Nigee's Guide to Healthy Body-fat Loss (It's not another "diet" book, honest!)

by
"Nigeepoo"

Preface

I said I was never going to do this - write a book, that is. I mean, aren't there enough "diet" books out there already? Aren't all "diet" book authors just out to make a fast buck? Mind you, this isn't a "diet" book, well, not as you know it!

However, after giving a friend a 4-hour explanation on Healthy Body-fat Loss, occasionally interrupted by her 3 kids and 2 dogs, she said that I really ***must*** write a book as my advice was unique, logical and easy to understand and deserved a wider audience.

So, you have Emily to thank/blame/whatever for what follows! So, who is Nigeepoo?

My name's Nigel and I'm a Principal RF Design Engineer with Thales (formerly Racal). So what's an Electronic Engineer doing writing a book about Healthy Body-fat Loss? The story starts in 1998. I'd just come through an acrimonious divorce and I was tired, bloated, 17st 7lb and depressed.

Then a pamphlet dropped through my letterbox. It was from Agora Lifestyles, promoting a book by a Dr. Robert C. Atkins (***who?***). I didn't actually buy his book but I read the pamphlet from cover to cover, and it described sleepiness after meals containing carbohydrates. All my life I have felt very sleepy after starchy meals but never knew why. So, despite my disbelief that Atkins' diet could work, I cut out bread, pasta, potatoes, rice, cereals etc - all the things we were told were good for us as they were "low-fat".

Within days, I was like a new man! No more sleepiness, body-fat slowly disappearing and no more heartburn after eating or drinking carbs. I was a total convert. By nature I'm very curious (which I why I'm an Engineer), so I wondered how the Atkins diet could possibly work. In 1999, I got Internet access at work and was delighted to see that there were people out there (some of them doctors) other than Atkins who were saying much the same thing.

I still didn't understand how the diet worked so I studied some biochemistry web-sites to get an understanding of human metabolism. In November 2002, I joined the Muscletalk forum after e-mailing the site owner James criticising an article on ketogenic diets that he had written. Username "Nigeepoo" was born! This was the beginning of a new phase in my learning. From there I found a US & then Canadian bodybuilding forum which allowed me to learn even more about optimum nutrition. In January 2003, the BBC series "Diet Trials" studied the Atkins diet amongst others. At the end of the series, viewers were referred to a BBC Nutrition & Fitness message board where I've been posting ever since. As a result of various recommendations, I bought some books on running, diet & nutrition, metabolism and biochemistry. I also surfed various journals, looking for studies on ketogenic diets and the effects of different proteins, fats and carbohydrates on test subjects.

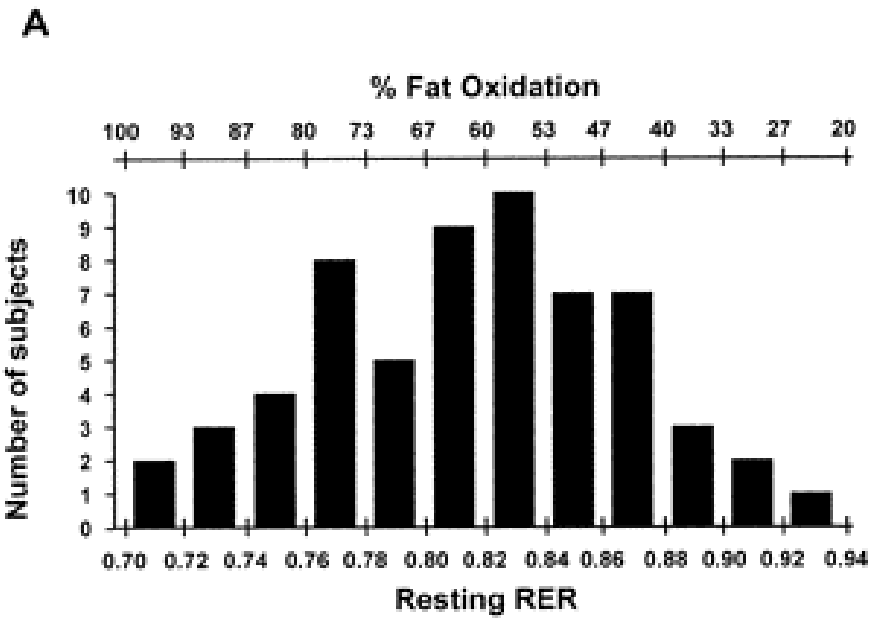
If there is one thing that I have learned, it's that **everyone is different.** I shall make all statements of significance bold for emphasis. So, on with the book.....

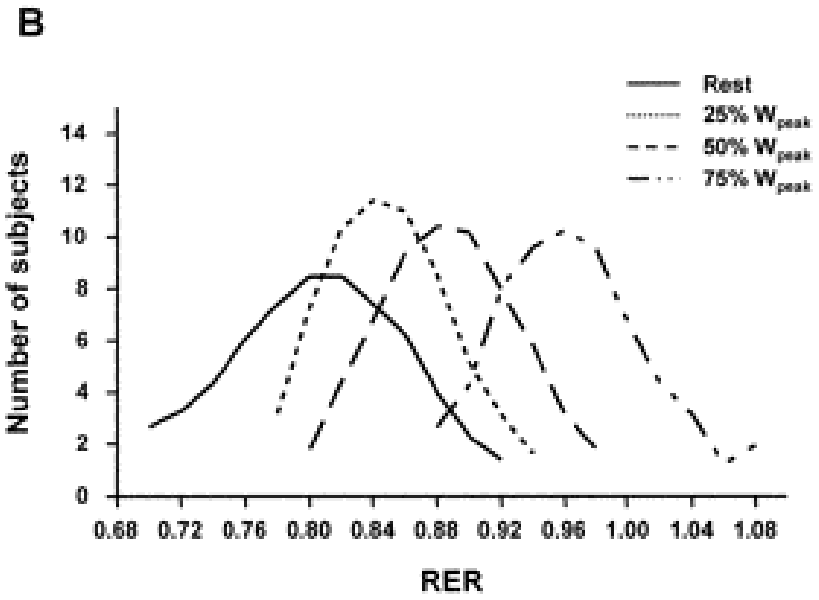
Everyone is Different

You, the reader, are unique. I don't know your metabolism or activity level so I couldn't possibly recommend a suitable diet for you. Before you throw this book away in disgust, let me explain. The point of this book is to give you the tools to work out for yourself what your body needs when it needs it and what it doesn't need when it doesn't need it.

Any person or book that says "eat X% of calories from proteins, Y% of calories from carbs and Z% of calories from fats" is assuming that everyone is the same. This applies to current "Healthy Eating" guidelines, which state that everyone should be eating 15% of calories from proteins, 55% of calories from carbs and 30% of calories from fats.

To illustrate just how different people are, type http://ajpendo.physiology.org/cgi/content/full/279/6/E1325 into your Internet browser's address bar. Find Fig. 2. Here are the results, for those who don't have Internet access:- Used with permission.





What does RER mean? Respiratory Exchange Ratio (RER) is the ratio of carbon dioxide breathed out to oxygen breathed in. This ratio depends on the fuel that the body is burning for energy. If the body is burning 100% fat, RER = 0.7. If the body is burning 100% carbohydrate, RER=1.0. If the body is burning 100% carbohydrate anaerobically (flat-out sprinting), RER > 1.0.

The top diagram is a histogram of fasted RER & % fat oxidation vs. number of subjects. At the left-hand end of the histogram, there are two cyclists with a fat oxidation of 93 - 100%. At the right-hand end of the histogram, there is one cyclist with a fat oxidation of 20 - 27%.

There's a helluva big difference between burning 93 - 100% fat at rest and burning 20 - 27% fat at rest. Interestingly, average fat oxidation is 66%, which means that carb oxidation is 34%. So, on average, at rest, people burn twice as much energy from fat as from carbs. Hmm! So why do current "Healthy Eating" guidelines recommend almost twice as much energy from carbs as from fats for sedentary people? Because they're crap?

As exercise intensity increases, the peak in the histogram shifts to the right as shown in the lower diagram. At 25% full work-load, mean fat oxidation is ~53%. At 50% full work-load, mean fat oxidation is ~37% and at 75% full work-load, mean fat oxidation is ~13%. I suspect that at 100% full work-load, mean fat oxidation is 0% i.e. 100% of energy is being obtained from carbs when running flat-out. Someone on a high-fat, low-carb diet like Atkins induction would keel over with hypoglycaemia if they exercised for any length of time at this rate.

As there is so much variation from person to person, you, the reader must establish your own optimum proportions of proteins, fats and carbohydrates in your diet and these will vary depending on when and how much exercise you do. It all sounds horribly complicated but it isn't.

You apply the principle of "**Eat, monitor and adjust accordingly**" to quote ToxicToffee (Muscletalk Moderator). The eating bit I will advise on in the next chapter. The monitoring bit does not actually involve the use of scales.

Hang on, isn't this book all about losing excess weight? Er, NO actually! Remember the old joke about the best way of losing 5lbs of ugly flab being to cut your head off? Well, if you cut your head off, you've lost 5lbs, but you're dead. Not exactly a good way to lose weight, then. As your body is made up of water, muscles, fat, bones, cartilage, tendons, organs, skin etc and your scales can't tell the difference between one thing and another, losing weight the wrong way can make you less healthy.

If you starve yourself (or skip breakfast for instance) or go for a run before breakfast, as your body is lacking in **glycogen** (see later) and **amino acids** (see later), a corticosteroid hormone called cortisol is secreted which converts muscle tissue into amino acids and then glucose. It also suppresses your immune system and eats away at your bones.

Unless you have a lot of bulky muscle on your frame, it's body-fat you should be losing, and to monitor this, either use a tape-measure around your waist, or check which hole your belt is on, or strip down to your underwear and jump up and down in front of a full-length mirror. As Big Les (another Muscletalk Moderator) always says, "**If it jiggles, it's fat**".

So, what happens if you eat too many carbs but your body isn't burning them? Initially, carb intake tops-up liver and muscle glycogen stores. The liver can store about 70g of glycogen and muscles can store about 400g of glycogen. Once glycogen stores are full though, more carb intake passes through the lipogenesis pathway - this basically means that carbs are turned into fat - which you end up wearing as body-fat. But there's even worse news. On the way to being worn as body-fat, fat is

in the blood as **triglycerides**. This is bad news for the cholesterol particles in your blood. See the chapter on **cholesterol**. What happens if you eat too few carbs? As stated above, a "sugar-burner" taking in insufficient carbs will become hypoglycaemic. See later.

Just discussing weight again for a moment, it's often said that all diets are the same, as weight loss is all about calories. This is true - sort of. Type http://www.second-opinions.co.uk/do-calories-really-count.html into your Internet browser's address bar. Weight loss is ***mostly*** determined by (calories eaten - calories excreted) - calories burned. So, if all you're interested in is weight loss, put this book down and just count calories. If however, you wish to lose body-fat without losing muscle, you need to know how to determine what proportions of proteins, carbs and fats to eat. You need to know the difference between good carbs & bad carbs and good fats & bad fats. You need to know the optimum times to eat proteins, carbs and fats. You need to know the difference between good exercise and bad exercise.

Good carbs, Bad carbs

As mentioned in Chapter 1, the body's carb requirements vary from person to person and increase with intensity of exercise done. So what are the best carbs to eat? Complex ones from "wholegrain" cereals? No.

Simple vs. Complex

TV ads for breakfast cereals bang on about the wholegrain goodness of complex carbohydrates. The terms "Simple" and "Complex" actually refer purely to the chemical structure of a carbohydrate and have nothing to do with how fast they turn into blood glucose in the body. The Glycaemic Index (GI) (or Glycemic Index if you're American) relates to how fast carbohydrates turn into blood glucose in the body. Type http://www.mendosa.com/gilists.htm into your Internet browser's address bar to learn about GI and see a list of 750 foods and their GI & GL (GL = Glycaemic Load = GI/100 x carb content per serving). If you don't have Internet access, I'm afraid I'm not putting the full list here! Here are a few extracts. Note: a GI of 55 is low; a GL of 10 is low.

Food	GI	Portion (g)	GL
Baguette, white, plain (France)	95±15	30	15
Coarse rye kernel bread, 80% intact kernels and 20% white wheat flour	41	30	5
White wheat flour bread (mean of 6 studies)	70±0	30	10
Wholemeal (whole wheat) flour bread (mean of 13 studies)	71±2	30	9
Bürgen ® Soy-Lin, kibbled soy (8%) & linseed (8%) loaf	36±4	30	3
All-Bran (mean of 4 studies)	42±5	30	8
Cornflakes (mean of 5 studies)	81±3	30	21
Grapenuts (mean of 2 studies)	71±4	30	15
Porridge made from rolled oats (mean of 8 studies)	58±4	250	13
Instant Porridge (mean of 2 studies)	66±1	250	17
Shredded Wheat (mean of 2 studies)	75±8	30	15
Baked Russet Burbank potatoes (mean of 4 studies)	85±12	150	26
Boiled potato, boiled in salted water, refrigerated, reheated (India)	23	150	8
Instant Mashed potato (mean of 6 studies)	85±3	150	17
New Potato (mean of 3 studies)	57±7	150	12
Sweet potato (mean of 5 studies)	61±7	150	17
Chickpeas (Garbanzo beans), boiled (mean of 4 studies)	28±6	150	8
Instant rice, white, boiled 1 min	46	150	19
Instant rice, white, cooked 6 min	87	150	36
Rice, boiled in salted water, refrigerated 16-20h, reheated (India)	53	150	20
Sucrose (table sugar) (mean of 10 studies)	68±5	10	7
Glucose (mean of 11 studies)	99±3	10	10
Fructose (fruit sugar) (mean of 6 studies)	19±2	10	2

The last three items in the list are all simple carbs. As you can see, many so-called complex carbs turn into blood sugar faster than table sugar! As fructose has such a low GI, does this mean that we can eat as much of it as we like? No.

When we eat fructose, it passes from the small intestine into the portal vein and goes straight to the liver. As liver cells contain an enzyme called fructokinase (which has a high affinity for fructose), all dietary fructose is absorbed by the liver where it tops-up liver glycogen. Liver glycogen is also topped-up by glucose (obtained from starchy carbs). Once liver glycogen stores are full, any excess fructose is converted to.....**triglycerides**.

Why is GI important? When we eat natural carbohydrates and they slowly raise blood glucose levels, pancreatic beta cells secrete a hormone called insulin, which allows glucose to pass into cells

(by moving Glu-T4 transporters inside the cells). As glucose enters cells, glucose levels in the blood slowly fall back to normal. It's a negative feedback loop. Humans evolved on a diet of natural carbohydrates and so the secretion of insulin never had to change blood glucose levels very rapidly.

When unnatural high-GI carbs are eaten, blood glucose levels rise faster than the body is used to. This results in over-secretion of insulin (hyperinsulinaemia). This then shuttles too much glucose into cells and results in.....low blood glucose! Rapidly-falling and low blood glucose levels cause feelings of severe hunger and cravings to eat more carbs. It's a vicious circle. Hyperinsulinaemia has other bad effects on the body. Type http://www.mercola.com/2001/jul/14/insulin.htm into your Internet browser's address bar to learn about Insulin and its Metabolic Effects.

Unfortunately, a weakness of GI is that adding fats and some proteins to high-GI foods lowers the GI but ***can*** increase hyperinsulinaemia. Saturated fats and omega-6 polyunsaturates raise the insulin secretion produced by carbs. Monounsaturates have little effect and omega-3 polyunsaturates lower the insulin secretion produced by carbs.

There ***is*** another index called the Insulin Index (II). Type http://www.mendosa.com/insulin_index.htm into your Internet browser's address bar to learn about II. If you don't have Internet access, here is an extract:-

Food	**Glycaemic Score**	**Insulin Score**
BREAKFAST CEREALS		
All-Bran	40	32
Porridge (Oatmeal)	60	40
Muesli	60	40
Special K	70	66
Honeysmacks	60	67
Sustain	66	71
Cornflakes	76	75
CARBOHYDRATE-RICH FOODS		
White pasta	46	40
Brown pasta	68	40
Grain [rye] bread	60	56
Brown rice	104	62
French fries (chips)	71	74
White rice	110	79
Wholemeal bread	97	96
White bread	100	100
Potatoes	141	121
PROTEIN-RICH FOODS		
Eggs	42	31
Cheese	55	45
Beef	21	51
Lentils	62	58
Fish	28	59
Baked beans	114	120
FRUIT		
Apples	50	59

Oranges	39	60
Bananas	79	81
Grapes	74	82
SNACKS AND CONFECTIONS		
Peanuts	12	20
Popcorn	62	54
Potato crisps	52	61
Ice cream	70	89
Yoghurt	62	115
Mars bar	79	112
Jellybeans	118	160
BAKERY PRODUCTS		
Doughnuts	63	74
Croissants	74	79
Cake	56	82
Crackers	118	87
Cookies	74	92

The above list has a few surprises. Some proteins produce a large insulin response. Whey (milk protein is 20% whey and 80% casein) produces a large insulin response. Another effect of excess insulin secretion is that fat-burning is reduced and fat-storage is increased, not exactly what someone who wants to lose body-fat really wants! Therefore, consumption of foods with an II greater than 60 should be minimised for optimum fat loss. So baked beans ("my carbohydrates are ***exceedingly*** complex") are out. Overcooking foods raises GI (& II) and baked beans are well-overcooked in a sugary sauce. On the other hand, refrigerating foods lowers GI (& II) by changing the structure of the starch, even if the food is subsequently re-heated.

As the terms "Simple" and "Complex" are meaningless in terms of carbohydrates' effects in the body, I prefer to use the terms "**Slow**" and "**Fast**". In a nutshell, **Slow** carbs are good and **Fast** carbs are bad. These terms can be applied to proteins, too. Egg is **slow** and Whey is **Fast**. Sticking to mostly **Slow** foods keeps blood glucose and insulin levels stable, which results in better appetite control and better health, too.

It was soaring blood insulin levels that were sending me to sleep all those years ago. Hyperinsulinaemia results in amino acids being shuttled into cells, too. However, L-tryptophan isn't shuttled into cells, so the level of this amino acid rises relative to others in the blood. As L-tryptophan competes with other amino acids to cross the blood-brain barrier, now that the competition has been removed, a lot of L-tryptophan enters the brain. Here, it's converted into 5-hydroxytryptophan (5-HTP) and then serotonin. High serotonin levels in the brain cause sleepiness. As serotonin is also a "feel-good" substance, it's no wonder that carbs are addictive - they really ***do*** make you feel good. For more information on hyperinsulinaemia, type http://www.allyourstrength.com/ArticleDetail.aspx?ID=78 into your Internet browser's address bar.

So remember, "**Right carbs, right amounts, right times**" to quote ToxicToffee.

Good fats, Bad fats

In a similar way to the previous chapter, there's a lot of bad information in the media about fats. Saturated fats are usually described as "bad" and polyunsaturates are usually described as "good". This is simplistic. ***Everything*** is bad in excess, even polyunsaturates. The thing about fats is that there are four basic types (saturates, monounsaturates, omega-6 polyunsaturates and omega-3 polyunsaturates), and these must be consumed in roughly the right proportions for optimum health. Suffice it to say, the majority of people in the West do not eat them in anywhere near the right proportions. So, what exactly ***are*** fats?

FATS 101

Fats are an ester of glycerol and fatty acids.

1 molecule of glycerol + 3 molecules of fatty acid = 1 molecule of triglyceride (fat) + 3 molecules of water.

It's the fatty acids that determine whether a fat is sat, mono etc. The four different types of fatty acid all have a CH_3 at one end and a COOH at the other. The difference is in the middle section.

Saturated fatty acids have a middle section consisting of all CH_2's. Here's a diagram for Stearic acid (the predominant fatty acid in beef fat):-

```
  H H H H H H H H H H H H H H H H H H O
H-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-O-H
  H H H H H H H H H H H H H H H H H H
```

Monounsaturated fatty acids have one C=C bond in the middle, which happens to be 9 from the left-hand end resulting in monounsaturates also being referred to as omega-9's, as omega is at the **end** of the Greek alphabet. Here's a diagram for Oleic acid (the predominant fatty acid in olive oil):-

```
  H H H H H H H H      H H H H H H H H O
H-C-C-C-C-C-C-C-C=C-C-C-C-C-C-C-C-C-O-H
  H H H H H H H H H H H H H H H H H H
```

Omega-6 polyunsaturated fatty acids have two or more C=C bonds in the middle with the last one being 6 from the left-hand end. Here's a diagram for Linoleic acid (the predominant fatty acid in sunflower oil):-

```
  H H H H H      H      H H H H H H H O
H-C-C-C-C-C=C-C-C=C-C-C-C-C-C-C-C-O-H
  H H H H H H H H H H H H H H H H H H
```

Omega-3 polyunsaturated fatty acids have three or more C=C bonds in the middle with the last one being 3 from the left-hand end. Here's a diagram for Alpha-linolenic acid (the predominant fatty acid in flax-seed oil):-

```
  H H      H      H      H H H H H H H O
H-C-C=C-C-C=C-C-C=C-C-C-C-C-C-C-C-O-H
  H H H H H H H H H H H H H H H H H H
```

These diagrams are a bit misleading. Where there is a C=C bond, there are two H's on the "underside" only of the molecule. This asymmetry causes the H's to repel each other and bend the molecule into a V-shape at each C=C bond. C=C bonds with H's on the same side are known as "cis" bonds. The above molecule is really cis, cis, cis (c,c,c) Alpha-linolenic acid. The other type of C=C bond is known as "trans" and looks like the following diagram:-

```
  H H H   H H   H H   H H H H H H H O
H-C-C-C=C-C-C=C-C-C=C-C-C-C-C-C-C-C-O-H
  H H   H H   H H   H H H H H H H H
```

This is a diagram of trans, trans, trans (t,t,t) Alpha-linolenic acid. As the H's are on opposite sides of the molecule, they do not repel each other and the molecule is straight as shown above. Note that saturated fatty acid molecules are naturally straight. Therein lies the problem with trans-fatty acids. They're straight like saturated fatty acids but have unsaturated bonds which are prone to oxidation. Type http://www.cyberlipid.org/perox/oxid0002.htm into your Internet browser's address bar. **WARNING!** Heavy-duty organic chemistry!

Our bodies take trans fatty acids and incorporate them into cell membranes as if they were saturated fatty acids. This results in atherogenicity (artery-clogging), damage to the immune system and other health problems. Trans-fatty acids are found in partially-hydrogenated vegetable oils and so any processed foods or cooking/spreading fats which has the word "**hydrogenated**" high-up in the ingredients list should be avoided. These are **bad** fats. There are also naturally-occurring trans-fatty acids made by bacteria in the stomachs of ruminant animals, like Conjugated Linoleic Acid (CLA). This looks a bit like the diagram below:-

```
  H H H H H     H   H H H H H H H H O
H-C-C-C-C-C=C-C=C-C-C-C-C-C-C-C-C-C-O-H
  H H H H H H H   H H H H H H H H H
```

This has one of the C=C bonds shifted to the left and also has one cis bond and one trans bond, so the molecule is always bent. CLA has certain beneficial properties but medical studies show mixed results. It's certainly not artery-clogging, so don't let anyone put you off eating butter from grass-fed cows (e.g. New Zealand butter) by suggesting that it has nasty trans-fats in it. CLA is a **good** trans-fat.

Anyway, back to diet. I've read that saturated fat consumption should be about 10% of total calories. This is because, even though sat fats are not essential (our bodies can manufacture sat fats), this guarantees adequate levels of sex hormones in the body. I've also read that total polyunsaturate consumption should be about 5% of total calories, with a ratio of omega-6 (O6) to omega-3 (O3) of 2:1. As O3's are only found in greater quantities than O6's in flax-seeds (a.k.a. linseeds) and oily fish, and many people eat way too little or no oily fish (and who, other than body-builders and some vegetarians/vegans, eats flax-seeds?), the O6:O3 ratio in the West is about 20:1. This is due to the widespread consumption of meats, eggs & milk from grain-fed animals, grains, nuts and seeds. So, it's not surprising that there are high rates of heart disease and other inflammatory diseases in the West, as O6's end up in series 1 & 2 prostaglandins and series 2 prostaglandins are pro-inflammatory. O3 fats end up in series 3 prostaglandins, which are anti-inflammatory.

So eat up yer oily fish if you're not vegetarian or vegan. Otherwise, eat up yer ground-up flax-seeds!

Monounsaturates can make up 15% to 35% of total calories, depending on activity levels. Remember from the histogram in Chapter 1, **sedentary** people on average burn twice as much energy from fats as from carbs. So, if energy from protein is 25% say, 25% of energy can come

from carbs and 50% can come from fats i.e. a 2:1 ratio of fats:carbs. The cyclists at the left-hand end of the histogram in Chapter 1 would do best on 25% protein, 5% carbs, 70% fat when sedentary, whereas the cyclist at the right-hand end of the histogram would do best on 25% protein, 60% carbs, 15% fat when sedentary. When active, more carbs are needed by everyone.

Which fats contain which fatty acids? Type http://www.manitobaharvest.com/nutrition/index.asp?itemID=183 into your Internet browser's address bar to see a Comparison of Dietary Fats chart. Type http://www.apag.org/oleo/fatsoils.pdf into your Internet browser's address bar to see tables of Properties and Composition of Vegetable and Special Oils, and Properties and Composition of Animal and Marine Fats and Oils.

For high-temperature cooking, saturates are the least likely to oxidise (when they're on fire, they're oxidising!), followed by monos, then omega-6's and then omega-3's. An oil doesn't have to be smoking to be oxidising. Alpha-linolenic acid oxidises at room temperature, which is why linseed oil is used to varnish cricket bats and thin putty. The best non-animal fat for high-temperature cooking is therefore Olive Oil. Extra-virgin Olive Oil has a lower smoking point than refined Olive Oil (due to higher levels of free fatty acids), but has higher levels of polyphenol antioxidants, which is good.

Good cholesterol, Bad cholesterol

Just as there is misinformation about carbs and fats in the media, there is also misinformation about cholesterol. First, the media implied that all cholesterol was bad and that "your number" had to be lowered by any means. The media now state that HDL is good cholesterol and should be raised and LDL is bad cholesterol and should be lowered. This is still wrong.

There is no such thing as good cholesterol and bad cholesterol. Cholesterol is good and that's that. So why is this chapter named "**Good cholesterol, Bad cholesterol**"? Er, pass!

To learn about the structure and functions of cholesterol, type http://www.cholesterol-and-health.com/index.html into your Internet browser's address bar. This informative site by Chris Masterjohn explains things in an easy-to-understand way. His use of a car analogy is good, so I shall expand on it here. What ***is*** cholesterol?

CHOLESTEROL 101

Cholesterol is a large molecule ($C_{27}H_{45}OH$) consisting of a hydrocarbon (fat-soluble) tail, a middle section consisting of four carbon rings (the steroid bit) and an alcohol (water-soluble) group on the end. Cholesterol is a powerful antioxidant and is what bile acids, mineralcorticoids, glucocorticoids, and sex hormones are made from. It is "chauffeured" around the body in lipoprotein "limousines". Lipoproteins are lipo (fat-soluble) at one end and protein (water-soluble) at the other end and form a spherical shell around their contents with the lipo end pointing inwards and the protein end pointing outwards. The shell is akin to the body of the limo. Inside the limo, there are apo(lipo)proteins which are akin to the driver, as they determine where the particles end up. The passengers are cholesterol, cholesteryl esters, phospholipids and triglycerides.

These limos come in different variants, like chylomicrons, VLDL, LDL, IDL and HDL, the difference being the type and amount of apoprotein and the relative proportions of cholesterol and other ingredients, and there are sub-groups of each type also. Complicated, innit? To learn about chylomicrons etc, type http://www.umanitoba.ca/faculties/medicine/units/biochem/coursenotes/blanchaer_tutorials/LipTutWeb/pages/choices.htm into your Internet browser's address bar.

The different variants are affected by how much **triglyceride** there is around. High serum triglycerides result in cholesterol-depleted, triglyceride-rich particles and low serum triglycerides result in cholesterol-rich, triglyceride-depleted particles. Therein lies the problem. As cholesterol is a powerful antioxidant, these small, dense (Type B) cholesterol-depleted particles are more prone to oxidation than the large, buoyant (Type A) cholesterol-rich ones.

LDL that becomes oxidised is now ***bad*** LDL and is swallowed by scavenger macrophages. These then swell-up into foam cells which then embed themselves into artery walls. Unoxidised LDL is not bad. Unoxidised HDL is good, too. High serum triglycerides can result in more-easily oxidised HDL, so even HDL can become bad under the right (or wrong, rather) conditions. Therefore, high serum triglycerides encourage **atherogenicity** (artery-clogging).

All things being equal, high cholesterol ***could*** result in high oxidised cholesterol which is why everyone bangs on about lowering "your number". People with hereditary sky-high serum cholesterol levels are at a high risk of artery clogs. However, if you don't smoke, you eat foods high

in natural antioxidants and your triglycerides are on the low side, your number is pretty irrelevant if it's under 7.0.

For a rather different viewpoint on cholesterol from the norm, type http://www.ravnskov.nu/cholesterol.htm into your Internet browser's address bar.

It's possible to reduce triglycerides quite drastically by eating long-chain omega-3 fats from oily fish. These inhibit the conversion of glucose into triglycerides, but beware. Inhibiting the conversion of glucose into triglycerides can result in increased blood glucose levels (not good) if sugary/starchy carb intake is too high. Solution? Reduce the intake of sugary/starchy carbs. Job done!

Fish oils also dramatically reduce overall mortality rates and mortality rates from coronary events when compared to control groups, and the reduction is almost twice that obtained from the use of statin drugs for cholesterol reduction, despite the fact that fish oils don't lower cholesterol at all. Type http://www.allyourstrength.com/ArticleDetail.aspx?ID=173 into your Internet browser's address bar.

What about eating cholesterol? Well, the liver secretes about 1,000mg of cholesterol per day. As cholesterol is eaten, the liver secretes less to compensate. As an average egg contains about 200mg of cholesterol, you can eat two eggs per day (400mg of cholesterol per day) without significantly affecting cholesterol levels in the blood. Type http://www.ajcn.org/cgi/content/abstract/32/5/1051 into your Internet browser's address bar. So why do current "Healthy Eating" guidelines recommend no more than 3 eggs per week? Because they're…….?

Healthy Fat Loss Guidelines

Having established what's good and what's bad, here are some guidelines for healthy body-fat loss. Please note that these guidelines have not been evaluated by any health agency and don't exactly conform with current "Healthy Eating" guidelines either, but then you know what I think of current "Healthy Eating" guidelines!

1) Eat 6 meals, or 3 meals and 3 "snacks" per day to keep your metabolic rate high. Skipping breakfast is **not** an option.

2) All meals and "snacks" should contain proteins, fats and fibrous carbs i.e. all meals and snacks should be "balanced".

3) **Slow** sugary/starchy carbs can be eaten at breakfast and in meals/snacks before and after workouts/exercise/intense activity. If/when you are sedentary, keep slow carbs to a minimum. Keep **fast** sugary/starchy carbs to a minimum all the time (except for the odd treat) as they cause wild swings in blood glucose and insulin levels. **The more intense exercise you do, the more slow sugary/starchy carbs you can eat.**

4) Drink >1.5 litres of no added sugar watery drinks per day. If your urine is too dark, you need to drink more.

5) Balance your omega-6 and omega-3 essential fatty acids (EFAs) by eating omega-3 rich oily fish (sild, sardines, pilchards, mackerel, herring, salmon, trout, fresh tuna etc) or cracked/ground-up linseeds (a.k.a. flax-seeds) or supplement with enough fish oil or flax-seed oil capsules to get 2g of omega-3 per day.

6) Eat 2 to 3 portions of low-sugar fruits per day - preferably before meals/snacks. Minimise consumption of high-sugar fruits.

Proteins are:- Meats, poultry, fish, eggs, cheese, Quorn, seeds, nuts, legumes (peas, beans & lentils).

Fibrous carbs are:- All veg that grows above ground level, bulbs (onions, leeks, garlic), non-sweet fruits (tomatoes, peppers, olives, aubergines, avocados, cucumbers/courgettes etc).

Slow sugary/starchy carbs are:- All-bran, no added sugar muesli, non-instant oats, sweet potatoes, lightly-boiled new potatoes cooled and refrigerated, brown Basmati rice, non-overcooked legumes & root veggies, lumpy wholegrain rye breads and Bürgen/Vogel's soya & linseed bread.

Fast sugary/starchy carbs are:- White wheat breads, wholemeal wheat breads, most breakfast cereals including Shredded wheat, Weetabix, Cheerios, Grapenuts etc, cereal bars, sugar, sweets, chocolate, cakes, biscuits, jacket potatoes, overcooked root veggies, sweetcorn and overcooked legumes like baked beans.

Low sugar fruits are:- Berries, stone fruits, citrus, tart apples, pears, dried apple rings, apricots, pear halves, peach halves and prunes without added sugar.

High sugar fruits are:- Ripe bananas, grapes, pineapples, sweet apples, sultanas, raisins, currants and dried fruits with added sugar.

Fats are sats, monos and the EFAs mentioned above. Butter is high in sats and monos. Olive oil & spreads are high in monos. Sunflower oil & spreads are very high in omega-6 EFAs - avoid. Don't fry or roast with high-EFA oils as they oxidise. Meats contain sats, monos and some EFAs. Minimise consumption of foods with the word "**hydrogenated**" in the ingredients list.

Note: Some foods fall in-between categories like unripe bananas which are medium speed sugary/starchy carbs.

Depending on your insulin sensitivity, speed of metabolism and exercise levels, you may get away with eating some fast sugary/starchy carbs - you'll just have to suck it and see.

6

Too much carbs, Not enough carbs

As stated in previous chapters, eating too much carbs raises triglycerides and makes you fat. What happens if you eat too few carbs? Interestingly, the proportions of fat & carbs that the body uses for fuel can be shifted. Referring to the histogram in Chapter 1, as glycogen stores are filled, fat-burning decreases and carb-burning increases. The opposite happens as glycogen stores are depleted.

It seems obvious then that to maximise fat-burning, glycogen stores should be depleted as much as possible. This is how low-carb, high-protein & fat diets work. Is there a danger if glycogen stores become fully-depleted? It all depends.....

As blood glucose levels fall, glucagon (which is secreted by pancreatic alpha cells when blood glucose levels drop below normal) converts liver glycogen into blood glucose. When liver glycogen stores are fully-depleted, ketones (by-products of the increased fat-burning) in the blood rise. As glucose contains 4kcals/g and D-3-hydroxybutyrate contains 5kcals/g, tissues like the brain, nerves, kidneys and muscles (but not the liver) can switch over to ketones as a fuel which can replace 60% of the energy that glucose was providing. This is an adaptation to starvation which reduces muscle wastage. The presence of ketones in the blood is known as ketosis. See the next chapter for an explanation of why ketosis won't hurt you - unless you starve yourself.

Lack of liver glycogen means that blood glucose has to be produced from amino acids like glutamine etc. This process is called gluconeogenesis and is also controlled by the hormone glucagon. Gluconeogenesis is a slow process. If intense exercise is done (which shifts the balance of fuel usage towards carbs), glucose can be used-up faster than it can be produced. This results in **hypoglycaemia**, which makes the sufferer feel light-headed, dizzy, headachy, hungry etc. At least this results in symptoms that make the sufferer eat some carbs. Eating too much carbs produces no symptoms at all.

Hypoglycaemia is not good, as the body produces the stress hormone cortisol in a panic attempt to raise blood glucose levels. Cortisol catabolises (breaks down) muscle into amino acids and also eats away at bones and skin.

This means that the more intense exercise you do, the more sugary/starchy carbs you need, which is what I said in the last chapter on healthy fat loss guidelines.

Ketogenic diets and Ketoacidosis

Everybody knows that ketogenic diets like Atkins' destroys your kidneys and rots your bones, right? WRONG! Everybody knows that diets like Atkins' cause ketoacidosis which is a very dangerous condition requiring urgent hospital treatment, right? WRONG!

There's a lot of nonsense spoken about ketogenic diets by people who really should know better. I suspect that they have been taught wrongly at uni or med school. As Diana Schwarzbein MD said in "The Key to Healthy Diets and Weight Loss" (type http://ultimate-low-carb-diet-tip.com/healthy-diets-weight-loss.html into your Internet browser's address bar).

"Knowing what I know today, it is still hard for me to accept that between 1981 and 1990, while I was in nine years of medical training, my instructors were teaching me and everyone else in medical training that a low-fat diet was the way to prevent obesity, diabetes, and heart attacks.

My instructors stressed the "fact" that eating fat not only made you fat but also caused a host of health problems. These professors spoke of hundreds of studies that they said proved that fat was indeed the culprit in creating a national epidemic of obesity, diabetes, and heart disease.....

But these studies about healthy diets proved to be **wrong**."

Ketosis is not ketoacidosis.

Consider the following four cases:- Note: Figures are from "Introduction to Nutrition and Metabolism" By David A Bender (Senior Lecturer in Biochemistry, UCL)

1) Healthy human, fed state: Glycogen stores are **replete**. Serum glucose = ~5.5mmol/L. Serum fatty acids = ~0.3mmol/L. Serum ketones = 0mmol/L. No gluconeogenesis is taking place. Amino acid pool is **replete**. Cortisol level = **normal**. **No loss of bone density or muscle mass**.

2) Healthy human, starvation for 7 days: Glycogen stores are **depleted**. Serum glucose falls to ~3.5mmol/L. Serum fatty acids rise to ~1.2mmol/L. Serum ketones (mainly D-3-hydroxybutyrate) rise to ~4.5mmol/L (not high enough to cause acidosis). Gluconeogenesis is occurring. Amino acid pool is **depleted**. Cortisol level = **sky-high**. **Bone density & muscle mass slowly decreasing**. THIS IS BAD KETOSIS.

3) Healthy human, low-carb diets: Glycogen stores are **depleted**. Serum glucose falls to ~5mmol/L. Serum fatty acids rise to ~1.2mmol/L. Serum ketones (mainly D-3-hydroxybutyrate) rise to ~4.5mmol/L (not high enough to cause acidosis). Gluconeogenesis is occurring. Amino acid pool is **replete** (due to high protein intake). Cortisol level = **normal**. **No loss of bone density or muscle mass**. THIS IS GOOD KETOSIS.

4) Human with untreated type 1 diabetes: Glycogen stores are **depleted**. Due to lack of insulin, the Glu-T4 transporters in cells cannot move to the surface so glucose cannot enter cells. Serum glucose = >20mmol/L. This causes major damage to kidneys, arteries, eyes, nerves etc by cross-linking with proteins (glycosylation) resulting in major disability and eventual death. As the body is FORCED to run off fatty acids & ketones, metabolic processes are out of control and ketones rise to MUCH higher levels than in 2) or 3) (I don't know how high exactly) resulting in acidosis and death. THIS IS KETOACIDOSIS. I don't know about cortisol levels but they are pretty irrelevant as death by other means occurs.

Conclusions: Low-carb diets are ***similar*** to starvation in that serum glucose levels are lower than normal and glycogen stores are depleted. The body is ENCOURAGED to burn less glucose and more fatty acids but the metabolic processes are all **under control**. The big difference between low-carb dieting and starvation is in the amino acid pool and cortisol levels.

Useful advice for vegetarians & vegans

Firstly, by vegetarian, I mean someone who does not eat the flesh of animals. This includes fish and chicken.

A vegan MD, Dr. Michael Greger (type http://www.drgreger.org/talks/#nutrition into your Internet browser's address bar) has a very informative and witty lecture on "Optimum Vegetarian Nutrition: Surprising New Research on Omega 3's and B12".

In a nutshell, vegetarians & vegans have the ***same*** mortality rates as omnivores - a study of 28,000 subjects showed this. Vegetarians & vegans have the ***same*** rate of heart disease as omnivores but ***double*** the rate of degenerative brain diseases like Alzheimer's. WHY?

There are two reasons.

1) Vegetarians and vegans don't eat oily fish and most don't eat cracked or ground-up linseeds either. This means that the ratio of O6 to O3 fats in their diet is way too high. This ***increases*** the risk of diabetes, certain cancers and heart disease.

2) Only animal produce naturally contains Vitamin B12. Lack of B12 in the diet raises the level of homocysteine in the blood, which attacks artery walls. This ***raises*** the risk of heart disease and Alzheimer's.

What to do?

1) Eat 1 heaped tablespoonful of cracked or ground-up linseeds per day, or add 4ml of flax-seed oil to food per day, or take four 1000mg flax-seed oil capsules per day.

2) Supplement with vegan B12.

'Nuff said?

Gluten - a pain in the .....?

Remember the advert "I'm feeling a bit bloated". "Here, have some Bifidus Digestivum!"? I wonder what percentage of the population suffer from either bloating, tummy pains, constipation, IBS, or a failure to properly absorb the nutrients from their food?

People with Coeliac Disease (CD) or Dermatitis Herpetiformis (DH) (intensely itchy spots on pressure points) have to avoid gluten as much as possible, as it produces an allergic reaction, with antibodies that attack the body (auto-immune disease).

However, gluten is implicated in other conditions due to molecular mimicry. Sjogren's Syndrome (dry eyes & other bits) and cerebellar ataxia (brain rot) are mentioned in the huge article "Cereal Grains: Humanity's Double-Edged Sword" by Loren Cordain (type http://www.thepaleodiet.com/articles/Cereal%20article.pdf into your Internet browser's address bar). Note: Hyperlinks with %20 in don't work properly!

Anecdotal evidence suggests that there ***are*** conditions other than CD or DH which can benefit from switching from gluten-containing grains (wheat, rye, oats, barley, spelt) to non-gluten-containing ones (rice, corn, quinoa, buckwheat, millet). Luckily, supermarkets like Waitrose and Sainsbury's have a large "Free from" section nowadays, which makes finding gluten-free substitutes for breads, cakes, biscuits, breakfast cereals etc a lot easier.

10

Good exercise, Bad exercise

As stated at the beginning of this epic work, it's all about fat loss, not weight loss. Exercise improves fitness, I'm not arguing about that. However, as a way of losing body-fat, it's not very good. You have to burn 3,500kcals to lose just one measly pound of body-fat. That's a helluva lot of exercise, and as stated before, too much exercise or exercise done at the wrong time can result in muscle loss.

In fact, just plodding away on a treadmill, apart from being incredibly boring, is not actually the most efficient way to burn body-fat. Cardio "bunnies" read on.

The smart way to burn body-fat is to combine Endurance Training with Weight (Resistance) Training. Type http://www.exrx.net/FatLoss/WT&End.html into your Internet browser's address bar.

"At the conclusion of the study, the "endurance only" group lost a total of 3.5 lbs.; 3 lbs. of which was fat ***and a half pound was muscle loss***. On the other hand, the "endurance and weight resistive" group lost 8 lbs. with an actual fat loss of 10 lbs. ***and an increase of 2 lbs. of lean body weight***." That's the way to do it!

The other smart way to burn body-fat is to do High-Intensity Interval Training (HIIT). Type http://www.exrx.net/FatLoss/HIITvsET.html into your Internet browser's address bar.

"The HIIT group lost over 3 times as much subcutaneous fat as the ET group despite of only expending less than half as many calories."

Also, type http://www.musclemedia.com/training/hiit.asp into your Internet browser's address bar. You need to be pretty fit to do HIIT - it's not for couch potatoes.

Finally, about "toning". It's not possible to control where your body burns fat from, so it's not possible to "tone" a specific body-part, although it ***is*** possible to build muscle in specific places. Anyone who promises you a toned tum & bum is after your money. 500 sit-ups will just give you a sore tum, not a toned one, so don't do it!

Good combinations, Bad combinations

Some people believe in food combining i.e. don't eat protein with carbohydrate as protein needs acid conditions to digest and carbohydrate needs alkaline conditions to digest. This theory assumes that the human digestion system is like a barrel where all foods are digested at the same time. This isn't the case. The following is cribbed with some minor edits from a message board so I hope I'm not breaking copyright by printing this. Type http://forum.bodybuilding.com/showpost.php?p=1447655 into your Internet browser's address bar.

DIGESTION 101

The order you eat foods in does not make a difference to digestion. Once foods hit your stomach, the peristaltic motion (that is - the muscles in your stomach wall contracting) mix it all together regardless! Also, the different enzymes that are released are released regardless of the order that you eat your food.

In your stomach:-
The presence of food in your stomach stimulates:-
1. Gastrin - this is what is responsible for the eventual release of HCl - or stomach acid.
2. Pepsinogen - this is converted to pepsin by the acid in your stomach. Pepsin is important in the digestion of proteins.

In the small intestine:-
Once food hits the small intestine the pancreas and gall bladder are stimulated:-
1. Pancreas - It secretes many enzymes which help digest proteins, starches and triglycerides (fats).
2. Liver/gall bladder - This is responsible for making and secreting bile. This is important in fat digestion. It is stimulated more when you eat fatty foods.

The small intestine itself is also important, but it actually does not secrete anything. It acts to further digest the carbohydrates, proteins and fats, due to enzymes that are bound to the wall of the intestines, and then acts to absorb these things.

So - digestion occurs in two parts - the LUMINAL phase - which involves all of the enzymes that are secreted by the stomach, pancreas and liver. And the MEMBRANOUS phase which is that which occurs because of the enzymes attached to the intestinal wall. It does not matter when you eat carbohydrates or proteins or fats during a meal, because the simple stimulus of food in your digestive tract will cause the secretion of the luminal enzymes (although as you increase your fat, you will stimulate more fat enzymes to be released).

Carbohydrates:-
Starches are the only type of carbohydrates to undergo luminal phase of digestion. This results from enzymes (called amylases) that are released from the pancreas. These act to break down the long starches into shorter polysaccharides (intermediate chains called dextrins). These are then cleaved again to form Disaccharides or trisaccharides (such as maltose or maltotriose).

Sugars and the trisaccharides and disaccharides from the starches are then further digested in the Membranous phase. This involves enzymes (such as lactase - for the breakdown of lactose, sucrase for the digestion of sucrose and maltase for the breakdown of maltose) that are bound to the intestinal wall. So - these enzymes act on lactose, sucrose and the di and trisaccharides from the

breakdown of starch to form glucose, galactose and fructose. These are them absorbed across the intestinal wall and enter the blood to go to the liver.

The liver then takes up most of the glucose/galactose and all of the fructose and converts it into glycogen or fats while the rest stays in the blood for the rest of the body.

Proteins:-
These are broken down in a similar fashion as carbs. But - the enzymes involved in protein breakdown are secreted by the stomach (pepsin and chymosin) and the pancreas. There are lots of different enzymes involved in protein breakdown (because of the large variety of amino acids). So - digestion of proteins begins in the stomach with the secretion of HCl and pepsin which begin to cleave the long protein molecules. This then continues in the small intestines with the secretion of pancreatic enzymes.

These smaller chains of amino acids (called peptides) are then either broken down by MEMBRANOUS phase enzymes on the intestine cells to form amino acids or are absorbed as dipeptides or tripeptides and then convert to simple amino acids by the cells. The amino acids are then released into the blood and are taken to the liver.

In the liver, some of the amino acids go straight into circulation for the muscles, some are used directly for protein synthesis, but the rest are processed to enter the pathway of energy metabolism, carbohydrate formation or fatty acid formation.

Fats:-
This is a little different. Fat is harder to digest because it does not absorb in the fluids in your gut. The digestion of fat is divided into four stages:-
1. Emulsification - This begins in the stomach and involves the warming and mixing of the fats. This breaks the fats into globules. The bile acids from the liver are then secreted into the intestines and makes the fat droplets even smaller.
2. Hydrolysis - Enzymes from the pancreas (lipases) then act on the fats to form smaller molecules.
3. Micelle formation - These smaller molecules (free fatty acids, cholesterol, single chain fats etc) combine with bile to form tiny, droplets called micelles.
4. Absorption - The micelles then attach to the intestinal wall and all the components (except the bile) are then absorbed. These are then packaged (into things called chylomicrons) and secreted by the intestinal cells into tiny tubes in your intestinal wall called lacteals which take the fats straight to your heart, which then enters your back to your heart, which then pumps it to the body. These are then taken up by the liver or the fat cells.

These processes in the intestine take a while to complete (depending on what you eat) and so eating one thing 5 minutes after the other will have no effect.

Having said all that, there are certain combinations of food that are less desirable to eat than others, but not for reasons of malabsorption.

Don't eat high-GI carbs together with whey, saturated fat or omega-6 fats. High-GI carbs produce a large glucose and insulin response. Whey, saturated fats and omega-6 fats magnify the insulin response. This reduces fat-burning and increases fat-storage. Guess what? Virtually all junk foods are a combination of high-GI carbs and fats. The only time that an insulin spike is acceptable is if you have just finished a workout and are bulking (building muscle). That particular insulin spike would be obtained by swallowing whey with glucose or maltodextrin but not fat.

The only other dodgy food combination is fruit and protein. Fruit whooshes through the GI tract at high speed (possibly due to the fibre and simple sugar content stimulating peristalsis) and if eaten with slow-digesting foods like egg protein, result in the egg protein being whooshed through too quickly producing eggy farts!

Appendix

References & Interesting links

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Even ***I*** could understand this – and I'm blonde! – Emily P. Kent.

Un-put-downable – he'd covered it in sticky tape! – Eileen C. Surrey.