Research points to obesity as a potential cause of vitamin D deficiency (not the other way round)

by Dr John Briffa on 7 February 2013 in Specific conditions, Sunlight, Weight Loss, Women’s Health

Previous research has found a link between lower levels of vitamin D and higher body weight, causing some to speculate that vitamin D deficiency may be a factor in obesity. The problem with this sort of evidence is that while it can show a link between vitamin D deficiency and, say, obesity, we can’t tell if:

1. vitamin D deficiency can cause obesity
2. obesity can cause vitamin D deficiency
3. neither (the two things are merely associated with each other)

An international group of researchers have attempted to discern better the relationship between vitamin D and body weight, and published their findings this week in the on-line journal PLoS Medicine [1]. The researchers used genetic studies in their analysis. Here’s an edited version of the journal editor’s account of the research and its findings:

"Here, the researchers use bi-directional “Mendelian randomization” to examine the direction and causality of the relationship between BMI and 25(OH)D [vitamin D]. …if a lower vitamin D status leads to obesity, genetic variants associated with lower 25(OH)D concentrations should be associated with higher BMI, and if obesity leads to a lower vitamin D status, then genetic variants associated with higher BMI should be associated with lower 25(OH)D concentrations.

…the researchers showed that the BMI allele score was associated with both BMI and with 25(OH)D levels among the study participants. Based on this information, they calculated that each 10% increase in BMI will lead to a 4.2% decrease in 25(OH)D concentrations.

By contrast, although both 25(OH)D allele scores were strongly associated with 25(OH)D levels, neither score was associated with BMI.

These findings suggest that a higher BMI leads to a lower vitamin D status whereas any effects of low vitamin D status on BMI are likely to be small. That is, these findings provide evidence for obesity as a causal factor in the development of vitamin D deficiency but not for vitamin D deficiency as a causal factor in the development of obesity.

In short, this study found that genes associated with higher body weight were associated with lower vitamin D levels. On the other hand, genes associated with lower vitamin D levels were not associated with a raised risk of obesity. This suggests that obesity drives low vitamin D levels, but that low vitamin D levels do not drive obesity.

Against this, there is some evidence that vitamin D deficiency might have a role in obesity. In one study, vitamin D supplementation was found to speed fat loss in women [2]. While the authors of this latest research acknowledge this study, they also say that other similar (and larger) studies have failed to confirm this effect.

As to why heavier individuals are at increased risk of vitamin D deficiency, the authors mention of variety of potential mechanisms including:

1. dilution of vitamin D in a larger body mass
2. the sequestration (preferential storage) of vitamin D in the fat tissues (taking it out of the bloodstream)
3. more rapid conversion of vitamin D as measured in the bloodstream to a more active form in more obese individuals
4. differences in lifestyle factors

It occurs to me that a one potential risk factor relates to the fact that most of our vitamin D requirements come from the action of sunlight on the skin. All other things being equal, lighter individuals will tend to have a higher ‘surface area to volume ratio’, which means that for a given amount of sun exposure, they will achieve higher vitamin D levels compared to bigger individuals.

Another thing worth considering is concerns amount of sunlight exposure. Even in larger people go out in the sun as much as smaller individuals, I suspect that (generally speaking), larger people are likely to expose less of their skin to the sun, and may be at increased risk of
vitamin D deficiency because of this.

Anyway, we’ll likely never know the full detail of why obesity might drive vitamin D deficiency, but this research does serve as a reminder that some people are at increased risk of this deficiency.

Increasing numbers of people (and their doctors, it seems) are interested in optimising vitamin D levels. Commenter Ted Hutchinson recently made me aware of a guide to vitamin D dosing based on achieving levels of about 50 ng/ml (125 nmol/l). Thanks to Ted for that.

References:

About Dr John Briffa
View all posts by Dr John Briffa

Subscribe
Subscribe to our e-mail newsletter to receive updates.

Related Posts:
- Why the device that counts the number of bites of food we take in a day is unlikely benefit health or weight
- Can getting more sun help protect against dementia?
- Review finds that ‘filling up on fruit and veg’ to promote weight loss does not work
- Study shines light on the fact that sunscreens don’t appear to offer real protection against melanoma
- Can light in the bedroom at night drive weight gain?

8 Responses to Research points to obesity as a potential cause of vitamin D deficiency (not the other way round)

Ted Hutchinson 7 February 2013 at 9:09 pm #

A couple more charts here from Grassrootshealth that may make it easier for people to understand why we all need to check our levels.

Vitamin D levels and sensitivity to pain
Vitamin D intake and serum 25(OH)D levels

Margaret Wilde 7 February 2013 at 9:37 pm #

With regard to the exposure of the skin to sunshine, my personal experience is that, having gained several stones in weight because of taking HRT prescribed at too high a dose, another adverse effect was very painful sensitivity to sunshine. – I simply could not bear to be out in the sun.

Both the excess weight and the photosensitivity were greatly reduced when I minimised my intake of salt and salty food.
for when food is scarce. It would be easy to rush to conclude the causal factor is the quantity of food eaten but Atkins directed that in order to live

constructs reasoning and argument. It is not uncommon that mammals gain weight when food is plentiful and the ability to do so gives advantage
did read Dr Atkins New Diet Revolution I was disappointed by the ratio of word-count to substance but I did get the basic premise upon which he

I put off reading the work of Dr Robert Atkins because of the controversy

could potentially lead to helpful answers is what factor(s) drive(s) any shift in metabolic emphasis.

to some kind of metabolic balance with the seasons. This could be true of many creatures and could be true of humans too, and the question that

underlying problem – not treat the symptom.

by all means ignore these ramblings, but I believe there is something within these thoughts worthy of debate.

In summary, I believe much can be learned from studying nature, and looking at the past. There is a danger in focusing on the vitamin D level

I have looked at vitamin D’s role in nature, and two things have struck me as significant.

Before modern agriculture, in areas away from the equator, vitamin D would necessarily need to be stored in summer, and released in winter,

when the ability to produce vitamin D via the skin is pretty much eliminated. Its a happy coincidence that vitamin d levels approach their peek in

the autumn when fruit would have been abundant, insulin sensitivity high (as vitamin D enhances insulin’s effectvieness) and thus vitamin d is

stored along with the the fat deposits from eating the abundant fruit. (more abundant tan normal anyway). In winter, when carbs are less

available, the body switches to burning fat as a fuel source, whilst releasing vitamin d as a by product. So, you have a sort of natural insulin

resistance in the winter and enhanced insulin sensitivity in the summer.

This has led me to believe, counter intuitivel to what most people thin, that there may be a tipping point where enhanced vitamin d levels actually

promote weight gain by making the fat cells more responsive to insulin then they ordinarily would be. This would make sense in nature, because

the period when vitamin d levels were optimum would coincide closely to the autumn harvest. Scientists (and doctors and just about everyone

else) seem to look for straightforward black and white relationship. However, things are rarely that straightforward in nature.

My belief is that vitamin D promotes insulin sensitivity, and that may therefore have been beneficial historically, to facilitate short term weight gain

to sustain an individual through the winter. That of course is not the situation that confronts many today, where for many, the stored fat and

associated fat soluable vitamins are never released. It is probably the high circulating insulin levels (and other associated hormones) that prevent

the release of fat vitamin D and leads to a permanent state of insulin resistance. This is possiiby a situation compounded by the prevalence of

the low fat orthodoxy, which means fat soluable vitamins are generally iin short supply, and the body probably stores then away whenever the

opportunity presents itself. The high circulating insulin levels would encourage storage if fat soluable vitamins, whilst simultaneously hindering

their release

The other thing I have been struck by is that the best food source for vitamin D, comes from cold water fish, in the very areas where sunlight is

least plentiful. It seems that nature compensates for the lack of sunlight – by providing dietary sources of vitamin D, where it is not possible to

produce it from sunlight. Or maybe people intuitively compensated by eating a high fat diet. This may be one problem that has arisen with the

global market in food: people may need to eat according to environmental factors.

Apologies for rambling on. But I thought I would throw these thoughts into the discussion.

In summary, I believe much can be learned from studying nature, and looking at the past. There is a danger in focusing on the vitamin D level

alone, rather than assessing its roles within the body.

Just as it is, in my opinion wrong to focus on the cholesterol level, or blood pressure level in isolation. There is a need to try deal with the

underlying problem – not treat the symptom. I suspect diet and lifestyle are the issues that should be addressed. In nature no animal exercises to

lose weight: they either rest, or expend energy hunting or searching for food.

By all means ignore these ramblings, but I believe there is something within these thoughts worthy of debate.

Always look at for your posts: a consistently good blog, one if the best around, in my opinion.

Paul Anderson.
off surplus body fats metabolism has to switch fuel (or alter the balance of a dual food arrangement) where cells can tap-in to energy sourced more from fats and less from carbohydrates. He suggests an emphasis on carbs was a metabolic state of 'glucosis' in which carbs provide the main source of fuel and if the carbs are plentiful then insulin will act on surplus glucose to lay it down as fatty reserves. But a big clue comes from the way in which fatty reserves are drawn down when needed. Atkins described that fat burning works differently and involves lipolysis and ketosis. Critics suggested 'ketosis' was not a healthy state, but from natures perspective and from an evolutionary stance it appears to stand up as an expedient solution to natural challenges. Critics probably found it easier to take into account what they thought they knew (that carbs provided fuel, proteins built tissues, and fats in the diet made us fat) and found it difficult to give credence to possibilities they hadn't considered and/or didn't know they didn't know. Plus opinion about Atkins was probably confounded by the similar sounding terms of ketosis and ketoacidosis. Ketoacidosis is a state best avoided. Yet mention Atkins in conversation and it will frequently evoke the response that someone tried it and can confirm they lost significant weight, or they know of someone who did.

---

**Chris** 25 February 2013 at 11:44 am #

Oops! Apologies to all. Certain additional paragraphs were mortal casualties in a copy and paste exercise.

---

**Ted Hutchinson** 27 February 2013 at 6:12 pm #

@ Paul's points.

I think when considering natural seasonal changes in 25(OH)D levels we should start by understanding what is the NATURAL 25(OH)D level for humans living as human DNA evolved.

Traditionally living populations in East Africa have a mean serum 25-hydroxyvitamin D concentration of 115 nmol/l. and from Luxwolda's more recent work we see 25(OH)D increased slightly with age. Pregnant had higher 25(OH)D than non-pregnant counterparts. Infant 25(OH)D at delivery in Ukerewe was about 65% of maternal 25(OH)D (79.9 ± 26.4 nmol/L)

We then need to consider what the current 25(OH)D levels are in people with paler skins but living further from the equator, wearing clothes, leading stressful lives under polluted skies actually currently is. Hypovitaminosis D in British adults at age 45 y shows the state of UK adults vitamin D status prior to 2007, I expect it is worse now particularly after summer 2012.

Paler skins gave early humans an evolutionary advantage with increased capacity to create Vitamin D3 enabling higher storage of Vitamin D3 along with higher circulating levels of Calcidiol. Below 100nmol/l no Vitamin D3 is measurable in tissue and only above circulating 25(OH)D levels at/above 125nmol/l can we measure Vitamin D3 (as distinct from Calcidiol) in tissue in significant amounts.

If you only have a summer job as a lifeguard at an outdoor swimming pool you need not only to save sufficient money but also sufficient Vitamin D3 to survive through the winter without a cash crisis or suffer loss of immune function and experience infection or be able to withstand other health crisis or illness. If your cash reserves depleted as fast as the half life (20 to 29 days) of 25(OH)D then you’ll certainly have to save extremely hard.

It seems to me we can only expect our body to function as it evolved when we achieve the Vitamin D3, Omega 3, magnesium and melatonin levels that are equivalent to those human DNA evolved with.

We also have to consider 25(OH)D deficiency/insufficiency in the context of magnesium, omega 3 and melatonin insufficiency. Bear in mind the natural omega 3 levels peoples eating only organic free range wild caught meat/fish/game would have obtained. Melatonin status prior to the invention of electric lighting and digital displays would have been higher as would magnesium content of foods prior to recent "advances" in modern plant breeding/fertilizing/pesticide/herbicide usage.

We also have to be aware of the way Circadian rhythm affects magnesium status

Before thinking about the finer points of how Vitamin D status would have varied seasonally in pale skinned peoples living near naked outdoor lives at this latitude eating omega 3, magnesium rich foods without the use of electric lighting, we should first consider the starting point of anti-inflammatory reserves of 25(OH)D, magnesium, omega 3, and melatonin these peoples would have entered winter with.

There is a big difference between starting your winter with a 25(OH)D around 75nmol/l and a 25(OH)D nearer to 200nmol/l. Between having a good circadian rhythm and living a modern life with electricity and the LED displays associated with modern lifestyles, between the omega 3 omega 6 ratios of modern humans and those of primitive cultures and similar trends for magnesium.

It’s no good looking just at one aspect of current problem giving rise to insulin resistance when many aspects of modern life predisposing to metabolic syndrome are being dis-regulated simultaneously and all of these factors are interrelated.
Vitamin D found to improve insulin functioning | Dr Briffa's Blog - A Good Look at Good Health - 27 February 2013

[...] one of my blog posts last week I reported on a study which suggested that obesity is a potential cause of vitamin D deficiency. [...]
Recent Blog Posts

- Walking versus running
- Article reveals unseen cause of bias that risks compromising the evidence-base for statins and other drugs
- Not all men with symptoms of an enlarged prostate have an enlarged prostate. What’s going on?
- How accurate are Professor Collins’ claims about the rates of muscle problems with statins?
- Why the device that counts the number of bites of food we take in a day is unlikely benefit health or weight
- Evidence links higher cholesterol with lower risk of death in older individuals
- Can getting more sun help protect against dementia?

Blog Categories

- Brain and Behaviour (191)
- Children’s Health (93)
- Cholesterol and Statins (180)
- Daily Mail Archive (35)
- Diabetes/Metabolic Syndrome (130)
- Exercise and Activity (114)
- Food and Medical Politics (405)
- Healthy Eating (627)
- Herbal Medicine (43)
- Low-Carbohydrate (182)
- Men’s Health (46)
- Nutrients and Supplements (224)
- Observer Archive (189)
- Podcasts (42)
- Pregnancy and Fertility (24)
- Sleep (55)
- Specific conditions (215)
- Stress (5)
- Sunlight (115)
- Uncategorized (53)
- Unhealthy Eating! (312)
- Weight Loss (296)
- Women’s Health (159)

Dr Briffa’s tweets

New post: How accurate are Professor Rory Collins's claims about muscle-related adverse effects of statins?
drbriffa.com/2014/08/22/how...

About 5 years ago from Dr John Briffa's Twitter via Twitter
Web Client
Vitamin D Research: A Round-Up. Vitamin D has certainly kept a lot of researchers busy, as evidenced by the multitude of studies published in recent years. Berkeley Wellness experts break down the latest findings on the vitamin for preventing fractures, heart disease, and more. Expand to continue reading. Close. Published March 18, 2015. Print. bone health.