot of bodybuilders who use creatine monohydrate take a maintenance dose of 5-10 grams per day and find this extremely effective. Personally I get good results at 2 grams per day, but when I take more (5 grams per day) the volumising effect is increased.

## ENHANCING THE EFFECTS OF CREATINE

Always take it with a simple carbohydrate drink if you want maximum results.

Preliminary information from England has shown that if you 'spike' insulin levels at the same time you take creatine monohydrate, more creatine may get transported into muscle cells. One study showed subjects who took a simple carbohydrate along with their creatine put on three times as much weight in only one week as those subjects taking creatine alone. So if you want to maximize your creatine size gains, take it in conjunction with a high-glycemic carbohydrate (such as grape juice or dextrose). Grape juice has one of the highest "insulin-releasing" effects of all juices, 200ml is sufficient.

## FOR A 100kg BODYBUILDER

### LOADING DOSE

FIRST 5-7 DAYS — 20-30 Grams (Depending on bodyweight) In 5g divided doses

eg 100kg Bodybuilder

| | |
|---|---|
| Breakfast | 5g creatine monohydrate in 200ml grape juice |
| Morning Tea | 5g creatine monohydrate in 200ml grape juice |
| Lunch | 5g creatine monohydrate in 200ml grape juice |
| Afternoon Tea | 5g creatine monohydrate in 200ml grape juice |
| Dinner | 5g creatine monohydrate in 200ml grape juice |
| Supper | 5g creatine monohydrate in 200ml grape juice |

TOTAL 30g (ie 100kg x 0.3g/kg)

### MAINTENANCE

3-10 Grams once per day

Take dose with 200ml grapejuice after training. (Training before supplementation has been shown to enhance muscle creatine uptake).

TIP: Consume the creatine drink immediately upon mixing (it appears to begin breaking down)

No need to 'cycle' creatine (going on and off the product) for bodybuilders.

Other athletes should 'cycle' their creatine use. ie. Use it at specific times in the training and competition cycle where demands on anaerobic energy systems are likely to be very high. Creatine supplementation especially aids performance when a series of bouts of high intensity exercise are repeated with short recovery intervals (1-4 minutes).

## PHOSPHATE SALTS

| | |
|---|---|
| Scientific Name: | Sodium Phosphate and Potassium Phosphate |
| Type of Nutrient: | Mineral salt of Phosphorus (essential nutrient) |
| History: | Popular with European athletes<br>Used as an ergogenic aid for over 60 years<br>German soldiers reportedly used them in World War I to relieve fatigue |
| How Supplied: | Crystalline Salt |
| Natural Source: (PHOSPHORUS) | Cod, Beef, Milk, Yoghurt, Chicken, Rice, Bread |
| Used for: | Lactic Acid buffer. Increasing 2,3-DPG (2,3 - diphosphoglycerate), the enzyme that unloads oxygen into muscle. Improving production and use of glycogen for fuel.<br>Improving both Endurance and Anaerobic performance. |
| Cost Effectiveness: | * * * * * |
| Safety: | Potassium Phosphate - Excellent<br>Sodium Phosphate - Good (used extensively in the meat and baking industries)<br>Excess of Phosphorus excreted in urine. |
| PRECAUTIONS: | EXCESSES OF PHOSPHORUS COMBINED WITH LOW LEVELS OF DIETARY CALCIUM MAY CONTRIBUTE TO A CALCIUM DEFICIENCY. ENSURE ADEQUATE CALCIUM IN DIET. |

## PHOSPHORUS - AN ESSENTIAL MINERAL

In both endurance and anaerobic exercise, a lot of muscle phosphate is lost into the blood (Kreider RB, et al Med Sci Sports Exer 1990;22:250-255. DALE G, et al Brit Med J 1987;294:939. McCully K, et al Muscle and Nerve 1988;11:212-216).

Resting levels of blood phosphate are increased with regular exercise, indicating that the body responds to exercise by increasing its overall level of phosphate, and that training increases phosphate needs. (Ljinghall S et al Acta Medica Scand 1987;221:83-93).

When phosphate levels are low, performance in marathon runners is usually down. (Colgan M Optimum Sports Nutrition 1993 p291).

Your body cannot manufacture phosphorus. It is an essential mineral you must obtain from your diet. In your body it is present as phosphate salts. Although phosphates are added to many foods and the daily intake in Australia is greater than the Recommended Daily Allowance, recent studies have shown pathologically low levels of blood phosphate in some athletes after endurance events (Dale G et al Brit Med J 1987;294-939). So even our high food intake of phosphate may be insufficient to supply the demands of intense training. Most fit and healthy athletes show resting phosphate levels at the top end of the

normal medical range. But this range was conceived for sedentary people. Does it cover optimal performance levels for athletes?

## BOOSTING PERFORMANCE

Research has indicated that phosphate salts can boost performance in track athletes in events ranging in distance from the 100 metre sprint to the 26 mile marathon. To be effective over this wide range, the phosphate salts would have to have the potential to improve energy production in all three human energy systems - the ATP-CP, lactic acid, and oxygen systems - which they do.

Relative to the ATP-CP energy system, phosphates form high energy bonds when attached to the organic compounds adenosine (ATP) and creatine (CP). There is evidence that supplemented phosphate improves the production and use of glycogen for fuel through its incorporation into numerous enzymes in energy production (Chasiotis D Med Sci Sports Exer 1988;20:545-550). Phosphates are necessary for optimal functioning of several B Vitamins, such as B1 (thiamine), which is involved in aerobic energy production from carbohydrates and fats. Sodium and potassium phosphate serve as buffers in the body and may function similarly to alkaline salts in improving the lactic acid energy system. Recently, Dr Richard Kreider and his colleagues at Old Dominion University, Virginia have, in repeated studies of phosphate supplementation, demonstrated it to buffer lactic acid (Kreider RB, et al. Med Sci Sports Exer 1990;22:250-255. Miller GW, et al Med Sci Sports Exer 1991;23:535).

Studies from various laboratories have repeatedly shown that phosphate supplementation raises blood levels of 2,3 - diphosphoglycerate (2,3 - DPG), the enzyme that deposits oxygen from haemoglobin into muscle cells (Farber M, et al. J Lab Clin Med 1984;104:166-175. CADE R et al. Med Sci Sports Exer 1984;16:263-268. STEWART I, McNAUGHTON L Res Quart 1990;61:80-84). Phosphate is a far safer but effective alternative to erythropoietin (EPO) - the real heart stopper. Slightly recapping, all three energy systems, ATP-CP, Lactic Acid and Oxygen are improved. To what extent the following studies will indicate.

## DRAMATIC IMPROVEMENTS IN POWER AND ENDURANCE WITH LESS PERCEIVED EFFORT

Dr Robert Cade and his group at the Department of Medicine of the University of Florida in 1984 ran a well controlled study (double blind, placebo, crossover design). Ten highly trained distance runners consumed either 1 gram of sodium phosphate four times daily or a placebo for three days. They then ran them on a treadmill to exhaustion. During the phosphate loading trial, lactic acid levels were lower, 2,3 -DPG levels were higher, VO2 max increased by 6-12%, and subjects ran 3-9 minutes longer. (Cade R, et al Med Sci Sports Exer 1984;16:263-268).

Other research findings from the Florida physiology laboratory suggest that phosphate salts will reduce the perceived psychological stress as measured by RPE (Rating of Perceived Exertion), of riding a bicycle for 3 hours at 75 to 80 percent VO2 max. Physiological measurements during this study suggested that increases in 2,3 DPG improved the release of oxygen from the Red Blood Cells and thus reduced the workload of the heart. The findings from the Florida laboratory strongly support an ergogenic effect of phosphate salts, and the lead investigator in these studies has been quoted as saying that ‘phosphate salts do allow for better performance’.

Closer to home, Dr Ian Stewart and his colleagues at the Tasmanian Institute of Technology did a study of highly trained cyclists, giving them 3.6 grams of sodium phosphate a day or a placebo, for three days before a maximum effort on the ergometer bicycle. Results showed that phosphate loading reduced lactic acid accumulation, increased 2,3 - DPG production during exercise, increased VO2 max by 11%, and increased time to exhaustion by 20% (Stewart I, McNaughton L Res Quart 1990;61:80-84).

One of the most recent and best studies (KREIDER RB, et al Int J Sports Nutr 1992;2:20-47) which tested both anaerobic and endurance exercise gave trained cyclists 4 grams of sodium phosphate per day or a placebo, for 3 days prior to a maximal exercise test and a 40km time trial on the ergometer bicycle.

During the anaerobic phosphate trials, maximal power output increased by 17%. As Dr Michael Colgin points out in his excellent book OPTIMUM SPORTS NUTRITION, that's the equivalent to adding 51 lbs to a 300 lb maximum bench press! During the aerobic phosphate trials, time for the 40km ride was reduced by 3.5 minutes. That's big. Despite some contrasting findings in other studies, there is no doubt in my mind that phosphate works big time. I have personally confirmed similar results on a female olympic level sprinter over 400 and 800 metre distances.

## MY PERSONAL RECOMMENDATIONS

The regimen practised by the researchers at the University of Florida has proved to be successful with no adverse effects in the subjects being reported.

| | | |
|---|---|---|
| The dosage was: | | 1 gram sodium phosphate |
| | | 4 x per day (ie 4g per day) |
| Mix with water | eg | 1g Breakfast |
| or fruit juice | | 1g Lunch |
| | | 1g Tea |
| | | 1g Supper |

For 3-4 days prior to competition

The last dose may be 2 to 3 hours prior to the event

The event can be either endurance (eg Triathalon) or anaerobic (eg game of squash, weight training) since phosphate loading works for both endurance or anaerobic exercise. A bodybuilder may benefit from daily use of phosphate salt in addition to a calcium supplement and a combination of low, med and high rep training.

Sodium phosphate has been used in most studies but potassium phosphate might work too. With the high level of sodium added to our food and the big losses of potassium in food processing, potassium phosphate would be a lot healthier. But don't use calcium phosphate. Two studies that have tried calcium phosphate found no effect at all (Bradel D, et al J Appl Physio 1988;65:1821-1826. MANNIX E, et al Med Sci Sports Exer 1990;22:341-347).

P.S. If anyone tells you that phosphate doesn't work, just acknowledge their comment, and keep your edge a secret.

## L-CARNITINE

| | |
|---|---|
| Scientific Name: | L-Carnitine |
| Type of Nutrient: | Amino Acid |
| How Supplied: | Powder, Capsules,Tablet |
| Natural Source: | Meat (Beef, Mutton, Lamb) |
| Used for: | Fat Loss, Energy |
| Legal status: | OTC |
| Availability: | Health food shops, gyms |
| Cost effectiveness: | * |
| Safety: | Good. NOTE: R-Carnitine - toxic<br>D-Carnitine - toxic<br>DL- Carnitine - toxic |

Fats provide about 50% of your energy during aerobic exercise and 80% of your energy towards the end of long endurance events (Coyle E.F. J Nutr 1992; 122:788-801). You have to be able to burn them freely. Carnitine absolutely controls fat use because it forms the mechanism or transport system that moves the free fatty acids into the mitrochondria (furnace part of cell) where they are burned as fuel. (Strack E et al Protides of the Biological Fluids. New York: Elsevier, 1964:234)

Branch chain Aminos and Pyruvate are oxidised in the energy cycle with the help of carnitine. (Brewer J Physiol Rev 1983;63:1420-1480).

Carnitine inhibits the accumulation of lactic acid in muscle (see Bicarbonate for Benefits of Lactic Acid buffering). One recent study of patients with angina being supplemented with L-Carnitine showed the build-up of lactic acid during moderate exercise was reduced by half, and the duration of exercise was significantly increased. (Brevetti G, et al Circulation 1988;77:767-773).

Because of Carnitines roles in the above, the amount of circulating carnitine in your muscles plays a major part in their efficiency and the amount of energy they can supply.

The standard textbook response is that a sedentary person on a good diet doesn't need to take L-carnitine because the body manufactures carnitine from the amino acids lysine and methionine (plus Vitamin C, niacin, pyridoxine, and iron).

But athletes in heavy training put their bodies in a state of stress that uses heaps of carnitine.

Their demand can easily exceed the bodies ability to make it (Lennon DLF, et al J Appl Physiol 1983;55:489).

Moderate exercise, such as cycling on an ergometer bicycle at only 55% of VO2 max, causes a 20% drop in muscle carnitine (Lennon DLF, et al J Appl Physiol 1983;55:489).

A much greater drop is caused by maximal exercise (Siliprandi N, et al Biochem Biophys Actu 1990;1034:17-21) putting athletes into the same carnitine status as patients with carnitine deficiency diseases.

Physiological studies show that carnitine supplements inhibit the decline in free carnitine in muscle caused by maximal exercise, and completely prevents the decline in free carnitine during endurance exercise. (Arenas J, et al Muscle and Nerve 1991;14:598-604). There is evidence that L-carnitine can boost both anaerobic and aerobic performance.

## HOW TO USE

A dose of 2-4 grams taken for 2 weeks, one hour before exercise appears to be effective.

This daily dose of L-carnitine shows no toxicity but DL-carnitine is TOXIC and must never by confused with L-carnitine, as they are two quite different compounds.

## GINSENG

| | |
|---|---|
| Scientific Name: | Panax Ginseng |
| Type of Nutrient: | Plant |
| How Supplied: | Powder, capsules, tablets, paste, tincture, tea |
| Natural Source: | Root of plant |
| Used for: | Fat loss, endurance (stimulant) stress resistance, mental alertness, concentration, workload capacity |
| Legal status: | OTC |
| Availability: | Health Food Shops |
| Cost effectiveness: | * * * |
| Safety: | Good |

Ginseng with active ginsenosides have been shown to increase brain activity, hormone activity, lung power and endurance while reducing lactic acid, fatigue, and glycogen use.

## PERFORMANCE ENHANCEMENT

One local study done in 1989, at the Tasmanian Institute of Technology by Dr Lars McNaughton and colleagues, ran a well controlled, double blind study for 12 weeks on experienced athletes.

In addition to physiological measures, they monitored direct effects and strength and recovery time from exhaustive exercise.

Compared with the control group (placebo) the group given ginseng showed an average increase of 22% in pectoralis strength, and 18% in quadricep strength, above the increases achieved by the control group.

The ginseng group also showed significantly faster recovery compared with the control group.

## HOW TO USE

A dose of 200mg/day of standarized ginseng extract is enough to be effective.

I find a dose of 1000mg of Ginseng powder 1/2 - 1 hour before exercise gives a big boost.

## CAUTIONS

Highly energetic, nervous, tense, hysteric, manic or schizophrenic people should not take Ginseng.

Ginseng abuse (habitual ingestion of 3 or more grams of Ginseng daily for long periods of time) can cause gynecomastia (bitch tits), high blood pressure, insomnia, irritability, nervousness, diarrhea, skin rashes, nausea and feelings of depression.

In addition it has been shown to increase the potential for a catabolic (muscle break-down) response in the body.

# GLYCEROL

| | |
|---|---|
| Scientific Name: | Glycerol |
| Type of Nutrient: | Food - Fat |
| History: | Used by Marathoners and Tri-athletes |
| How Supplied: | Liquid |
| Natural Source: | Hydrolysis of triglycerides in the body produces glycerol (glycerin) |
| Used for: | Hydration of muscle cell, increasing endurance and workload capacity, Protein sparing |
| Cost Effectiveness: | * * * * * |
| Safety: | Can cause headaches |

As your muscles are worked during a bout of exercise, they have a tendency to dehydrate or lose water. Glycerol has the ability to keep water in and around the muscle longer to keep it from fatigue.

As well as increasing endurance and workload capacity, glycerol has been demonstrated to have protein sparing properties (Essen - Gustavsson B et al Eur J Appl Physiol Occup Physiol 1990; 61(1-2): 5-10).

Glycerol improves intracellular water levels while decreasing extracellular water. For this reason, it is used by surgeons during brain operations to shrink brain (Maughan 1997).

To improve performance before a marathon, try taking 20g of glycerol in divided doses, starting 2 hours before the event. It is best taken with 500ml of fluid - preferably with electrolytes (sodium, in particular)

| | | |
|---|---|---|
| ie | 2 hours before | 5g Glycerol |
| | 1.5 hours before | 5g Glycerol |
| | 1 hours before | 5g Glycerol |
| | 0.5 hours before | 5g Glycerol |

## SECTION II

### THE PHARMACOLOGY OF RECOVERY

- HMB
- WPC/WPI
- Glutamine
- Omega 3 }See Section III Fat Loss
- Chromium Picolinate }for descriptions
- VIT C

Strenuous athletic events and the associated intense training that comes with them can really 'knock' the body around.

Adequate recovery, (ideally with supercompensation) between exercise bouts will aid in the manifestation of peak athletic performance.

# HMB

| | |
|---|---|
| Scientific Name: (HMB) | beta-hydroxy beta-methylbutyrate Monohydrate |
| Type of Nutrient: | Food |
| History: | Recently discovered nutrient which has had 8 years of major university research |
| How supplied: protein | 250mg Capsule or may be added to high quality |
| Natural Sources: | Alfalfa (lucerne) Corn silage, Grapefruit, Catfish. Also produced in the body. Its precursors are the amino acid leucine and the keto acid KIC. Contained in breast milk. |
| Used for: | Muscle Growth, Fat Loss |
| Cost effectiveness: | Expensive but does work. If you can afford it, try it |
| Safety: | No negative side effects recorded |
| Precautions: | SHOULD NOT BE TAKEN BY PREGNANT OR LACTATING WOMEN. ANY INDIVIDUALS WITH KNOWN MEDICAL PROBLEMS SHOULD CONSULT WITH THEIR PHYSICIAN FIRST. |

One of the most recent studies, S NISSEN, et al "Effect of beta-hydroxy beta methylbutyrate (HMB) Supplementation on Strength and Body Composition of Trained and Untrained Males Undergoing Intense Resistance Training", done at Iowa State University 1996.

In a four-week, double blind study, three grams of HMB were given in three divided doses per day to subjects undergoing intense weight training.

Overall HMB increased lean body mass 2kg (3.1%) and decreased body fat by 7.3% (1kg) (both significantly better than the controls).

The HMB subjects increased their bench press strength by 10kg (37% increase over controls). Similar results were found for other exercises.

In another study (Nissen et al J Appl Physiol 81(5): 2095-2104, 1996) two indicators of muscle breakdown (proteolysis) - urinary measurement of 3-methylhistidine and blood plasma levels of creatine phosphokinase were analysed.

Researchers concluded that supplementation of 1.5 or 3g of HMB/day can partly prevent exercise-induced proteolysis and/or muscle damage and result in larger gains in muscle function associated with resistance training (A 55% improvement on lean mass gain between the HMB groups and control group. A 295% improvement in strength gains between the two groups).

## HOW DOES IT WORK?

It appears that HMB works by a similar mechanism to anabolic steroids in minimising muscle-tissue breakdown. Anabolic steroids have side-effects and are illegal. But much of their effect is not so much through increased protein synthesis but rather by decreased muscle breakdown.

HMB would appear to exert its effects in this same department. By slowing the rate of protein breakdown, muscle size and strength can be increased.

## IS HMB SAFE?

One big way that HMB differs from steroids is that HMB is a food while the other is a drug. Extensive studies have been done to evaluate HMB's safety and no negative side-effects have been recorded. It is produced naturally in the body from metabolites of Leucine (an amino acid found in complete proteins) and HMB is found in some foods.

**CAUTION** Since no safety studies have been presently undertaken on pregnant or lactating women, this group is advised against taking HMB.

## HOW TO USE HMB

HMB works best with regular exercise. And the harder you train, the greater will be its benefits. It also works best with a protein rich diet (3g/kilo bodyweight).

A good quality WHEY PROTEIN CONCENTRATE (WPC 85) or Isolate is probably the best way to supply the necessary amount of protein.

## HMB DOSAGE

The recommended dosage of HMB is 3 grams per day, in 3 divided doses of one gram each.

| | | |
|---|---|---|
| ie | Breakfast | 1g HMB |
| | Lunch | 1g HMB |
| | Dinner | 1g HMB |

As mentioned earlier, hard training and a high protein diet will maximize results. An 80kg bodybuilder wishing to gain muscular mass should consume 240 grams of high grade protein per day.

| | | |
|---|---|---|
| eg | Breakfast | 30g Protein |
| | Morning Tea | 40g WPC 85 |
| | Lunch | 30g Protein |
| | Afternoon Tea | 40g WPC 85 |
| | Post Workout Meal | 60g WPC 85 |
| | Dinner | 30g Protein |
| | Supper | 10g WPC 85 |

The scientists who have studied HMB extensively do not believe there is any benefits to cycling (going on and off) HMB.

# WHEY PROTEIN

| | |
|---|---|
| Scientific Name: | Whey Protein Concentrate/Whey Protein Isolate |
| Type of Nutrient: | Food |
| How Supplied: | Powder |
| Natural Source: | Milk |
| Used for: | Muscle growth, immune system enhancing |
| Legal Status: | OTC |
| Availability: | Health food stores, gyms, mail order |
| Cost Effectiveness: | Concentrate * * * * * |
| | Isolate * * * |
| Safety: | Excellent |

Bodybuilders have intuitively known the importance of a protein rich diet for building muscle for a long time. Only in recent years has the scientific community started to accept this.

Studies with both strength and endurance athletes have indicated that intense exercise does increase protein and amino acid needs. (Friedman J E et al Int J Sports Med 10 (1989):118-123) (Lemon P et al Sports Med 1991; 12(5): 313-325). Studies have also shown that the anabolic effects of exercise are increased by a high protein diet. (Fern EB et al Expermentia 47 (1991): 168-192) (Goranzon H et al Am J Clin Nutr 41(1985): 919-928).

And the harder you train, the more important dietary protein becomes to your muscle building efforts.

In the last 10 years it has been shown that whey protein may possess special properties not seen in other proteins. In one study, a whey protein diet appeared to enhance the liver and heart glutathione (arguably the most important water soluble antioxidant) concentration in ageing mice and to increase longevity (Bounous G et al Clin Invest Med 1989; 12(6):343-9).

Also, undenatured (undamaged by heat treatment or acid) whey protein (such as modern high quality WPC and WPI) has been shown to enhance the immune system (Bounous G et al Clin Invest Med 1991;14(4): 296-309) (Bounous G et al Clin Invest Med: 1989 JUN; 12(3);P154-61) and lower serum cholesterol (Zhang X et al Br J Nutr 1993p;70(1): 139-46) as compared to casein and soy proteins.

However, one recent study (Bosselaers et al Food Chem Toxicol 1994; 32 (10): 905-9) showed that casein, but not whey or soy, had antimutagenic effects and may be cancer protective.

A study done in 1986 (Battermann W Deutsche Milchwirtschaft 1986;37 (33): 1010-1012) pointed out the possible ergogenic effects of Whey Protein.

Overall, Whey Protein is considered to be the best supplemental form of protein for athletes because of its increased bioavailability and solubility compared to other milk proteins and its high percentage content of Branched Chain Amino Acids (25%+).

Recently, a number of improved Whey Protein powders have come onto the market. A predigested whey protein powder that is made by low temperature, high speed sonic drying with micro-pore membrane filters and Ion-exchanged columns to remove lactose is the best. These new Whey Protein Isolates are very soluble and great for mixing - but they are also quite expensive.

For value for money, you can't beat Whey Protein Concentrate. Its BV (Biological Value) and protein content is slightly less than WPI; its carbohydrate (lactose) and fat content is slightly more than WPI but its price is half that of WPI.

The superiority of whey protein as a supplement can be seen by its BV rating (the higher the better). The BV of a protein is calculated by subtracting the amount of protein excreted (urine, faeces) from that ingested. This gives an estimate of how much protein is retained in the body (hopefully reflecting increased retention by muscle tissue).

The BV is therefore a measure of a proteins ability to be used by the body.

For comparison, the BV of predigested undenatured whey protein is 157.

Egg white has a BV of 87.

Soy protein has a BV of 74.

(You may recall hearing somewhere that egg has a score of 100. Well, it does - but this is a different system of rating known as PER (Protein Efficiency Rating) not the BV).

## WHY TAKE A PROTEIN SUPPLEMENT AT ALL?

Good question - but if you've ever tried consuming large amounts of protein (eg 300 grams per day) you'll know the answer. For most people, it's physically impossible to eat enough protein rich whole foods such as beef, chicken, fish and eggs on a daily basis. It is both time consuming and tiring on the jaw. You soon become 'sick and tired' of this continuous effort to eat.

Not only is drinking your protein quicker and easier, using a Whey Protein has a higher BV and can actually save you money in comparison to whole foods.

## WHICH ONE SHOULD I CHOSE?

Whey Protein is superior to other milk proteins such as calcium caseinate and vegetable protein powders such as soy. Actually, of all the proteins, Whey protein has an amino acid profile closest to that of human breast milk - and look how a baby grows!

In my mind the only choice is between WPC and WPI. My advice is if you can afford it, use WPI. Otherwise at half the price, WPC is much better value for money and I think it tastes better.

I personally recommend WPC to most of my clients, especially the ones on super high protein diets because of the large quantity they need (around 10 kg's per month).

WPI, although slightly superior, would work out very expensive.

## HOW MUCH DO I TAKE,AND WHEN?

For serious bodybuilders, consume around 2.2-3.3 grams of protein per kilo of bodyweight in divided doses throughout the day.

eg For an 80kg bodybuilder
80 x 3.3 = 264 grams per day
- 7 = Approx 38 grams per meal, seven times daily.

| | |
|---|---|
| Breakfast | 38 grams |
| Morning Tea | 38 grams |
| Lunch | 38 grams |
| Afternoon Tea | 38 grams |
| * Post Workout Snack | 66 grams |
| Dinner | 38 grams |
| Pre Sleep Snack | 10 grams |

Note: The protein listed is total protein. It may be total protein shake, or half food, half protein shake or total whole food. Do not rely entirely on liquid drinks - although they are so convenient. Make sure there are plenty of whole food proteins such as lean beef, chicken, fish, pork, lamb and eggs. Also, don't neglect vegetable proteins.

* The most important protein shake of all is your Post Workout Snack. This should contain 25% of your daily protein intake. Make sure you consume plenty of carbs of varying glycemic indexes at this meal also.

The Pre Sleep Snack is vitally important also. This is smaller that the other snacks and should be fat free.

# GLUTAMINE

| | |
|---|---|
| Scientific Name: | L-GLUTAMINE |
| Type of Nutrient: | Amino Acid |
| How Supplied: | Tablets, Capsules, Powder |
| Natural Source: | Protein foods |
| Benefits: | Anti Catobolic, (prevents muscle breakdown), Boosts immune system, Growth hormone release, Enhances muscle cell volume |
| Cost Effectiveness: | * * * * * |
| Safety: | Good |

Glutamine is a very important amino acid to bodybuilders. It's the most abundant amino acid in the body, making up over 50% of the extracellular and intracellular amino acids.

It has a major effect on liver function, acts as cellular fuel to muscle and other tissues in the body and may regulate protein synthesis. (Rennie et al Metabolism 1989; 38 ( 8 Suppl 1): 47-51.)

It also boosts the immune system against the drop in immune function after intense exercise.

Technically speaking, Glutamine is generally not considered an "essential amino acid". It can be synthesized from other aminos - notably glutamic acid, valine, and isoleucine. But after intense exercise (stress) the demands for glutamine can be so great that the body cannot manufacture enough and it may become "conditionally essential". Under these conditions, glutamine supplementation can make a world of difference. In European hospitals glutamine is treated like a drug - being administered to patients suffering from stress or trauma (surgery, burns, disease). Studies show that this glutamine supplementation produces a potent anti-catabolic effect - preventing muscle wasting. (J Lacey et al Nutrition Reviews 48(1990): 297-309) (E Roth et al, J Parent Ent Nutr 14 (1990):1305-1365).

Of most importance to the bodybuilder is the size of the glutamine pool in a muscle cell. Both increasing the production of protein (for muscle building) and decreasing protein degradation (and resulting muscle breakdown) are dependant on how much glutamine is stored. If there's plenty, then other aminos will not be forced into glutamine production. This leaves them free for protein syntheses. Also, skeletal muscle which bodybuilders work so hard for will not be broken down to manufacture glutamine. Glutamine acts to maintain amino acid balance thus enabling the body to manufacture more protein.

A study in 1995 (Welbourne T Am J Clin Nutr 1995; 61:1058-61) has shown that a few grams of glutamine taken orally increases plasma growth hormone levels. Two grams of glutamine increased growth hormone levels fourfold. Whether this extra growth hormone results in positive effects on body composition (increased muscle, decreased fat) is yet to be determined - but it certainly wouldn't hurt.

Glutamine also appears to be important for proper muscle glycogen deposition and cell volumisation.

When demands by the intestinal tract, immune system and other parts of the body exceed dietary glutamine production levels, cell volume decreases as the muscle glutamine levels fall. This is catabolic (S Low, et al J Physiol 492.3 (1996): 877-85). Glutamine helps maintain proper cellular hydration or cellular volume.

## HOW TO TAKE

Studies show that between 50% and 85% of a large dose of glutamine ingested orally does not reach the bloodstream - since glutamine is also used by the mucosal cells of the intestinal tract. (Jungas P L et al Physiol Rev 1992; 72 (2): 419-448).

There are two schools of thought as to the best way around this. One says to take a very large amount (5 grams or more) at once so that it doesn't matter that a lot is destroyed. The other school of thought is to take 2-3 grams four or more times throughout the day.

Two important times would be immediately after training and before bed.

There's a possibility that loading up on supplements like glutamine in combination with a high glycemic index carbohydrate (causes large insulin release) such as grapejuice for a week might increase muscle cell volume (by super-saturating the muscle cells glutamine stores). This would be done in a similar way to Creatine Loading.

For example:

| | | |
|---|---|---|
| | Breakfast | 3 grams with grapejuice |
| | Morning Tea | 3 grams with grapejuice |
| FIRST | Lunch | 3 grams with grapejuice |
| WEEK | Afternoon tea | 3 grams with grapejuice |
| | Post Workout Snack | 3 grams with grapejuice |
| | Dinner | 3 grams with grapejuice |
| | Before Bed | 3 grams with grapejuice |

After the "loading" week the dosage may be backed off to 2-3 grams twice per day. Firstly - after training

Secondly - before bed.

## VITAMIN C

| | |
|---|---|
| Scientific Name: | Ascorbic Acid |
| Type of Nutrient: | Essential water soluble vitamin |
| How Supplied: | Powder, Tablets, Capsules |
| Natural Source: | Citrus Fruits |
| Used For: | Antioxidant |
| Cost Effectiveness: | * * * * * |
| Safety: | Excellent |
| Precautions: | Excessive doses may cause diarrhoea, upset other vitamin actions and act as a diuretic. |

Not only is Vit C a potent antioxidant, it also may have “growth-factor-like” properties for collagen synthesis - important for the repair of your tendons and ligaments.

Some research suggests Vitamin C may also help improve the testosterone-to-cortisol ratio (anabolic-to-catabolic ratio).

Vit C may also help protect muscles from excessive damage and may help ‘contractile tension’ (strength).

### HOW TO USE

1000 MG 3 x DAILY

| | | |
|---|---|---|
| eg | BREAKFAST | 1000mg (1 gram) Ascorbic Acid |
| | LUNCH | 1000mg (1 gram) Ascorbic Acid |
| | DINNER | 1000mg (1 gram) Ascorbic Acid |

## SECTION III

# THE PHARMACOLOGY OF FAT LOSS

As the developed world as a whole gets fatter each year, certain athletes, (bodybuilders in particular), endeavour to obtain all-time lows in bodyfat percentages. Supplemental dietary techniques have been developed by these athletes almost to a level of a science and some of the major 'secrets' have been revealed in this section.

## CAFFEINE

| | |
|---|---|
| Scientific Name: | Methylxanthine |
| Type of Nutrient: | Stimulant drug of Central Nervous System |
| History: | Used for hundreds of years in form of tea and coffee beverages |
| How Supplied: | Powder, Tablet, Liquid, Suppository |
| Natural Sources: | Tea, Coffee, Guarana, Kola Nut |
| Used for: | Reducing bodyfat and perception of effort. Increasing workload capacity, muscle fibre recruitment, exercise intensity, endurance, alertness, concentration, and oxygen uptake, Glycogen sparing |
| Cost effectiveness: | * * * * * |
| Safety: | Up to 600mg/day (7 cups of coffee) considered safe (Gilbert 1992) |
| Precautions: | Should not be taken by pregnant women (has been linked with reduced bodyweight of the newborn) or people with heart problems (excessive doses can cause extra beats of left ventricle). Can cause physical dependence at daily dosages of 350mg and above (about 4 cups of coffee). 5 grams and above can be a lethal dose (about 60 cups of coffee). |

Some Personal Trainers will be horrified at the thought of encouraging clients to consume caffeine. However, its effects on physical performance and bodyfat reduction are too great and well documented to ignore. Used prudently, caffeine's benefits can be made to outweigh possible risks.

### FAT REDUCTION

The most common beneficial finding of caffeine use is an increasing in burning of bodyfat as fuel (Costill et al 1978, IVY et al 1979).

Compared with controls up to 100% more bodyfat is burned by the subjects using caffeine.

Caffeine is a powerful lipolytic agent, promoting the breakdown of stored fats. This leads to a dumping of fats (non-esterified fatty acids, NEFA's) into the blood where they can then be taken up by skeletal muscle to be oxidized.

Caffeine increases lipolysis by increasing blood adrenaline levels, and adrenaline is a potent internal lipolytic hormone (J. Appl Physiol 72:1297, 1992). Adrenaline can activate lipolysis not only from fat cells but also from within fat cells (muscle triglycerides).

When ingested with a meal, caffeine increases the rate at which the food is to be converted into usable energy.

When caffeine is taken between meals, it causes fats to be transferred from deposits in the cells to the bloodstream. Here, as free fatty acids they can be used as energy by most of the organs of the body. (Gilbert 1992).

A high protein, low carbohydrate, low fat diet works best with caffeine for maximum fat burning. A high carbohydrate diet negates the fat-burning effects of caffeine (Weir J et al Med Sci Sports Exerc. 1987; 19:100-106)

Caffeine also raises the activity levels of the body, which can mean that the energy derived from food is used up in exercise rather than be stored as fat. In addition, caffeine stimulates the temperature-regulating centres of the body, which in turn produces an increase in body temperature. To sustain this change, energy that might have otherwise been deposited as fat is used. Thus, even when the body is at rest, a greater amount of food is burned. (Caffeine: The most popular stimulant, Gilbert 1992).

Although caffeine achieves peak blood levels about an hour following oral ingestion, the fat burning response does not begin until 3-4 hours after ingestion. (Weir J et al Med Sci Sports Exer 1987; 19:100-105 Belect S et al Metabolism 1968; 17:702-707).

Most of the drug is removed from the body within 12 hours. However, smoking causes the body to metabolize caffeine 50% faster, whereas other substances can substantially extend caffeine's life. Oral contraceptives can more than triple the half-life of caffeine. I remember laughing lots of times when being told that eating grapefruits with coffee for breakfast would reduce fat. But now we know it's true. The bitter compound which is contained in the grapefruit, known as Naringin, will extend caffeine's life in your body, slowing the breakdown of the Xanthines in the liver (British Journal of Clinical Pharmacology).

This enables a lower dose of caffeine to remain active and give the same effects as a higher dose whose duration of effect has not been extended.

While we're on the subject of increasing the effects of caffeine, are there any other substances that can be 'stacked' with caffeine? Yes, there are. Another legal one is Aspirin. Like caffeine, aspirin is a methylzanthine. Bodybuilders combine Caffeine, Aspirin and Ephedrine in a thermogenic cocktail. Ephedrine is not legal without a prescription in Australia, nor is its herbal precursor Ma Huang or Ephedra herb which are classed S4 drugs. They are on the International Olympic Committees list of banned substances.

On its own, 1/2 an aspirin per day with one of your meals will help prevent the formation of gallstones which some people develop when dieting for weight loss (Dr David Powell 1997).

The thermogenic cocktail of the three drugs promotes fat burning, increasing lean body mass while decreasing muscle breakdown (Dulloo Ag, Nutrition Review 1989; 5(1):7-9). Aspirin taken under these conditions can also have a positive effect on workload capacity and anabolic drive. Methylzanthines potentiate the ephedrine activity by increasing release of the hormone nor-epinephrine (Falk B et al Can. J Physcol Pharmacol 1990; 68:889-892).

The ratio of caffeine to ephedrine is 10:1 (Int J Obesity 17: Suppl 1, 51-578, 1993) in combination with 300mg Aspirin. (This combination is actually patented). Prolonged daily use of Aspirin can blow ulcer holes in your gut. Agents that work like Aspirin (prostaglandin blockade) may exert the same synergistic effect without the risk of finding blood in your stools. Several plant derived compounds share aspirin's actions, like curcumin from the spice tumeric and gingerols from ginger root.

## NARINGIN

| | |
|---|---|
| Scientific Name: | Naringin |
| Type of Nutrient: | Food |
| How Supplied: | Grapefruit powder (with peel) |
| Natural Source: | Grapefruits (including peel)<br>NOTE: Not Grape Juice (usually red) but Grapefruit Juice (green) |
| Used for: | Thermogenic enhancer<br>Xanthine extender |
| Legal status: | OTC |
| Availability: | Limited |
| Cost effectiveness: | * * * * |
| Safety: | Excellent |

As mentioned earlier, the bitter compound which is contained in the grapefruit will extend caffeine's life in your body, slowing the breakdown of the xanthines in the liver (British Journal of Clinical Pharmacology).

This enables a lower dose of caffeine to remain active and give the same effects as a higher dose whose duration of effect has not been extended.

One of caffeine's most beneficial effects is its ability to increase lipolysis (fat burning) by increasing blood adrenaline levels, because adrenaline is a potent internal lipolytic hormone (J Appl Physiol 72:1297, 1992).

Naringin is a flavonoid and may have anti ulcer effects. Grapefruit juice contains 500 - 800 mg/litre naringin.

## HOW TO TAKE

200-300 ml Grapefruit juice (100-150 mg naringin) with 200-350mg caffeine. Drink two more glasses of grapefruit juice over the day 4 hours apart.

Caffeine dose will vary according to Bodyweight/Tolerance/Reason for use and Individual differences.

The total calories and carbohydrates of grapefruit juice drinks must be taken into account when planning a fat loss program. Using dried grapefruit peel can supply high concentrations of Naringin without many carbs or calories.

## PUTTING IT ALL TOGETHER

FOR FAT LOSS, PHYSIQUE ENHANCEMENT

| Example | PRESENT REGIME |
|---|---|
| SUBJECT: Female | Lifestyle: Sedentary - just started exercising |
| AGE: 25 | 4 coffees per day (320mg caff) |
| WEIGHT: 80kg | 2500 calories per day |
| BODYFAT: 30% | Typical High Fat, High Carb diet |

NEW REGIME
First week: Total abstinance of caffeine containing foods.
Reduced calorie, low fat, low carb, high protein diet.

| | | |
|---|---|---|
| Week Two: | Upon awakening 250-350mg caffeine | |
| Drink 2 litres water | 1 multi mineral | 200ml Grapefruit juice |
| throughout day | 4 hrs later | 200ml Grapefruit juice |
| | 4 hrs later | 200ml Grapefruit juice |

1 hr before weight training} 250mg caffeine
or 3 hrs before Aerobic training}

Reduced calorie, low fat, low carb, high protein diet

Daily total not to exceed 500mg caffeine.

**TIP: TOLERANCE EFFECT**

If you have ingested caffeine containing foods and beverages in high amounts for a long time, your body may have developed a tolerance to the effects of caffeine.

If this is the case then slightly higher dosages may need to be taken.

Alternatively, and probably better, is to have a complete break from caffeine for a few weeks prior to its use. This allows the body time to clear itself of the drug so that when it is taken in the future, a small amount has a greater effect.

To avoid or minimise the effects of tolerance, dosages should be kept as low as possible and used intermittently.
ie. don't use caffeine every day and every fortnight of use should be followed by one week off.

## BRINDLE BERRY

| | |
|---|---|
| Scientific Name: | Garcinia Cambogia |
| Active Ingredient: | Hydroxy Citric Acid (HCA) |
| Type of Nutrient: | Fruit acid |
| History: | Thai and Indian cooking (condiment) for hundreds of years Ayurvedic medicine. HCA isolated 1965 |
| How supplied: | Tablets, Capsules, Powder |
| Natural source: | Brindleberry or Malabar Tamarind |
| Benefits: | Fat loss, (Accelerating fat burning, inhibiting the formation of new fat, Appetite suppression), cardiovascular health (lowers cholesterol) |
| Legal status: | OTC |
| Availability: | Some Health Food shops and Mail Order ph: 015 530 243 |
| Cost effectiveness: | * * * * |
| Safety: | Good |
| Precautions: | Breast feeding women avoid. Can dry up milk production (Dr D Powell 1997). Diabetics avoid. |

HCA is a natural compound extracted from the rind of an exotic Asian fruit known as Garcinia Cambogia or Malabar Tamarind (commonly called Brindleberry in Australia).

Scientific research has uncovered some powerful effects in the area of fat loss for this substance which has been used for centuries as a spice.

These are:

### STOPS PRODUCTION OF NEW FAT

HCA acts as a lipogenic inhibitor meaning that it inhibits the production of fat in the body. It has been demonstrated that this amazing extract has the ability to reduce fat production by 40-70% up to 12 hours after eating a meal. It does this by attaching itself to a compound known as citrate lyase. Citrate lyase is an enzyme necessary for the production of the building blocks of fat, Malonyl Coenzyme A. By rendering citrate lyase inactive, Malonyl Coenzyme A cannot be made and so fat is not synthesized.

### ACCELERATED FAT BURNING

Low levels of Malonyl Coenzyme A triggers another fat reducing reaction. Put simply, when your body is not making fat it likes to burn fat. The low level of Malonyl Coenzyme A activates the oxidation of fat in the liver and adipose tissues. This accelerated fat burning (thermogenesis) is the most important effect of HCA for fat loss.

### APPETITE REGULATION - NO HUNGER

Increased gluconeogenesis and larger glycogen stores in the liver seem to signal the brain that the body is full. In addition, enhanced gluconeogenesis counter acts lowered blood sugar (hypoglycemia) and the hunger usually associated with it. By controlling appetite, HCA reduces food intake and makes dieting easier.

## INCREASED METABOLIC RATE

Metabolic energy is necessary in order to synthesize new glucose. Thus, whenever gluconeogenesis is stimulated, metabolic rate increases (Flatt JP Biochem of Energy Expenditure, Bray GA, London 1978, pp 211-228). This increases the expenditure of calories in the body.

## PROTEIN SPARING - EASIER DIETING

In a negative calorie balance, that is , when more calories are burned than ingested, stored fat and protein are oxidized to meet the body's metabolic demands. It is preferable that fat rather than protein be burned during this state. But during dieting (restricted calorie intake) up to 30% of the weight reduction can come from muscle loss. HCA stimulates fat burning while simultaneously retarding protein breakdown. This minimizes the loss of muscle. It does this because of its effect on ketone bodies - which slow the rate at which protein is broken down in skeletal muscle (Sherwin RS et al J Clin, Invest 1975, 55:1382-1390). HCA accelerates the rate of ketone production. The glucose formed from gluconeogenesis stimulates the secretion of Insulin. Insulin is more anabolic than Testosterone and thus the breakdown of protein in the muscle tissue is inhibited (Sherwin RS et al J Clin Invest 1975 55:1382-1390). By maintaining more muscle, as well as looking better, the body will burn more fat. The greater the lean mass, the faster the metabolic rate and the less that calories have to be cut back. This makes dieting easier.

## LOWERS CHOLESTEROL

HCA reduces LDL (Berkhout TA et al, Biochem J 1990; 272:181-186) (the bad cholesterol) and triglycerides(Sullivan AC et al, Am J Clin Nutr 1977; 30: 777-784). It is thought that this lowering of the production of both cholesterol and fatty acids is a result of HCA's effects on the metabolism.

## INCREASING THE EFFECTS OF HCA

Two substances that have both been demonstrated to enhance the fat burning effects of HCA are L-Carnitine and Chromium.

L-Carnitine, a naturally occurring Amino Acid, becomes supercharged when paired with HCA, picking up fats and throwing them into the body's furnace, where they are burned and used as energy. L-Carnitine is essential in the transfer of long chain fatty acids into the mitochondria of the cells, (furnace part of cell).

Chromium is a key mineral that "keeps insulin levels in check" by making the hormone more efficient at regulating blood sugar levels (US Dept of Agriculture).

A number of clinical trials have been performed including an eight week double blind control study in 1991. The people who took HCA in combination with Chromium lost an average of approximately 5 kg (11.1 pounds) per person (Anthony Conty, MD 1991 Hilton Head Study: Lipodex - 2). This finding was confirmed by a 1993 trial (11.48 lbs)(Anthony Conty, MD 1993 Allendale Study: Lipotrol/Actotherm).

## SAFETY

Brindleberries are a natural food, being used in foods for hundreds of years. Researchers have satisified themselves that HCA has no adverse side effects. Since HCA does not act on the central nervous system, when it induces the body to lose weight, unwanted side effects including insomnia and depression do not occur. However, a word of caution is in order. The effects of HCA on diabetes have not yet been evaluated in clinical studies. Until appropriate clinical trials have been conducted, however, I would advise diabetics, persons with high blood pressure, pregnant women, and others who have serious medical conditions to use this supplenment under a doctors supervision.

## HOW DO I TAKE HCA?

The most cost effective is HCA in powder form. However, since HCA does not dissolve easily and doesn't have a pleasant taste, some people will prefer tablets or capsules. One local Melbourne company has just developed a delicious fizzy lemon cordial version which contains a high dose of Brindleberry, and is only two calories per serve.

The best way I know of to use HCA for fat loss is to take 250-500mg, three times daily, 30-60 minutes before meals. However, recent research indicates that higher doses will increase the effects further. Since HCA appears to be quite safe even at higher doses (500-1000mg), your budget may be the deciding factor.

For the best result, because of the synergistic action of chromium and L-Carnitine upon HCA, I recommend taking 500-1000mg L-Carnitine and 200mcg Chromium with each dose of HCA. Chromium Picolinate is the most effective form of Chromium.

In summary, the fat burning "stack" looks like this:

250 mg HCA
500 mg L-Carnitine
200 mcg Chromium Picolinate

3 x per day, 1/2-1 hr before breakfast, lunch, dinner.

## OMEGA 3 - FATTY ACIDS

| | |
|---|---|
| Scientific Name: | Eiosapentanoic Acid (EPA)<br>Docosahexanoic Acid (DHA) |
| Type of Nutrient: | Polyunsaturated fat |
| How Supplied: | Capsules |
| Natural Source: | Fish (oil) |
| Used for: | Regulating insulin metabolism, anticatobolic, anabolic, anti-inflammatory, lipolytic (fat burning) , antilipogenic (stops fat production), blood cholesterol lowering, and vasodilating (increases vascularity) effects |
| Legal status: | OTC |
| Availability: | Health Food Shops |
| Cost effectiveness: | * * * * |
| Safety: | Excellent |

OMEGA-3's contain an abundance of EPA and DHA. These fatty acids serve as starter material for hormone-like compounds in the body that positively affect blood pressure, clotting, immune response and triglyceride levels.

Probably of most interest to the bodybuilder is that these fatty substances actually aid in making less fat and breaking down more in the body and boosting anabolic drive.

### HOW TO TAKE

10 capsules a day of 1,000 milligrams of fish oil (10 g per day).

Eating fish will give you a fair amount of OMEGA-3's so you may cut back or cut out your supplemental dose.

As well as making you leaner and more vascular OMEGA 3's aid recovery and workload capacity.

## L-CARNITINE

| | |
|---|---|
| Scientific Name: | L-Carnitine |
| Type of Nutrient: | Amino Acid |
| How Supplied: | Powder, Capsules,Tablet |
| Natural Source: | Meat (Beef, Mutton, Lamb) |
| Used for: | Fat Loss, Energy |
| Legal status: | OTC |
| Availability: | Health food shops, gyms |
| Cost effectiveness: | * |
| Safety: | Good. NOTE: R-Carnitine - toxic<br>D-Carnitine - toxic<br>DL- Carnitine - toxic |

### LESS FAT - MORE ENERGY

L-Carnitine, a naturally occurring Amino Acid, becomes supercharged when paired with HCA, picking up fats and throwing them into the body's furnace, where they are burned and used as energy. L-Carnitine is essential in the transfer of long chain fatty acids into the mitochondria of the cells (furnace part of cell).

Fat can only be converted to energy if Carnitine is present. If fat is more readily able to become energy through the presence of Carnitine then energy levels will also be improved and muscle sparing may be promoted.

L-Carnitine may also stimulate the production of metabolic energy from other fuel sources such as adipose fat (around the waist), branch chain Amino Acids, pyruvate and very long fatty acids deposited around the body (Rubaltelli FF et al, Biol Neonate 1987;52 (suppl 1): 65-77).

Carnitine is used by the liver to convert fatty acids into ketones. Once present in the bloodstream, ketones will lower cortisol levels and reduce catabolism. Red meat is the best natural source for Carnitine.

Carnitine levels may also be increased in the body by the use of amino acids like Lysine and Methionine, since Carnitine can be synthesized from these aminos (plus Vitamin C, niacin, pyridoxine and iron).

Carnitine supplementation is of no use to a sedentary person (unless there is a deficiency). However, a hard training athlete is an entirely different animal and when combined with a low-calorie, low carbohydrate diet and HCA, L-carnitine is a very effective supplement. Effective doses range between 500 mg - 5 grams per day.

### HOW TO TAKE

I recommend 500 mg three times per day for fat loss. The higher doses (5 grams per day) have been found to increase Ketone production and increase the use of free fatty acids and fatty tissue in the body as an energy source. This leads to a glycogen-saving effect that aids performance.

You may wish to experiment by taking 2 grams one hour before exercise to experience the performance boosting aspect. The intestine cannot absorb more than a 2 gram dose of L-Carnitine. (Hultman et al, Eur J Appl Physiol 62:450, 1991) at one time.

## CHROMIUM

| | |
|---|---|
| Scientific Name: | Chromium Picolinate |
| Type of Nutrient: | Mineral |
| How Supplied: | Capsules |
| Natural Source: | Yeast, Liver |
| Used for: | Increased Insulin efficiency |
| Legal status: | Personal use only |
| Availability: | Mail order, some health food shops, UTC (under the counter!) |
| Cost effectiveness: | * * * |
| Safety: | Good |

### DEFICIENCY WIDESPREAD

Chromium deficiency is widespread in the general population (Anderson RA et al, Am J Clin Nutr 1985; 41:1177-1183). It is even worse amongst athletes, who may require up to twice as much as couch potatoes.

### INCREASED INSULIN EFFICIENCY

Insulin exerts a powerful effect on both protein synthesis and the metabolizing of fats. Chromium enables insulin to do its work.

Without optimal chromium levels, insulin metabolism, muscle strength, supply and use of glycogen and fats as fuel, endurance, and your level of bodyfat, will all be sub-optimal.

### CHROMIUM PICOLINATE REDUCES FAT AND INCREASES MUSCLE

Although research on athletes has just begun, several studies have demonstrated significant improvements in muscle mass and decreases in bodyfat in double blind tests (Dr Muriel Gillman at Bemidgi State University. Deborah Hasten at Louisiana State University).

New animal studies provide further evidence of muscle-enhancing and fat-reducing effects of chromium picolinate.

Chromium picolinate, compared to other forms of Chromium supplements such as Chromium nicotinate, chromium chloride or chromium polynicotinate seems to be the most active form of chromium on the market.

### HOW TO TAKE

An effective dose would be 200-250 mcg three times per day (600-750 mcg)

| | | |
|---|---|---|
| eg | Breakfast | 200 mcg |
| | Lunch | 200 mcg |
| | Dinner | 200 mcg |

You will recall Chromium picolinate is part of the HCA, L-CARNITINE FAT BURNING 'STACK'. The Chromium Picolinate I use is in 400 mcg capsules. I pull the capsule apart and use half at a time.

## GINSENG

| | |
|---|---|
| Scientific Name: | Panax Ginseng |
| Type of Nutrient: | Plant |
| How Supplied: | Powder, capsules, tablets, paste, tincture, tea |
| Natural Source: | Root of plant |
| Used for: | Fat loss, endurance (stimulant) stress resistance, mental alertness, concentration, workload capacity |
| Legal status: | OTC |
| Availability: | Health Food Shops |
| Cost effectiveness: | * * * |
| Safety: | Good |

The active chemicals in Ginseng are around one dozen compounds known as ginsenosides. Scientifically, they are termed triterpenod saponin glycosides.

Although Chinese physicians have been the authority on medical use of Ginseng for over 4,000 years, they have never developed a methodology for its use with athletes - nor has anyone else.

Recent scientific research has come up with some conflicting results. This is largely due, especially with American studies, because the quality of the Ginseng used has not been analyzed. Real Ginseng works - but some studies, the ones that failed to support this, did not test whether the substance they were testing had any active ingredients. No active ingredients (ginsenosides), no active effects.

RULE No 1 when choosing Ginseng - make sure you are buying good quality Ginseng high in ginsenosides.

Ginseng is best known for its stimulant effects. A lesser known but significant benefit is its ability to reduce stored bodyfat. In a series of animal studies, Dr E.V. Avakian and colleagues have shown that ginseng increases oxidation of free fatty acids.

## TAKING GINSENG FOR FAT LOSS

1. Ginseng should be taken in courses of approximately 4 - 6 weeks duration with a break of the same duration between courses.

2. 500 mg twice per day (1 gram per day) is an effective dose.

## CAUTIONS

Highly energetic, nervous, tense, hysteric, manic or schizophrenic people should not take Ginseng.

Ginseng abuse (habitual ingestion of 3 or more grams of Ginseng daily for long periods of time) can cause gynecomastia (bitch tits), high blood pressure, insomnia, irritability, nervousness, diarrhea, skin rashes, nausea and feelings of depression.

In addition it has been shown to increase the potential for a catabolic (muscle break-down) response in the body.

## FIBRE

| | |
|---|---|
| Scientific Name: | Cellulose, Hemicellulose, gum, mucilage, pectin, lignin |
| Type of Nutrient: | Undigestable food |
| How Supplied: | Food |
| Natural Source: | Fruit, vegetables, bran, grains |
| Used for: | Reduce bodyfat, stabilize blood sugar, regularity, holding down cholesterol and preventing colon cancer |
| Legal status: | OTC |
| Availability: | Supermarket, fruit, vegetable shops |
| Cost effectiveness: | * * * * * |
| Safety: | Excellent |

Not really a supplement and not really a food, since it is that part of plant foods that the human system cannot digest. However, I've included it because it can have a powerful effect on fat loss and many people neglect its importance.

If you asked a dozen people what fibre does - the most common answer would be that it keeps your crapper in order. This is correct, but it is not the only effect.

For an athlete, or anyone wanting to lose fat, the effects of fibre on insulin metabolism are significant. Fibre retards the digestion of sugars and fats so that less fast sugar and less high calorie fat enter the system (Wallace G, Fibre in Human and Animal Nutr, Wellington: Royal Soc of NZ, 1983).

High fibre diets (30-50 grams per day) create an environment in your body that supports the use of food for energy rather than storage as bodyfat. Insulin levels remain stable and energy uptake is slow and stable. One recently completed study gave a group of subjects over 8 weeks a low calorie, low fat diet. Very little weight was lost.

Then for another 8 weeks the subjects diets were supplemented with:

| | |
|---|---|
| Chromium Picolinate | 400mcg |
| L-Carnitine | 200 mg |
| Fibre | 20 grams |

At the end of the second 8 week period, the average weight loss was 15.1 lbs of which 11.8 lbs was fat. Fantastic!

## HOW TO TAKE

There are several categories of fibre and hundreds of different types.

For best results get a good variety, ie the soluble fibres like pectins in apples and carrots, the gummy fibre in oatbran and the insoluble celluloses in wheat bran and other grains.

Eat between 30 and 50 grams per day as part of your meals, eg 5-10 grams, 5-6 times per day.

## CHITOSAN

| | |
|---|---|
| Scientific Name: | Aminopolysaccharide |
| Type of Nutrient: | Special Fibre (Lipophilic) |
| How Supplied: | Powder, Capsules |
| Natural Source: | Plankton and exoskeletons of crustaceans (crabs, lobster, shrimp) |
| Used For: | Weight loss agent, fibre, colon cleansing |
| Legal Status: | OTC |
| Availability: | Health food shops |
| Cost Effectiveness: | * * * |
| Safety: | Appears safe if used in moderation |

Chitosan has been used for over 30 years by water purification plants to detoxify water. It can absorb oil, grease and other toxic substances with great effectiveness. Pharmaceutical grade Chitosan can absorb 10 to 12 times its weight in fat! This is what makes it so effective as a weight loss agent. It is a lipophilic fibre, meaning that it is chemically attracted to fat. Most fibres are hydrophilic, which means they repel fat and attract water.

By soaking up the dietary fats of your food, Chitosan helps to prevent the absorbtion of fats in the body and, at the same time, facilitate their elimination. It binds the eaten fat into an indigestable ball which then passes out through the body (undigested), thus reducing the amount of fat calories to be stored or used.

Although there are no known nasty side-effects of Chitosan, it is still a relatively new weight loss agent and more studies are required.

Some people report constipation. Another concern is that it might indiscriminately absorb other nutrients (such as fat soluble vitamins like E) and create dietary deficiencies.

### PERSONAL RECOMMENDATIONS

My recommendation is to use it only on an occasional basis such as for “binge busting”. ie: For the most part, follow a balanced, low fat diet but if you are inclined to have the odd “Belly Busting Mac Attack” or “Pizza Pigout”, 10 grams of Chitosan will theoretically absorb over 100 grams of fat (900 calories) and rescue you from the “Battle of the Bulge”.

I do not think it wise to rely on its properties to compensate poor eating habits.

Taking Chitosan too frequently may lead to a dietary deficiency of essential fatty acids.

## WATER

| | |
|---|---|
| Scientific name: | H2O |
| Type of Nutrient: | Drink - colourless, odourless, tasteless |
| History: | Long |
| How Supplied: | Tap, Bottle |
| Natural Source: | Rain |
| Used For: | Increasing efficiency of electro/chemical reactions in body |
| Cost Effectiveness: | * * * * * |
| Safety: | Excellent when pure |
| Precautions: | Preferably use filtered water to ensure purity |

Optimum hydration of the body on a cellular level will effect all mechanisms of ergogenics positively.

**Recommendations:**
Drink around 1 glass of pure water every waking hour.
Drink more with exercise - before, during and after.

SECTION IV

## ERGOGENESIS FOR FAT LOSS - CASE STUDY PAUL ADEY

The effectiveness of the ergogenic fat loss diet in conjuction with dietary supplements is demonstrated in this 5 week study of a male bodybuilder.

## CASE STUDY

| | |
|---|---|
| **NAME**: | PAUL ADEY |
| **AGE:** | 31 years |
| **SEX:** | Male |
| **HEIGHT:** | 6' |
| **YEARS TRAINING:** | 15 |
| **BODY TYPE:** | Mesomorph |

EFFECT OF HIGH PROTEIN, LOW CARBOHYDRATE, LOW FAT DIET IN COMBINATION WITH SUPPLEMENTS ON BODY COMPOSITION

Paul came to see me in February 1997. He was happy with his training but felt he could improve on the nutrition side. I could see he had great genetic potential but was quite smooth. The first thing to do was strip his body of the excess fat while retaining his muscle mass. We did this by altering his diet and adding supplements. His weight training remained unaltered. I photographed him (14th February) noting his weight (108.1 kg) and bodyfat (21.5%).

Five weeks later (21st March) we repeated the measurements. Paul had dropped nearly 7 kg (down to 101.3 kg) and his bodyfat had dropped to 14.8% (a 6.7% drop).

To calculate Lean Bodyweight, determine the amount of fat in kg and then subtract this from the bodyweight.

| | | Lean Bodyweight |
|---|---|---|
| eg: | 108.1 kg x 21.5% = 23.2 kg fat | 84.9 kg (108.1 - 23.2) |
| | 101.3 kg x 14.8% = 14.99 kg fat | 86.31 (101.3 - 14.49) |

This means that over the five weeks Paul was able to lose 8.21 kg of fat and put on 1.41 kg of muscle. This is a phenomenal result for a natural bodybuilder. I would have been happy if he had just retained his lean muscle mass, let alone increase it by over 1 kg. You can't beat good genetics in combination with correct diet, training, supplementation and rest.

| | | |
|---|---|---|
| **Date:** | 14th Feb | 21st March |
| **Weight:** | 108.1 kg | 101.3 kg |
| **% Bodyfat:** | 21.5 | 14.8 |
| **Lean Muscle Mass:** | 84.9 kg | 86.3 kg |
| **Amount of fat:** | 16.2 kg | 8.1 kg |
| **Amount of fat lost:** | | 8.21 kg |
| **Amount of muscle gained:** | | 1.41 kg |

The following is Paul's daily diet and supplement "stack", designed by the author Richard Hargreaves, for RAPID fat loss whilst maintaining muscle mass.

## PAUL ADEY'S DAILY FOOD AND SUPPLEMENT INTAKE

### UPON AWAKENING

7:30 AM
300 mg HCA (Ironpower)
200 mcg Chromium Picolinate (MEGA PRO)
250 mg Caffeine (Ironpower)
300 mg Aspirin (Disprin)
300 ml Grapefruit Juice (Farmland NO ADDED SUGAR)

### BREAKFAST

8:00 AM
1 Dozen egg whites }
2 egg yolks } Cook in non-stick frypan
Pepper }
PROTEIN DRINK
- 50g Whey Protein Concentrate (Ironpower) }
  (3 heaped tablespoons) }blend
- 400 ml water }

1 Multi Vitamin/mineral supplement
2000 mg Vitamin C
1 Zinc

### MORNING TEA

10:00 AM Large chicken breast (no skin) with lemon and pepper
Salad - lettuce, tomato, capsicum, carrot
PROTEIN DRINK (same as breakfast)

12:00 PM 300 mg HCA
200 mcg Chromium
PROTEIN DRINK (same as breakfast)

### LUNCH

12:30 PM Lean steak (300 gm grilled)
Vegetables - broccoli, carrot, snow peas, corn
PROTEIN DRINK (same as breakfast)

### AFTERNOON TEA

3:00 PM 180 grams Tuna in springwater (weightwatchers)
Salad (same as morning tea)
PROTEIN DRINK (same as breakfast)

5:30 PM 250 mg Caffeine
300 mg Aspirin
PROTEIN DRINK (same as breakfast)

6:00 PM WEIGHT TRAIN FOR 1 HOUR

**POST WORKOUT SNACK**
7:00 PM PROTEIN DRINK (same as breakfast)
PROTEIN SLICE (MAX'S)

5 g Creatine Monohydrate
300 mg HCA
200 mcg Chromium Picolinate

**DINNER**
8:00 PM SAME AS LUNCH

**SUPPER SNACK** (before bed)
11:00 PM PROTEIN DRINK (same as breakfast)

**BED** 11:15 PM

**NOTE:**

This is the diet Paul followed from 14th February to 21st March (five weeks). It is not a long term eating plan, but a short term specific purpose diet for Fast Fat Loss whilst maintaining muscle. It is extremely high in protein (too high for long term consumption) and limited in carbohydrates. (Lacks simple sugars such as fruit, and lacks starchy complex carbs such as bread, rice, cereal, pasta)

His long term maintenance diet will be more balanced with less protein and more carbohydrates. Fat will still remain low.

## SECTION V

ERGOGENIC SYNERGY

- SYNERGISTIC SUPPLEMENT STACKS TABLE 1
  PERFORMANCE ENHANCING ERGOGENESIS
- HOW DOES THE SSS WORK?

TABLE 2 SYNERGISTIC SUPPLEMENT STACKS
FAT REDUCING ERGOGENESIS

With most of the facts on individual ergogens now explained, Section V combines all these individual components into a synergistic supplement system or stack for enhancing performance.

'Performance Enhancing' Tables tie together all the ergogens into an easy-to-understand format.

INSERT TABLE.1 DOCUMENT  (PAGE 59)

**"Enhancement of either aerobic or anaerobic capacity can increase endurance and the total amount of work accomplished during sustained maximal effort to exhaustion" (McGee DS et al J Applied Sport Sci Res 6 (2):pl-95, 1992).**

| | |
|---|---|
| BIOENERGETICS - | The flow of energy in a biological system. (Body) |
| ANABOLISM/ ANTI CATABOLISM - | Building up Recovery and Damage Prevention of Protein (Muscle) |
| ANABOLISM - | Build up of Muscle (Protein) |
| ANTI-CATABOLISM - | Anti breakdown of Muscle (Protein) |
| ANTI OXIDANT - | Damage prevention from Free Radicals |

**SYNERGISTIC SUPPLEMENT STACK TABLE FOR FAT REDUCING**
**TABLE 2**

| FAT LOSS STACKS | | Lipolysis | Thermo genesis | Anti lipogenesis | Reduced Dietary Fat Absorbtion | Appetite Suppression |
|---|---|---|---|---|---|---|
| *STIMULANT STACK | CAFFEINE + NARINGIN + ASPIRIN | * | * | | | |
| NON-STIMULANT STACK | HCA + L-CARNITINE + CHROMIUM PICOLINATE | * | | * | | * |
| MILDLY STIMULANT STACK | FIBRE | | | | * | |
| | CHITOSAN | | | | * | |
| | GINSENG | * | | | | |
| *SUPER STIMULANT STACK | GINSENG + CAFFEINE +NARINGIN + ASPIRIN | * | * | | | |
| SUPER NON-STIMULANT STACK | FIBRE, CHITOSAN, + HCA + L-CARNITINE + CHROMIUM PICOLINATE | * | | * | * | * |

* NOTE: ADDING EPHEDRINE TO THESE STACKS IN A RATIO OF ONE PART EPHEDRINE TO TEN PARTS CAFFEINE WILL ENHANCE EFFECTS SIGNIFICANTLY

## HOW DO THE SYNERGISTIC SUPPLEMENT STACKS (S.S.S.) WORK?

The S.S.S. work by:

1. Reducing acidity in exercising muscle

2. Reducing ammonia accumulation

3. Providing a source of bioavailable phosphate

4. Increasing hemoglobin and hematocrit

5. Increasing carnitine level in muscle

6. Increasing 2,3 - DPG

7. Increasing the muscle supply of both endogenous and nutritional antioxidants

8. Anti-Catabolism

9. Anabolism

10. Increasing Lipolysis

11. Increasing Thermogenesis

12. Anti lipogenesis

13. Reducing Dietary Fat Absorbtion

SECTION VI

# OTHER SUPPLEMENTS

This section takes a look at the “odds and ends” of current supplementation use.
I give my opinion on what works, and what doesn’t.

The recommendations of this section are based on current scientific knowledge. Although most of these substances are good for something, my judgement on them is based entirely on safety and performance enhancing (ergogenic) ability.

## AMINO ACIDS

Boy, what a broad band of functionalities these substances have. They can increase growth hormone release, they can precurse more biologically active compounds, they can effect moods, sleep, energy levels, act as muscle cell volumizers.

Amino acids are generally classified as 'Essential' or 'Non-Essential' or a new classification emerging known as 'conditionally essential'.

'Essential aminos' are amino acids the body cannot manufacture itself and so has to get through diet.

'Non-Essential aminos' are the other main class. It comprises of amino acids which the body can manufacture itself from other aminos.

'Conditionally Essential aminos' are a small class contained within the 'non-essential' categorie of aminos. Under certain conditions of stress (exercise) the body cannot manufacture enough of the 'non-essential' amino acids and so under these conditions it is essential that it be provided through dietary intake - hence the term "conditionally essential".

| | | | | | |
|---|---|---|---|---|---|
| ESSENTIAL AMINOS | Isoleucine | Leucine | Lysine | Methionine | |
| | Phenylalanine | | Threonine | Tryptophan | Valine |
| CONDITIONALLY ESSENTIAL | Arginine | Histidine | Taurine | Glutamine | |
| NON ESSENTIAL | Ornithine, Carnitine, Tyrosine, Glycine, Gaba, Histidine, Cysteine, Cystine, Proline, Aspargine and Aspartic Acid, Citrucline, Serine. | | | | |

Collectively the three amino acids Isoleucine, Leucine and Valine are known as the BRANCHED CHAIN AMINO ACIDS (BCAA's).

A recently discovered metabolite of Leucine, known as HMB (beta Hydroxy beta Methylbutyrate) now joins the ranks with creatine monohydrate as a proven ergogen. HMB slows muscle breakdown following training and thus the anabolic environment set up by the workout is fully utilised for new growth rather than recovery. Researchers believe that at least 30 grams of leucine is required for the body to manufacture 3 grams of HMB. Three grams of HMB per day is an effective dose for an 80kg bodybuilder.

Arginine has long been acknowledged as a potent stimulator of growth hormone release when infused intravenously. Ornithine, Leucine and glutamine also raise levels of growth hormone.

Glutamine boosts the immune system and may have a cell volumizing effect - not unlike creatine. (See Glutamine Section II Recovery p 36).

Carnitine is responsible for transporting fats into the mitochondria (furnace part) of a cell. (See Carnitine Section I Energy Systems p 26, Section III Fat Loss p 48).

Individual amino acids of significance are listed under their name.

## ANTIOXIDANTS

This is a very general term used to describe a wide variety of substances which have different antioxidant properties. An antioxidant is a substance that neutralizes the damaging effects of free radicals (electrons) which are a by product of oxidation. Antioxidants can be vitamins, minerals, or herbs derived from a diverse range of substances eg Vit C, Vit E, Green Tea, pine bark, grape seed. All these substances are or contain antioxidants.

Some are more potent than others. Some work along slightly different pathways.

The following is a list of some of the best antioxidants and how they can be of help.

VIT C - 3 grams per day
VIT E - 500iu per day
(Essential Vitamins)

CAROTENES (beta-carotene (carrots), lycopene (tomatoes)) 100mg per day

SELENIUM (mineral) 100mcg per day

Proanthocyanidins (pine bark, grape seed extract) 200mg per day
(reported to be 40 times more powerful than the vitamin antioxidants)

Curcuminoids (spice tumeric)

GARLIC

Methionine, Cysteine, (Amino Acids)

N-acetyl-cysteine (NAC) 400mg per day

Bilberry, Rosemary, Ginkgo biloba , Alfalafa (lucerne) (HERBS)

CATECHINS (green tea)

Glutathione (most abundant water-soluble antioxidant inside of cells)

Lipoic acid 200mg per day

Flavonoids (fruits)

Bioflavonoids (quercetin, rutin and hesperidin)

**PERSONAL ADVICE:** Although antioxidants will not enhance immediate athletic performance, over a career span they will provide an edge by helping to minimize the damaging (and 'ageing') effects of free radicals.

A daily 'Multi' Antioxidant would be a good idea. The dosages suggested for the above categories of antioxidants are amounts which have proven to be effective.

**ADRENAL GLANDS** and various other glandulars are the ground up and freeze dried constituents of animal glands. They contain negligible amounts of active hormones.

And even then, most if not all genetic information that was contained will be destroyed during digestion, since genetic information is coded in DNA as a specific protein. Oral glandulars like all proteins, are broken down during digestion.

To have any possibility of working, glandulars would need to contain around 100 times the amount of active hormone generally found in commercial Freeze Dried glandular products.

**PERSONAL ADVICE:** With so many other effective supplements now available, don't waste your money on expensive low quality protein.

**ANDROSTENEDIONE** (Pronounced AN-DRO-STEN-DE-OWN)

Very new.

An adrenal hormone and is the direct precursor to testosterone. It is made in both males and females. It is also found in the pollen of certain pine trees classing it as a 'dietary supplement'.

This is one to watch out for. More research is required on its effects on athletes - if any and potential side-effects.

**PERSONAL ADVICE:** Keep your eyes on the thrillseekers (first to try anything type of mentality) and see with your own eyes any results - good or bad.

**BORON** Ever since Boron was shown to slightly increase testosterone in post-menopausal women it has been sold as a dietary supplement. Too bad it has absolutely no effect on testosterone in healthy athletes.

**PERSONAL ADVICE:** Don't waste your money. Eat plenty of fruit and vegetables if you want boron.

**BCAA's** Acronym for 3 AMINO ACIDS (LEUCINE, ISOLEUCINE, and VALINE) formed in a BRANCHED CHAIN. In high enough doses, may help improve recovery. However, much of this may be a result of a metabolite much more active than the original Amino Acid. The amino acid I'm talking of is Leucine and its metabolite is HMB.

**PERSONAL ADVICE:** Since HMB has been scientifically proven to aid muscle growth in persons training, I would much rather put all my money on the 'SURE THING', despite its steep price, and use HMB instead.

**BEE POLLEN** May be good for other things, but definitely not for improving athletic performance. Even high doses 20-30 grams per day which does have a mentally stimulating effect (Buzz) has no effect on performance.

**PERSONAL ADVICE:** Don't take for improving athletic performance.

**DHEA** A hormone which converts to ANDROSTENEDIONE which then converts to Testosterone. Has been shown to increase testosterone levels in older adults.

Prescription needed.

**PERSONAL ADVICE:** If you're young, forget it DHEA only works in restoring an older persons steroid production to levels of when they were younger. Consult your doctor if you decide to try DHEA.

**EPHEDRA/EPHEDRINE** EPHEDRA is the herbal precursor of Ephedrine - a powerful stimulant. Like Ephedrine, Ephedra is classed as an S4 drug. Ephedrine in the form of Ephidrine Hydrochloride requires a prescription.

On its own but especially when combined with Caffeine and Aspirin, Ephedra will accelerate fat burning while retaining muscle mass. An effective ratio is:

250mg Caffeine
25 mg Ephedrine
300 mg Aspirin

(1 Sudafed tablet 60mg Pseudoephedrine may be substituted for the 25mg Ephedrine).

**PERSONAL ADVICE:** Consult your doctor.

**FRAC** At first glance appears to be a miss-spelt acronym for CRAP, and at a second glance I think it is!

Gamma Oryzanol/Ferulic Acid (FRAC) is derived from rice bran which is definitely a good source of fibre, but will have absolutely no ergogenic effect.

**PERSONAL ADVICE:** I think this one belongs in the toilet. Cannot recommend.

**GUARANA** From the Amazonian jungles comes this brown coloured powder which has been crushed from dried guarana seeds. The active ingredient is caffeine (around 4%) which is a powerful central nervous system stimulant with many performance enhancing properties.

**PERSONAL ADVICE:** If you're after a natural source of caffeine, then Guarana is worth trying. However, coffee and pure caffeine are both much more cost effective.

**INOSINE** Used in the belief that it will increase energy and endurance.
I think the only thing it will increase is the ache in your big toe if you suffer from gout.

**PERSONAL ADVICE:** Use Creatine instead.

**KIC** (Ketoisocaproate) is a metabolite of Leucine which then metabolizes to HMB. Useful for recovery but not as effective as HMB.

**PERSONAL ADVICE:** Use HMB instead.

**LEUCINE** - See Amino Acids
BCAA's
KIC
HMB

**LUCERNE** (Alfalfa)
NOT TO BE MISTAKEN WITH LEUCINE (AMINO ACID)
Lucerne or Alfalfa is a highly nitrogenous herb.
LEUCINE is an Amino Acid.
However, Lucerne contains high levels of the amino acid leucine along with HMB, every other amino acid, vitamins/minerals and antioxidants.
Lucerne is a complete protein, high in fibre, low in fat and in concentrated form (30 x or greater) is an extremely valuable supplement for muscle growth. This is largely due to its ability to supply the body with HMB.

**PERSONAL ADVICE:** Despite the expense of high quality herbal extracts, is definitely worth using and may even prove to be more effective than HMB alone.

**MCT's** (MEDIUM CHAIN TRIGLYCERIDES)
Fat source of fuel (from coconut oil) which acts more like a carbohydrate than a fat (fast acting).
Very popular a decade ago. Excessive amounts cause diarrhoea.

**PERSONAL ADVICE:** Experiment if you like but I wouldn't recommend it for either fat loss or muscle growth or energy.

**MINERALS** Go hand in hand with Vitamins. If any are deficient, peak performance will be adversely effected. Imbalances may also hinder performance.

**PERSONAL ADVICE:** Take a high quality one a day Multi Mineral Supplement.

**OCTACOSANOL** is a revival of wheat germ oil, advertised as the wonder fuel for athletes 30 years ago. Octacosanol, a white alcohol, was theorized to be the active ingredient in wheat-germ oil. Advertisements suggested it would increase energy and stamina, presumably by increasing oxygen consumption and glycogen metabolism in the muscle.

No research has been uncovered to support the contention that octacosanol will improve glycogen metabolism, oxygen consumption, or for that matter, any other physiological function that would improve physical performance.

**PERSONAL ADVICE:** Save your money.

**PHOSPHATIDYL SERINE (PS)**

This is a very new supplement, which I understand may soon be available through Ironman magazine, not to be mistaken with Phosphatidyl Choline, derived from Lecithin,

Not a lot of information is available as yet to its effectiveness, but the theory of how it could work is sound.

Phosphatidylserine is derived from soybean liquid extracts and has been shown to have an effect on the body's production of cortisol - the catabolic hormone that cannabolizes muscles when excessive.

The theory behind PS is that if you can limit the cortisol increases that are a by-product of heavy training, you may be able to prevent excess muscle tissue breakdown, thereby allowing greater muscle growth.

In a double-blind, placebo-controlled study, (P Monteleone et al "BLUNTING BY CHRONIC PHOSPHATIDYLSERINE ADMINISTRATION OF THE STRESS-INDUCED ACTIVATION OF THE HYPOTHALAMO-PITUITARY-ADRENAL AXIS IN HEALTHY MEN" EUR J CLIN PHARMACOL, 41(1992):385-388), subjects took placebo or 800mg per day of PS for 10 days. They were then exercised intensely to induce physical stress.

Cortisol levels were measured. In the placebo group, cortisol levels rose significantly after exercise. The PS group showed a significant blunting of cortisol production.

Researchers hypothesize that PS may counteract stress-induced activation of the pituitary-adrenal axis - a hormone feedback system.

**PERSONAL ADVICE:** PS may be a valuable supplement, but no studies have yet been done to evaluate whether or not it will produce an increase in muscle mass and/or strength.

Try it for a month. If it seems to work, experiement with dosages and timing to evaluate its effectiveness.

Try taking 800mg per day in two divided doses. 400mg in morning and 400mg before workouts or before going to bed on non-training days. Experiment with and between meals.

**ROYAL JELLY** is the exclusive food of queen bees.

High in vitamins/minerals and trace amounts of just about everything, royal jelly certainly will do you no harm.

Royal jelly has not been proven to have any effect on athletic performance. However, it may be an anti-bacterial agent, and an anti-inflammatory to aid in the healing of wounds. It may also strengthen the immune system and act as an anti-ageing compound.

**PERSONAL ADVICE:** If you're after short term improved athletic performance, save your money.

**SMILAX** Funny name. Makes you smile - but I bet not half as much as the manufacturers of this 'useless for improving physical performance' substance whose advertising tries to tell you otherwise.

**PERSONAL ADVICE:** Steer clear of this one.

**TAURINE** A conditionally essential amino acid.

This is the second most abundant amino acid in the body (glutamine is the most) and may be produced from Methionine, Cysteine and B6.

Taurine may act as an insulin mimicker and as such may enhance glucose and amino acid metabolism.

Because of its cell volumizing effects it may enhance protein metabolism and research A Militello, et al, Effect of Taurine Administration on Amino Acid and 3-Methylhistidine Concentrations in Man (Vienna, Austria: 41st INTERNATIONAL CONGRESS ON AMINO ACIDS, 1995) reveals it may help decrease muscle breakdown. The dose used was 500mg three times a day.

**PERSONAL ADVICE:** Expect to find this amino being added to many new products. Not proven but promising.

**VANADYL SULPHATE** (SULFATE American spelling)

This one's a bit controversial. One side saying it works, the other side saying it's toxic and should be taken off the market.

Vanadyl may mimick insulin and possible insulin-like effects. Insulin is quite anabolic.

Some studies have shown Vanadyl to be toxic to the liver.

More research is required to find out exactly what Vanadyl does and doesn't do. Bodybuilders use it and claim that it gives them fuller, harder muscles and a better more vascular pump.

**PERSONAL ADVICE:** Don't overdo it until more research has been done on its toxicity. The recommended dose of 30mg per day in divided doses is sufficient to see the effects. This dosage does not so far appear to be toxic. It should be taken with meals.

**VITAMINS** Very important. If you lack in any, performance may be adversely affected.

**PERSONAL ADVICE:** As an insurance policy, take one high quality multi vitamin supplement per day, with a meal.

**YOHIMBE** (YOHIMBINE HYDROCHLORIDE) is derived from the dried bark of Corynauthe Johimbe, a tree native to Gabon, the Southern Cameroons and the French Congo in Africa. It is widely used as an aphrodisiac. Yohimbe does not contain any testosterone. It is an alpha-2 adrenergic agonist (A2) which has been shown to actually decrease fat synthesis in the body (D Miller - Wieland, et al Horm Metab Res 26.4 (1994):169-172) as well as increase fatty acid mobilization from fat stores in women - especially around hips. (M Berlan, et al In J Obes 15.5 (1991):305-315).

Metabolic slow-down and accumulated lower body fat in women can be blamed in part on an excess of A2 receptors. By binding up the A2 receptors, the decrease in nora-drenaline production caused by extended dieting should be blocked.

**PERSONAL ADVICE:** Needs a prescription.

The common dosage of yohimbine HCL used in the medical profession is one 5.4mg tablet three times per day.

Studies have shown that increased dosages may be less effective - so don't take a "more-is-better" attitude.

However, the yohimbe in herb form may require 1000mg yohimbe herb in the morning with food and 1000mg in the evening with dinner to provide an effective dose.

**ZINC** forms part of numerous essential enzymes for hundreds of different functions in your body, from cell growth to testosterone production. The body pool is small and has to be constantly replaced from the diet. Inadequate zinc, even for one week, retards muscle growth and weakens immunity. (Hambidge KM, et al Zinc In: Mertz W ed. TRACE ELEMENTS IN HUMAN AND ANNUAL NUTRITION 5th EDITION VOL 2, New York: Academic Press, 1986:1-137).

**PERSONAL ADVICE:** The best sources of zinc are meats, eggs and seafood. Make sure you are consuming these foods regularly in your diet.

## A WORD TO TRAINERS

Personal trainers, coaches and devout fitness enthusiasts can tailor their synergetic supplement stacks for their own particular needs. Supplements, dosages, and timing need to be individualised. Eg Creatine and Sodium Bicarbonate is of little value to a marathon runner. Creatine and Sodium bicarb effects anearobic endurance rather than aerobic capacity.

Imagine the dramatic impact on a footballers field performance when he can run faster, longer, harder, more frequently with less perceived effort, push in a pack and tackle harder (strength and power) with quicker recovery and less muscle soreness than without this ergogenic system. The team that gets all players operating at optimum levels consistently will be light years ahead of the pack. The secret's out - It's only a matter of time and we'll witness a "super-team". A group of men, the likes of who have never been witnessed before, outperforming their opposition on all levels. The sort of reliable support as having the wind behind you every quarter.

Trainees are frequently after something that will give them an edge. Helping them to safely achieve their goals faster and easier is the best way to give your business an edge. A Master trainer who provides better customer service, benefits through improved client retention, more referal business and improved perception of him/her being an "Expert".

## SECTION VII

UPDATES:

RED CLOVER

CHITOSAN