PROFESSOR TRIM'S
WAISTLINE

THE PROFESSOR'S FEATURES

AUTUMN 2006

Plateauing in weight loss

What it means and what you can do about it

Here's something you won't read about in the women's magazines: Weight loss is not a linear process. In other words, you're unlikely to lose a steady 1 or 2 kilograms per week until you get down to where you want to be.

Why don't the women's magazines talk about this? Because they don't want you/her to think there might be something a little less than magical about the diet/food/treatment/drug program they're trying to sell to you.

The truth is, weight loss is a dynamic process. Change one thing (eg. food or exercise), and the body changes other things (eg. metabolism, the rate at which you burn energy, etc.) to make sure that you don't disappear.

If you think about it, this makes perfect sense. There's a natural and evolutionary advantage in carrying extra body fat. It means that, come a famine, you will have enough stored energy to survive. Hence, the body defends this extra weight by changing things like your level of hunger, the rate at which you burn energy, your metabolism and the rate at which your body converts food into fat.

If you try to lose, these changes come into play to act against you. It's nature's way of stopping you from disappearing. Hence we have the familiar 'plateau'. This is a time when weight loss stops and what you're doing no longer seems to be working. It can happen at the start, in the middle or at the end of a program (see charts). But one thing is for sure. If you lose enough weight over a long enough period, you're bound to hit at least one plateau.

THE PROFESSOR'S POSITION ON PLATEAUS

Weight loss plateaus are universal – even someone starving to death will hit spots where weight loss stops for a while as the body adjusts to what is going on. So why don't popular weight loss programs recognise this? The answer seems to lie in its lack of immediacy. Plateaus usually only occur after initial weight loss (although not always). This is too long after the fact for the purveyors of the latest diet; they've moved on to the next one. But as you'll see in this issue, it's the answer to the long-term weight loss dilemma. Understand this, and you'll understand weight loss better!

What do we know about plateaus?

Given that plateaus are so obvious, the question is what do we know about them to help people through these difficult patches. The answer is not much. Out of all the obesity research currently being reported around the world, very little (with the exception of a notable few friends of the professor) is being done to improve our knowledge in this area.

In this glaring absence, what can we say about plateaus that makes sense in theory, if not in practice. Well here's a couple of pearlers from the professor's pocket:

1. Everyone losing (or gaining) weight will hit a plateau(s) at some stage.

Let's imagine you're stranded in the desert and have no food, but enough water to survive. Let's also say you start this venture at 100kg. This means that walking 1km to find food may use up

say, 100kcals of energy. But not finding any, this means that for the first few days and weeks, it's likely that you'll lose several kilograms, say down to 80kg. Now, walking that 1km only uses eg. 80 kcals (because you're carrying less body weight and are fitter). Hence you now have to go for 5kms to get the weight loss you used to get with 4kms. Your body's metabolism will also drop by eg. 10% from burning 1kcal/min to 0.9kcals per minute (or roughly 200kcals a day), and thus further putting the breaks on weight gain.

The speed with which this happens is variable and depends on a number of factors. But it's inevitable that plateauing will occur at some stage. Hence the drop in weight loss you'll experience is unlikely to be that shown by a straight line.

2. There are big individual differences in the timing and lengths of plateaus

Unfortunately, nobody can say when and for how long a plateau will occur for an individual. This is dependant on

in this issue

a number of factors not yet identified, but probably including the time having been overweight, age, gender and the actions taken to lose weight. The length of a plateau is also influenced by what is done at this stage *(see below)*.

3. A plateau is natural and is a period of adaptation

The great Harvard Nutritionist Jean Mayer once said:
"*Like a wise man will reduce spending when his income is cut, the body reduces the amount of energy it expends when energy intake (food) is reduced*".

HOW TO BREAK THROUGH WEIGHT LOSS PLATEAUS

General

- Take a holiday
- Go to bed earlier
- Get up later
- Go camping
- Go bushwalking
- Try different sex

Energy intake

- Try new foods
- Change eating patterns
- Try different drinks
- Eat different foods
- Go low carb (for a while)
- Change drinks

Energy expenditure

- Try different exercises
- Add weights to exercise
- Increase speed
- Walk a different route
- Walk backwards
- Stand for longer

The difference between the wise man and the body is that energy use (particularly metabolism) is dropped below that of energy expenditure in order to reduce the imbalance even more. In other words, a decrease of 10% in energy intake may lead to a decrease of 12-15% in energy expenditure, because, unlike the wise spender, the body can't afford to go into debt.

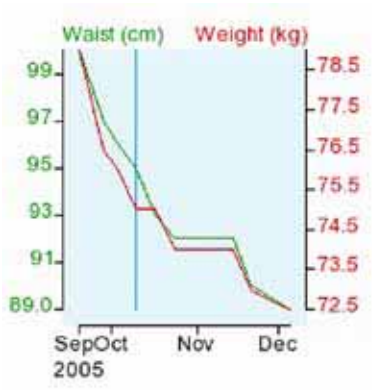
Plateaus occur as a result of the body's adaptation to the rate of energy intake in relation to energy expenditure.

4. Change is likely to be the best weapon against plateauing

Adaptation of the body comes about largely through routine ie. eating, drinking and exercising the same amount each day. So it's no surprise that the best weapon against plateauing is likely to be a break in routine ie. change. Weight gain occurs gradually over time largely because of small changes in energy use (through declining metabolism and activity) in relation to food intake over time. Similarly a change to the routine in the opposite direction is likely to cause a breakthrough in adaptation and a drop off a weight loss plateau. This can be brought about in a number of ways such as those shown in the table.

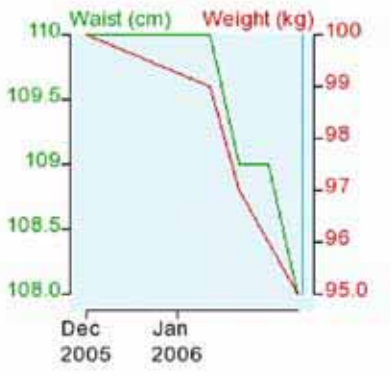
SOME INTERESTING PLATEAUING EXPERIENCES

The graphs below show some typical weight loss experiences on the Professor Trim's program.



1.**Sam**: Lost regularly to one plateau after 2-3 months. Then again on the downward.

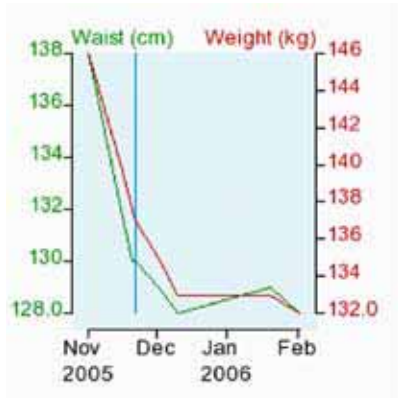
2. **Fred:** Erratic losses and plateaus, but mostly in the downward direction



3. **Ted:** Slow start (probably because of being long-term overweight) then dropped quickly

4. **Neil:** A smaller drop and longer first plateau than Sam, but then back in action.

5.**Jed:** relatively quick early drop in waist (fat) but then slowing as weight catches up



6. **Tom:** Now showing signs of getting off a sticking point after quick early losses

THE PROFESSOR'S PRACTICE

Diabetes Update

Because Type 2 diabetes is so intimately related to obesity, and because this is one of the fastest growing epidemics on the planet, the Professor has devoted a special section to latest findings in this issue. Now read on:

Tingling in the fingers and toes could be an early sign of diabetes

One of the common symptoms of type 2 diabetes is a 'burning' or 'tingling' sensation in the feet and/or fingers. The medical name for this is 'idiopathic neuropathy (IN)' and it begins because of a narrowing of the small arteries in the extremities.

In a study carried out in the US, this knowledge has been used to test whether IN can be a predictor of diabetes. Researchers took three groups of people; one with established diabetes and IN, one with diabetes but no IN and one with 'pre-diabetes', who have all the signs of progressing to full-blown diabetes, but not yet with the disease.

All of the prediabetic patients presented initially with numbness, pain, tingling or a burning sensation in the feet and, at times, also in the fingers. Researchers called this Ipaired Glucose Tolerance Neuropathy (IGTN). According to researcher, Dr. A. Gordon Smith of the University of Utah, "The neuropathy in patients with IGTN looks similar to the neuropathy of those patients with diagnosed diabetes."

This means early tingling or burning in the fingers or toes might be an early warning sign for Type 2 diabetes and even heart disease. Early actions to increase physical activity and change diet might help prevent progression once this is detected.

For reference:

Gordon Smith A, Robinson Singleton J. Idiopathic neuropathy, prediabetes and the metabolic syndrome. *Journal of Neurological Sciences*, 2006; January 27.

Risk Factors for Diabetes

Data from the Nurses Health studies in the US, shows dietary patterns most associated with risk of inflammation of the arteries (which is associated with risk of developing diabetes). These are diets which are:

High in:

- sugar-sweetened soft drinks;
- refined grains (eg white rice and white bread);
- diet soft drinks;
- processed meat (eg corned beef, burgers)

Low in:

- wine;
- coffee;
- cruciferous vegetables (eg cabbage, cauliflower, broccoli);
- yellow vegetables

This pattern was associated with a 2-9 times increased risk of developing compared to the healthiest pattern.

For reference:

Schulze et al. 2005. Dietary pattern, inflammation, and incidence of type 2 diabetes in women. *American Journal of Clinical Nutrition*. 2005; 82(3):675-84.

Diabetes treatments may not be so safe

Although it is now accepted that Type 2 diabetes is a lifestyle-based disease and therefore largely preventable, changes in medical management are going to require a significant shift. Effective medications for dealing with the problem have been available for some time and there is a well practiced progression of drug-use as the disease becomes worse.

Now however, for the first time, some questions are being asked about the safety of some of these drugs.

Insulin, has been the standard 'end-choice' drug since its discovery in the 1920s/ As this duplicates the actual hormone missing in the disease itself,. it would seem unlikely that insulin injections could cause harm. However, German researchers investigating a link between different forms of cancer and insulin have now re-opened an old argument *(European Journal of Medical Research, 2005;10(8):339-44)*. By following a group of type 1 and type 2 diabetics using insulin over a 10 year period, they found almost a 10 fold increase in cancers of the bowel and colon compared to the general public. The overall numbers were small however, and the researchers have suggested a need for larger studies before drawing firm conclusions.

Other diabetes drugs

In another recent study, Canadian researchers have raised a question mark over the use of another group of drugs (*Canadian Medical Association Journal*, Jan 17, 2006). The sulfonylureas are a group of medications used as a second line of treatment as diabetes progresses. Their safety has been questioned before, but a general view was that this was mainly the earlier, first generation version of these drugs.

The Canadian researchers looked at death rates in people who had taken two classes of these drugs (first and second generation) between 1991 and 1996 and a different class of drug (metformin) used to treat the disease at an earlier stage. They also looked at the dose levels of each type of drug taken.

Overall deaths were highest in those receiving high doses of the first generation drug, but they were also higher than those on the later generation sulfonylureas than on metformin. The researchers suggest the reason may be because the effects of these drugs targeted on the pancreas, could also work on the heart. Again the findings are preliminary, but a bit unsettling for the 7% of Australians currently now diagnosed as diabetic and the 15% who are pre-diabetic. More attempts might be made to prevent patients progressing to this second line of therapy if these findings are proven.

Type 2 diabetes is increasing rapidly in kids

As little as 10 years ago, Type 2 diabetes, a disease associated with being

DIABETES UPDATE (con't.)

overweight and inactive, was unheard of in children. This is in contrast to the auto-immune Type 1 form of the disease. Now, the rise in childhood incidence has shocked health scientists. In a small country like Fiji, the figure has gone from none in 2000, to 14 children with the disease in 2005. More tellingly, a national survey in the US published in the November 2005 issue of *Pediatrics*, has shown that 1 in 14 adolescents (7%), and 1 in 6 overweight adolescents (17%) now have symptoms of pre-diabetes, which is measured by abnormally high blood sugars. Usually this is a warning of fully developed type 2 diabetes within about 10 years. This is also reflected in the fact that around 25% of American children with diabetes have the type 2, lifestyle related form, compared to around 4% in 1995.

Diabetes risk could be seen in kids teeth

Diabetes can cause blockages in small blood vessels such as the hands and feet (see story on 'tingling'this issue). The small vessels of the eyes are also affected and hence blindness and eyesight difficulties are often common in diabetics. Now dentists are claiming a similar 'early warning' system in the gums and teeth. Comparing children and adolescents aged 6-18 with diabetes with those who did not have the disease, dentists in New York have shown a greater incidence of periodontal disease (loss of attachment of the teeth) in those with diabetes, particularly in those aged 12-18 (*Diabetes Care*. 2006;29(2):295-9). There were no differences between the groups in dental caries.This suggest that symptoms of diabetes may be picked up early through a thorough examination of teeth in adolescents. Periodontal disease in an overweight inactive child, could be a first warning sign.

Diabetes costs us all

We know a sickness like Type 2 diabetes costs the community. However a study carried out in Texas (*Diabetes Care*, Dec. 2005) has shown that it also affects the local economy. The study found that, for every $1 of lost income due to diabetes, another 36 cents is lost in reduced local spending. This is because adults with diabetes work less and even if they do work, spend less than those without the disease, thus hurting the local economy. Lower local spending can lead to layoffs and further reduced spending by others in the community who do not have diabetes but are impacted by its cost to the community at large.

trim's tummy ticklers

TYPICAL DISCOURSE BETWEEN MEMBERS OF THE HUMAN ENERGY CONSERVATION SOCIETY.

Weight loss terminology and what it means

The field of weight loss has given rise to its own language, some of which is difficult for the layperson to understand. Here's the Professor's spin on some of the most confusing terms:

Hunger/Appetite: There is often confusion between these even amongst scientists (and the dictionary). Hunger is the biological drive to need to eat. Appetite is the learned drive to want to eat. The first can't be put off, the second can.

Energy: Measured by calories or kilojoules and refers to capacity to do work, either in exercise or in food and drink.

Energy-density (ED): Number of calories (kilojoules) per gram of food/drink. High ED foods are more fattening

Energy balance: Balance between energy taken in (in food and drink) and that expended (as exercise, metabolism and heat loss).

Calories/Kilojoules: Measure of energy. 1Cal=4.2kJ and is the amount of heat energy required to raise the temperature of 1g of water by 1degree C.

Nutrient density: The number and amount of different nutrients, including vitamins and minerals.

Lipid: Another term for fat. Can also include things like cholesterol (not a true fat) and triglycerides in the blood.

Adipose tissue: Another term for groups of fat cells ie. on the belly of men and hips and buttocks of women.

Lipogenesis/Lipolysis: Lipogenesis refers to the making and deposition of fats or lipids in fat cells in the body and lipolysis refers to the break down and release of these to be used up as energy.

Glycaemic Index (GI): A measure (out of 100) of the speed of digestion of carbohydrate type foods. Foods with a high GI (>60) are digested quickly and can raise blood sugars. Foods with a low GI (<40) are digested slowly and may reduce hunger.

Protein Effectiveness Index (PEI): Doesn't exist yet, but will refer to the speed of digestion of different protein foods. In contrast to GI, a quickly absorbed protein satisfies hunger for longer and is the preferred option for weight loss.

THE PROFESSOR'S PICK

Critical periods for weight gain

These can ruin a good man (or woman)

According to the Professor, body weight is like sand on a beach. It comes and goes. But sometimes it builds up to a big wide beach, and other times it thins out, depending on the sand available.

With weight gain, this generally occurs slowly over a lifetime. However, there are some life stages and some life events where the risk is greater. It's worth being aware of these so you can take action — either before or during — to minimise the effect. Here's a list identified by the Professor, with the most common spelt out below:

Life stages

Puberty is a time in boys and girls where cell numbers in most parts of the body increase rapidly. If the lifestyle is poor (lack of exercise and bad nutrition) a greater number of fat cells can develop, making weight loss later in life difficult.

The ***peri-menopause*** in women is the 1-2 years leading up to the ***menopause***. Weight gain is most marked here, but can continue into the menopause as female hormones decline and fat is re-distributed from the lower to the upper body. Research has shown that traditionally living tribal women and those who remain active during this period do not gain weight, suggesting this is a lifestyle-based cause. In men, a less marked period occurs in mid-life, around 40, where a slowdown in metabolism, reduced activity levels and often an increase in food and drink make a stable weight difficult to attain.

Life events

The most fattening life event in modern women is pregnancy. Increases in weight here are normal, but unfortunately many women put on more than is required and then have trouble losing it after childbirth. The more children, the greater the chance of weight gain. ***Breastfeeding*** and a quick return to exercise are ways of reducing the effects of this.

Other life events that can fatten up both sexes include ***marriage*** (possibly because of the reduced effort chasing what is now 'on tap'), and ***quitting smoking***. The latter occurs largely because of the reduced metabolism that comes from eliminating nicotine. Improved taste and not having something to do with the hands, also contributes to an increased food intake.

Quitting sport is another life event that can lead to weight gain, with the greatest potential gains occurring in those competing at an elite level who then become sedentary.

Life Stages	
Men	**Women**
Puberty Mid-Life (40 yrs)	Puberty Peri-menopause Menopause
Life Events	
Men	**Women**
– – –	Pregnancy Childbirth (Not) Breastfeeding
Men and Women	
Marriage Quitting smoking Quitting sport Holidays Changing a job Grief and bereavement Festive occasions Divorce / separation After slimming	

What to do about critical periods

The most important thing about critical periods is to be aware that they exist and can lead to increases in body weight. In most cases working through these before trying to lose weight can be the best tactic.

Your kid's chances of becoming fat = 80% in their lifetime

According to the authoritative diabetes educational group www.diabetesincontrol.com, the rising incidence of diabetes is reflective of the epidemic growth of obesity and physical inactivity in the U.S. population. Of the children living with Type 2 diabetes, 85 percent were either overweight or obese at diagnosis. Roughly 70 percent of all diabetes cases can be directly attributed to obesity. Over the last two decades, the prevalence of overweight doubled among children 6-11 years of age and tripled among those 12-17 years of age. Currently, almost one-third of adults are obese and two-thirds are overweight. Fifty percent of adults will become obese and 80 percent will become overweight during their lifetime.

TRIM TIPS – 1

CRACK IT BEFORE DAWN

Any type of exercise before breakfast *(yes any type)* can result in more fat loss than from exercise after breakfast. This is because of the decreased availability of glucose in the fuel mix as a result of the overnight fast. Try this as an excuse for an early morning rumble in the jungle if all else has failed.

TALKING TURKEY WITH TRIM

Q. After starting on the Professor Trim program I've become more interested in health issues in general and am keen to know just how much water I should be drinking each day. I've heard 8 glasses is the optimum and would like to know if this is true.

A. Without meaning to be rude, could I point out the similarity between this question and the one about how long a piece of string may be. Think about it: If you lived outdoors in Timbuktu in summer, 8 glasses wouldn't touch the sides. If, on the other hand, you lived in Tasmania in winter, did very, very little and never went outside, you might only need 4 or 6. Of course the human body is very good at balancing hydration levels from day to day. It not only takes fluid from the water (and tea and coffee and other drinks) you consume, but it takes it from foods, most of which have a fluid component, but some of which (eg. fruit) has more than others.

To decide exactly how much you need you must consider the environmental conditions and your activity levels. More fluid is lost by those who are active and (obviously) in hot and dry conditions. However a recent report by the US army (*Nutrition Reviews*, 2005;63(6 Pt 2):S30-9) suggests that a daily water intake of 3.7L for adult men and 2.7L for adult women (about 15 and 11 standard 10oz glasses) meets the needs of the vast majority of people. This may be raised significantly however by strenuous physical exercise and heat stress.

Q. Weekends are a problem. You tend to go off your program, because it's different. What should I do?

A. This needs to be looked at carefully to see at what time of the weekend and why there is a problem. Some men like to relax with a few beers on Friday night. Some like to have a break from routine on Saturday and Sunday. It's most likely that eating out will occur on a friday and saturday and these are the times where recidivism is most likely.

There are two main approaches to weekends:

1. The first should be to attempt to modify the weekend behaviour causing the problem. For those who like to drink more at night, the obvious solution is to exercise more during the day, or eat less over the weekend as a whole.
2. For some men, weekends are seen as a break from routine and nothing much will make them break this. If this is the case, compensation has to be made during the week by either (a) moving more and (b) eating less.

In any case, it's important to stress that weekends are a problem for many men. While some find it hard to stick to their routine, others often find the extra time valuable for doing MORE exercise (e.g. walking further) which can help them party more on the weekend, and give them a head start for the week.

Q. Going out for meals is a problem. My mother always expects me to eat too much.

A. Sometimes the only solution to this is an extra 'trading off' period i.e. if there is no way out, eat less or exercise more on the following (or preceding day). Another useful tip for drinkers is to not start drinking until after a certain time (e.g. 6 pm). You can make a joke of this by telling people you never accept one before six and never knock one back after.

The reason for putting back the time of starting drinking is obvious. Many men have trouble refusing alcohol after starting drinking because alcohol reduces inhibition, but can do so before starting. By putting back the time of starting this reduces the total alcohol intake for the night.

While it often may not be possible to leave food, it may be possible to refuse whole servings such as desert, snacks and second helpings. If the total amount of food can be reduced and compensation can be made by trading off the next day, this provides a compromise to the problem.

Q. I'm losing off the arms and shoulders, but it doesn't seem to be coming off the waist.

A. Fat cells on the male upper body are all similar i.e. they're large and lipolytic i.e. they give up their fat as energy easily. The waist, for most men, is where they store reserves of fat last. It's a good, readily accessible store which can be accessed easily in hard times, such as famine.

But this doesn't mean fat isn't also stored elsewhere. It's a bit like blowing up a multi-shaped balloon. Different balloons pop out in different places when you blow. But ultimately all will expand totally if you blow hard enough. Generally, men store fat on the wait last. Hence this is the first place it comes off. But in some cases there will be losses off the arms, chin, chest etc., as well as the waist (usually there will be a corresponding decrease in waist). The idea is to keep at it. Eventually it will come off the waist as well.

TRIM TIPS – 2

EAT EARLY, EAT OFTEN

Breakfast is the most important meal of the day to raise metabolism and reduce body fat. Then, if you go for longer than about 4 hours without eating, hunger will build up and you'll be more tempted to eat things that were meant more as door-stoppers rather than food. Eat something like snacks, or fruit at least every 4 hours for better waist loss – or have a meal replacement.

PROFESSOR TRIM'S TABLE TALK

With the festive season over, we turn to some healthy sweets and snacks to bolster the morale through the cooler months. All are low in fat (though some may not be so conservative on energy density, so the Professor says don't overdo it).

BANANA DATE MUFFINS

(Makes 8 muffins)

1 cup wholemeal self raising flour
1 whole egg
1 egg white
1 tsp vegetable oil
1/3 cup brown sugar
1/4 cup apple sauce
½ tsp ground cinnamon
1 mashed banana (medium size)
1/3 cup chopped dates

1. Preheat oven to 200°C.
2. In a mixing bowl, beat together the egg and egg white.
   Add the oil, sugar, apple sauce, cinnamon and mashed banana and mix well.
3. Add the flour gradually, mixing together lightly. Gently fold in the chopped dates.
4. Spray a muffin pan with cooking spray and spoon in mixture.
   Bake for 35 - 45 minutes or until cooked.
   FAT <1g/muffin

SWEET CHILLI AND ONION DIP

(Makes approximately 3 ½ cup servings)

1 medium onion, roughly chopped
1 tbs water
200g low fat cottage cheese
2 tbs sweet chilli relish
½ tsp onion powder
½ tsp paprika

1. Mix together onion and water in a microwave safe container
2. Cook on high for 3 minutes, or until onion is tender.
   Rinse onion in cold water to cool.
3. Meanwhile, process the cottage cheese until smooth and all lumps are removed.
4. Place in chilli relish, onion powder and paprika and well drained onions and process until finely chopped (but not smooth)
   Serve chilled with crudites or rice crackers.
   FAT <1g/serve

SWEET POTATO CHIPS

(Serves 2 – 4)

1 large orange sweet potato, peeled
cooking spray
garlic salt

1. Preheat oven to 200°C.
2. Peel sweet potato and cut into slices approximately 1 cm. Cover a baking tray with aluminium foil and spray lightly with cooking spray.
3. Place sweet potato chips on the foil, spraying lightly with the cooking spray Sprinkle with garlic salt and bake for 20minutes.
4. Turn chips and also sprinkle with garlic salt. Bake for a further 5-10 minutes until golden. Chips will not be as crunchy as normal potato chips, but are very tasty.
   FAT <0.1g/serve

THE PROFESSOR'S POETRY

The Store

I ran a fish and chip shop,
She had a health food store.
I'd never really met her,
Though our shops were just next door.
She lived on sunflower seeds and rice,
I lived on fish and chips.
She weighed just 40 kilograms,
And I one forty six.
We fell in love one morning,
We were putting out the trash.
She was wearing beads and silk,
And I was smoking hash.
I saw her through a Chiko roll,
Twas then we both locked eyes.
She asked me in for guava juice,
I said "I'll bring the pies."
I nibbled on her carrot cake,
For which she felt obliged.
So she polished off a size 10 chook,
A burger and some fries.
She followed that with battered savs,
And lobster fricassee
With creamy sauce and all the while
I sipped her ginseng tea
She was on my steps next morning,
With her hands held our for more
So I filled her up with a great big cup
Of sweets so she wouldn't withdraw.
Then she offered me her honour
In exchange for even more.
I was honoured with her offer
'Till she tried to eat me – raw!
We did it then quite often,
And considered it was fate.
That she got fat and pimply,
While I kept losing weight.
Now for the perfect lifestyle
We both need look no more
Since she now runs my chip shop,
And I her health food store.

PROFESSOR TRIM'S REAR END

Looking into the fat cell

Advances in physiology have now made it possible to study fat cells — those tiny bodies that make up the gluggy mass on our bodies known as fat — in much finer detail than ever before. For example we now know that:

The average person has around 50 billion fat cells: These may only be tiny and contain about 0.0000001 of a micron of lipid (fat) each, but 50 billion of these can add up to a lot!

Girls have more fat cells than boys: For reproductive purposes, it's useful for females to have more fat cells than boys. This provides them with the energy to survive a famine through pregnancy and therefore continue the human race. The normal percent fat mass for girls therefore is between 15-35%, with a very fit athlete getting down to around 12%.The normal level for boys is between 12-24% with a very fit athlete getting down TO around 5%.

Too little fat leads to amenorrhea in women: It's as if Mother Nature knows that fat is necessary as an energy reserve for pregnancy. Hence if the female of most species becomes emaciated, through either exercise or starvation, a 'switch' is thrown to turn off menstruation and hence the prospects of becoming pregnant. This is what ultimately stops plagues of some species, like mice.

There are different depots of fat throughout the body: Although fat cells cluster in bunches, there are specific bunches where the function and size of cells differ. The main depots are visceral (around the organs of the trunk),subcutaneous abdominal (on the outside of the belly) and subcutaneous gluteal (on the hips and buttocks).

Few parts of the body are without fat cells: Pinch your belly and roll it through the fingers and you'll feel fat cells. Pinch the eyelids however, and you'll feel only skin. The elbows, the brain and, ironically the penis (in men only of course) have no fat cells.

Fat cell size and function differs on different parts of the body: Fat cells around the waist are generally bigger in size than those around the hips and buttocks. These also give up their fat more readily and are hence easier to diminish in size.

Fat cells differ in men and women: Although men and women do have fat cells all over the body, women have more of the smaller, less active gluteal cells which are designed to hold fat as an energy reserve for pregnancy. Men have more abdominal fat, which, on women, would not leave much room for a baby.

Increase in size is the biggest cause of obesity: Hyperplasia, or increase in fat cell size, is generally the main cause of increases in body fat – at least up to a point. When a point of extreme obesity occurs, baby fat cells (called pre-adipocytes), which sit between adult cells, start to spring to life and add a bigger petrol tank.

Hyperplasia occurs more readily at different life stages: Although becoming overweight generally comes from increases in fat cell size, an increase in numbers occurs at a couple of periods in life. This is usually when there is a growth spurt such as early childhood or puberty, or when there is a big increase in obesity (see above).

Fat cells are active: There was a time, only about a decade ago, when it was thought that fat cells are inactive and therefore not very interesting (especially compared with muscle cells). Now, new molecular biology techniques have shown that fat cells are very active, sending messages in the form of hormones and other chemicals to other parts of the body and receiving advice from other chemicals, the brain and who knows what else.

You can slice fat cells off but…: Once fat cell numbers increase there is little that can be done to reduce these. You just have to live with a bigger petrol tank. Plastic surgery and liposuction are both ways to get rid of fat cells – at least temporarily, but we don't know as yet how long these stay off. Certainly if the individual returns to an unhealthy, lifestyle, these cells are likely to be replaced.

Some newer fat cell findings: Three recent studies just published in the January 31st 2006 edition of the *International Journal of Obesity* at the time of going to press throw some new light on the fat cell.

1. Asians may have more 'visceral' fat In one, carried out in Japan, it's been shown that Japanese men have a higher proportion of visceral to subcutaneous abdominal fat than Caucasian men at the same level of overall body fatness.
This is important because it has long been known that Asians have a higher health risk than Caucasians even if they have the same waist measurement and body mass index. Visceral adipose tissue (VAT), is deep level fat around the viscera, or organs of the trunk. This is very active and tends to be much more closely linked with disease than the other type of 'subcutaneous' belly fat that makes up a 'pot belly'.

2. Exercise decreases abdominal fat more than diet A second study carried out in the US, examined the question of whether a diet alone, or a diet with low or high intensity exercise a has a differential effect on different fat cell depots.

Obese women were give a low calorie diet, or a diet with exercise that amount to the same number of calories as the diet alone. Fat cells in different parts of the body were examined to see if each of these regimes affected fat cells differently. The researchers found this was indeed the case. Although all groups lost about the same amount of weight, those given the exercise program as well as the diet tended to lose more from the subcutaneous fat cells around the waist, suggesting that these respond somehow differently to other fat cells. Because these are more linked to disease risk in women, this suggests that exercise might have a greater benefit for health improvements than diet in obese women.

3.Fat cells may be influenced by the type of fat in the diet. Researchers in Spain have looked at the number and inside of fat cells on different parts of the body using special techniques, and compared the results with the types of diets eaten.

The theory was that different types of fats (ie. 'good' and 'bad' fats) may have different effects on the fat cells. And yes, this was the case. Omega 3 and omega 6 fatty acids, which come from fish and vegetables and which are regarded as 'healthy', seem to be more associated with fewer abdominal fat cells which are also smaller in number than those which are present in people who eat a more saturated fat diet. Another type of fatty acid, known as omega 9 seems to be associated with fewer fat cells, suggesting that it may limit the growth in the number (or hyperplasia) of fat cells. The differences in response in the cells may be one explanation of why it is possible to lose weight on a particular type of diet including fats, while not losing on another — even though the calorie content is the same.