Gel food & an in-depth look at what fuel the body needs by Andy Kirkpatrick

When I was a kid I was a real sci-fi nut and spent most of my childhood dreaming about being out in the vastness of space or travelling into the future. I read every sci-fi book and comic I got hold of and a common future product was that scientists would be able to manufacture a meal that would fit into the palm of your hand. Now this kind of science has its downside. Anyone who's seen Willy Wonka will know that one of the perils of condensing a meal into a capsule is that you can end up swelling like poor old Violet Beauregarde and end up looking like a raspberry.

Space age fodder or just baby food?

POWER GELS

Even when they get it right things aren't always as good as they seemed, just look at Chuck Heston in the film, Soylent Green, munching away on a ٢١st century snack unaware it was a by-product of state-sponsored euthanasia.

Then about five or six years ago my childhood fantasies seemed to be close to coming true. A manufacturer sent me a parcel containing what looked like a plastic jar of hair gel. The note said that this jar contained the same amount of energy and goodness as a fish supper and, what's more, it had no fat and so could be digested easily. It came with some plastic squeegee containers, the idea being that you could squeeze the liquid into your mouth when running, cycling or disco dancing and the stuff wouldn't give you cramp in doing so.

Great idea I thought until I tried it. Yes, it not only looked like hair gel but also tasted like hair gel and although many people tried it no one was willing to have more than a teaspoonful. The only person who really seemed to love the stuff was Richie Patterson. He liked the stuff so much he consumed the lot over a single day. Breakfast, dinner and tea. He raved about how, although it tasted like transparent alien slime, he'd never felt like he'd ever had so much

energy - which for a man who had far too much energy for his own good in the first place wasn't necessarily a good thing.

Although it had the gastronomic appeal of industrial solvent remover the stuff seemed to be going well for Richie and he even made use of his newfound energy to try Parthian Shot on Burbage South. It seemed as if he was on the verge of a major sport nutritional breakthrough - that was until he had a major bowel breakthrough in his underpants. Unfortunately for Richie this prototype power gel also turned out to be a very effective delayed laxative and, like Violet Beauregarde, Richie became a victim of man's foolish meddling with the cheese sandwich.

WHAT ARE POWER GELS

The ١٩٨٠s saw an explosion in performance-orientated power snacks, such as Power and Cliff Bars and many climbers found that these dense carbohydrate bars provided much more fuel than their old staples of Mars and Marathon bars. It wasn't long until people began to find the limitations in these bars. The problem with the bars was that they were so dense and heavy that they were difficult to digest, as they would overload the digestive system, and were almost inedible if on the move due to their density. They also required a lot of water to digest and were impossible to eat if the temperature dropped, as they turned to concrete.

Then in the late '٨٠s, Dr William Vaughan, one of the original people behind the Power Bar concept, began to look around for something that would overcome these problems and supply energy needs to athletes, the people who found the bar idea didn't work for them while active. The result was a carbohydrate gel, with the amount of calories kept high enough to provide the energy needed without overloading the digestive system. The packaging was also designed to allow the runner or cyclist to quickly squirt the gel into their

mouths without having chew and affect breathing. Due to the fact that the servings were kept small, with the idea that the user would eat two an hour rather than have one big hit, meant that the gel was in an easy form that could be digested far more quickly, was difficult to freeze and easy to eat. This first gel was called Gu and was quickly followed by several other makes (Power Gel, Cliff Shots and Go Gel).

These gels all have similar ingredients with the main bulk of the gels' calories coming from both complex and simple carbohydrates, plus vitamins and electrolytes. All of the gels are sweet with many different flavours including caffeine rich flavours.

The gels themselves are pretty simple but why you need them and how they work is not, but need to be understood if you're to achieve your full potential whether you're walking, climbing or mountaineering.

THE SIMPLE AND THE COMPLEX CARBOHYDRATES

When I was at school I used to think that carbohydrates got their name because the body needed them like a car needed petrol. This obviously shows I was a bit of a dunce when it came to Biology, but in some ways I wasn't that far off the mark (the word 'carbohydrate' actually comes from the fact that glucose is made up of carbon and water).

We won't go over O Level Biology but of the three primary food types (carbohydrate, fat and protein) carbohydrate provides the body with its primary, or 'quick', energy and so a large part of a climber's diet is comprised of carbohydrate (٦٠-٧٠%), with fat (٢٥% or less) and protein (١٢% to ١٥%), providing the rest. The main thing to understand in performance nutrition is the differences between complex and simple carbohydrates as they have a direct affect on how much energy you have at your disposal and so need to be understood.

The simplest carbohydrate is glucose. Glucose, also called 'blood sugar' and 'dextrose', flows in the bloodstream so that it is available to every cell in the body, with cells absorbing it and converting it into energy to drive the cell. Specifically, a set of chemical reactions on glucose creates ATP (adenosine triphosphate) and a phosphate bond in ATP powers most of the machinery in any human cell.

Glucose is made up of six carbon atoms and the elements of six water molecules. Other simple sugars are fructose, which is the main sugar in fruits, and has the same chemical formula as glucose ($C_6H_{12}O_6$), but the atoms are arranged slightly differently (white sugar is made of one glucose and one fructose molecule bonded together). Lactose is the sugar found in milk and is made of one glucose and one galactose molecule bonded together, with galactose having the same chemical components as glucose but the atoms are arranged differently. Maltose, the sugar found in malt, is made from two glucose atoms bonded together. All of these other sugars are converted to glucose by the liver and are simple carbohydrates (they have a simple molecular construction). Glucose, fructose and galactose are monosaccharides and are the only carbohydrates that can be absorbed straight into the bloodstream through the intestinal lining.

Lactose, sucrose and maltose are disaccharides (they contain two monosaccharides) and are easily converted to their monosaccharide bases by enzymes in the digestive tract. Monosaccharides and disaccharides are called simple carbohydrates. They are also sugars (they all taste sweet) and all digest quickly and enter the bloodstream quickly. When you look at the nutrition label on the back of food packaging and see 'Sugars' under the 'Carbohydrates' section of the label, this is what it's talking about.

Complex carbohydrates (or starches) are made up of chains of glucose molecules. Starches are the way plants store energy, chaining glucose molecules together to form starch. Most grains (wheat, corn, oats, rice) and things like potatoes are high in starch. Your digestive system has to first break down these chains so it can metabolise the simpler glucose molecules into

the bloodstream. It takes a lot longer to carry out this process and this is why you get instant energy from a Kendal Mint Cake and slow burn energy from a flapjack. If you drink a can of cola, the glucose will enter the bloodstream at a rate of something like ٣٠ calories per minute. A glass of rice milk would be digested more slowly at around two calories per minute (if you could stomach it).

So what climbers need are loads of simple carbohydrates then, so they can get loads of energy? Well no. Due to the fact that simple sugars require little digestion, when we gobble down those cola cubes the glucose level of the blood rises rapidly. In response, the pancreas secretes a large amount of insulin to keep blood glucose levels from rising too high. This large insulin response in turn tends to make the blood sugar fall to levels that are too low (three to five hours after). This tendency of blood glucose levels to fall may then lead to an adrenaline surge, which in turn can cause nervousness and irritability. When this happens the tendency is to gobble down more chocolate and so you carry on your roller-coaster ride of glucose and hormone levels. This is not experienced after eating complex carbohydrates, or a balanced combination of carbohydrates. It's for this reason that most gels contain a mixture of both, so that you get both a quick energy buzz and slower burn energy.

'The next time I came across this new breed of hill food was in Yosemite. Airlie Anderson had procured some from the mountain shop and at first sight it looked like the concept had moved on somewhat. It no longer looked like Vidal Sassoon had knocked it up, having been transferred to a tiny portion in a small foil packet, which looked rather like it had originally been designed to hold a prophylactic.

All the way up El Cap, Airlie raved about how "neat" it was, along with her other new found nutritional fad - beef jerky. Now anyone who's had jerky knows that it tastes like rotten sun-dried road kill and so I wasn't keen on tasting this other highly recommended "treat". After several packets Airlie's

bowels remained unmoved and so I tried some, being forced to do so due to the fact that we'd eaten all the other food.

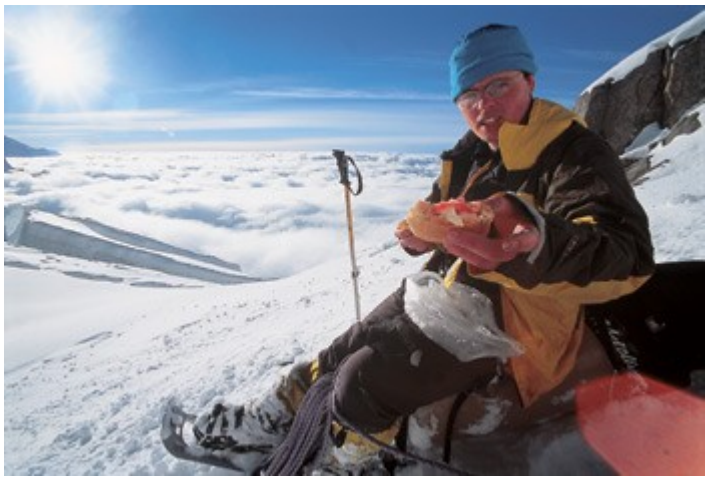
In order to honestly describe the consistency of this stuff (which was labelled banana on the wrapper, with a small yellow drawing of one beside the text in case you were still unsure), it's easy to offend, but all I could come up with to compare it too was monkey love juice (it was a wild guess).

We finished the route around ɛam and we were all exhausted, that was apart from Miss Anderson. She'd eaten several coffee and mocha flavoured gels on the last belay and was now running around like a woman on the edge of a nervous breakdown (or on the edge of a very big cliff). Unable to move, me and Esmond Tressider watched as she gathered firewood, felled trees and built a fire on which she started cooking what food we had left (you guessed it… beef jerky).

At the time I was too knacked to be impressed but afterwards I wondered if maybe those scientists were getting the formula right at last'.

FAT AND POWER GELS

There is virtually no fat in any current power gels but in order to understand how they, and the body, works then fat needs to be understood. Although fat has more than double the calorific content of carbohydrates (nine calories per gram) it's a hugely inefficient energy source, requiring twice as much energy to metabolize. This can cause the feeling of listlessness and fatigue experienced after a fatty meal, as the body directs its energy towards digesting the meal (blood flow is reduced to the muscles). This is also why fatty foods are popular in cold conditions as this inefficiency creates heat and warms us.



Gel food doesn't replace soul food, like the humble cheese sandwhich.

When working really hard (high aerobic) our bodies burn glycogen, of which you can only store about two and a half hours' worth. Once this is used up you 'bonk' or 'hit the wall'. This is where fat comes in. If you lower the aerobic level your body begins burning your stored fat instead of your precious glycogen. Fat does not need to be consumed when on the move as all climbers have enough fat, and the energy within it, stored around their bodies to power them up several laps of the Eiger North Face. A very lean climber with low body fat (٧%) still has over ٣٢,٠٠٠ calories stored away in blubber. For most endurance climbs this is what is powering you.

The most common fat (or lipid) in the body is triglycerides and this is the storage form of fat in the body, much of which is stored just under the skin. Triglycerides are an important source of energy reserves in the body and act like a bank for energy. Deposits of tryglcerides are made into fat cells for energy storage and when energy is needed, these stores of triglycerides are broken down into fatty acids. Fatty acids are then released into the circulation and used for energy. The percentage of body fat for an individual results from whether or not more withdrawals or deposits have been made at the fat cells. Long-term energy output release draws heavily on these reserves and knowing how to make efficient withdrawals.

The important fact is that in order for the body to break down this fat it requires the support of glycogen and blood glucose (carbohydrates). If you were to believe that you can just live on your 'belly timber' then you'd be

wrong. Once the carbohydrates in your stomach and liver are used up then fat metabolizing slows down considerably, at which point the body is forced to turn to its own muscle as an energy source. So in order to sustain both explosive and long-term energy levels it's imperative to sustain your carbohydrate levels.

Once the day's climbing comes to an end I find it's good to eat a meal with a fairly high fat content. This can often prove hard at higher altitudes but if your body's been working hard or it's cold then it will naturally crave fat. In Patagonia last winter our bivvy meal at the end of the day comprised of rice, cheese and olive oil (flavoured with chilli, pepper and garlic). This helped to restore glycogen stores for the following day and helped boost warmth and fat stores and was a perfect post-gel meal.

In order to climb or operate in the mountains to your full potential it's crucial that you do not fall into a pure rock-climbing mentality towards fat. We are not talking about crimping up ٥٠ft of rock but extended endurance and too many climbers confuse the two at their cost.

'The next person to rave about the stuff was Ian Parnell, who returned from Alaska with such rave reviews I feared he was part of some dodgy pyramid marketing scam. The gel of choice now was apparently some stuff called Good GU, which was by all accounts the new crack cocaine among super Alpinists. At least the stuff would live up to its name I thought.

Ian and Jules Cartwright had lived on it on their new route on Mount Hunter and Mark Twight, Scott Backes and Steve House had taken ٦٠ packets each on their ٦٠-hour non-stop ascent of the Czech Direct on Denali. Size wise the packets were bigger but the stuff still looked like you should rub it on to boils, or the noses of an acne-ridden teenager, not squirt it into your mouth over a Snickers bar. How did it taste? Sweet - like far too much of a good thing. I wasn't convinced that the stuff would ever leave the lid of my 'sack'.

ELECTROLYTES

Electrolytes (sodium potassium, chloride and magnesium) are critical for peak performance as they are essential in maintaining hydration and for the proper functioning of muscles (they reduce cramping), with many studies showing that rehydration occurs at a faster rate when electrolytes such as sodium are consumed during exercise.

The longer the trip, the more important food becomes.

Potassium is the major electrolyte found in all of your body's cells and plays an important role in the transmission of nerve impulses, enabling muscle contraction. Magnesium is essential for the efficient metabolism of carbohydrates and research has shown that athletes have a higher-than-average rate of magnesium deficiency. For any activity electrolytes are obviously highly important, but for many mountain activities they are crucial, perhaps playing as big a role as the carbohydrate in keeping you on your feet when combined with water.

CAFFEINE

Caffeine is a big ingredient of several flavours and is viewed with great suspicion. In nearly all cases this caffeine comes from natural sources and is equivalent to between ١¼٢ and ١١¼٢ cups of coffee. Is this bad for you? Small doses of caffeine promote greater mental awareness by boosting the nervous system and can be a great boost when heavily fatigued, an important factor if you're pushing yourself into the red. It also helps in the metabolism of stored

fat, sparing limited glycogen. You should be aware that if you're eating two caffeine gels an hour for a couple of hours then you are really overloading your system, although if you're a caffeine addict you will need considerably more caffeine to take effect, as the brain's caffeine receptors become dulled (three weeks without caffeine will cleanse these senses).

One imagined side effect is that caffeine will increase dehydration, but recent research has shown that moderate consumption of caffeine (٣٠٠mg or less) during exercise does not cause dehydration. If regular hydration methods are adequate for your activity it's not likely that the added caffeine will increase your frequency of urination any more than water consumption. Caffeine does constrict the blood vessels and Mark Twight recommends offsetting this by taking an aspirin every ١٢ hours, plus, it generally improves blood flow on cold climbs.

Last year in Patagonia, Ian Parnell and I scored a box of out-of-date Power Gel before we left. I tested them first by feeding my daughter one to see if they were safe and although she did a good impression of someone who'd just put pile cream on their toothbrush by accident, I took them anyway.

Once there I used the gels for the first time in anger and I must say I was impressed. On my last trip to Patagonia, low calorie intake had ruined an already terrible trip and this time I was keen not to make the same mistake again. Carrying a ٣٥kg 'sack through waist-deep snow for two days is usually enough to push you into the red, but taking one gel every two hours along with a mouthful of water I never really hit that wall you often experience in those situations. Another bonus was because my blood sugar level stayed balanced I didn't get that awful doubt and depression often present early on a trip that can be confused as low morale rather then calorie deficit.

Once we started up our route we rationed ourselves to four packets each a day, with a muesli Power Bar for breakfast and a proper meal at night. For the first time in my life I didn't seem to be pushing myself deep into the red. I wasn't feeling down about things on belays, or being irritable due to low blood

sugar. I also wasn't fantasizing about food (I usually think about all the food I refused or turned down), or even dry heaving, in fact as far as nutrition went I'd never felt so good.

I must admit that I have never been a big water drinker but because I needed a few mouthfuls of water with each gel I also found my hydration was much better (with us both sharing a one litre Nalgen filled with High ٥). In the past on such routes by the time I reached the bivvy I'd be utterly knackered but on this route I felt amazingly fresh. Instead of almost sleeping on my feet, or crying with thirst as I waited for the snow to melt I actually felt I had energy to spare. Another bonus was they were so easy to use, just bite off the top, squeeze and swallow and were compact enough to sit in easy-to-reach pockets rather than lie forgotten in the lid of my rucksack. I was sold.

HOW TO USE GEL

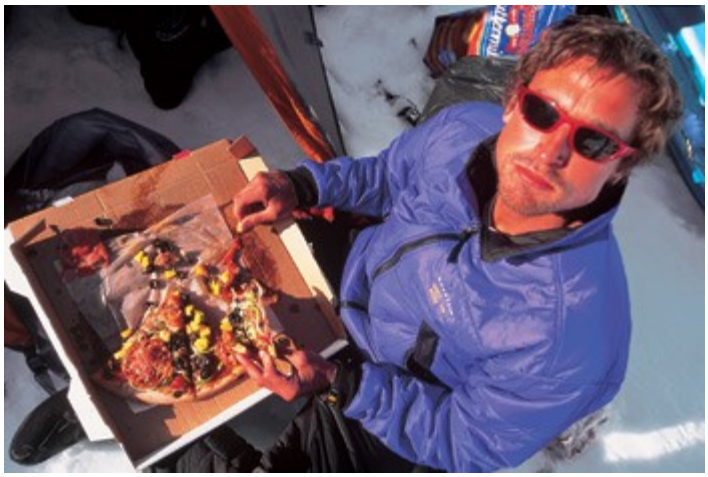
Firstly don't just buy some and head straight out on a major route. You need to make sure that your body and palate is up to this sickly sweet 'baby food'. Taste wise, luckily, there are dozens of different makes and flavours and so it should be easy to find one that works for you. One brand that deserves some mention is the Cliff Shot that features a tiny 'keeper' that stops you from losing the foil top which usually ends up as litter.

All the packets recommend that you consume the gel at different rates and with varying quantities of water, I'd take these recommendations as something to aim for only if you are performing at a very high level or get them free (consuming two an hour isn't cheap). You can use them to supplement a more traditional 'packed lunch', or alone but at a slower rate (every two hours). Don't wait until you feel hungry before eating the gel as by then your power could already be fading and it will take time for your blood sugar to rise.

Ian Parnell told me how he and Kenton Cool would often eat three at once during their ٣٥-hour ascent of the Father and Sons Wall on Denali. Although more effective than perhaps eating a Mars Bar it's worth noting that the body

can only digest ٤٠٠ calories an hour when exercising and so it's better to stagger your gels if possible. As for water I just go for a mouthful and if out of water I find they are one of the few foods I can eat (due to the gel's high water content). The one exception is ISI Go Gel which comes with enough water for hydration, although that means that this type is heavier.

And so after all these years I've finally found my ultimate sci-fi food and personally I feel that those clever scientists have, finally, solved all the problems inherent in meddling with good old-fashioned grub. I now view these tiny foil packets as the most important component of my mountain nutrition. Best of all, in using it I've learnt a great deal about how my body works and what I need to do to make it work harder. Now I wonder if Richie Patterson would be interested in doing some further testing?



Don't forget that food is supposed to be fun.