What do burgers, bottle-feeding, climate disruption, fat cats, the nitrogen content of plants, night shift work, and poverty, have in common? The Protein Leverage Hypothesis, and David Raubenheimer

The Update team reports:

We here outline the fascinating proposal that the macronutrient responsible above all others for the global obesity epidemic is after all not dietary fat, and also is not carbohydrate (or to be more meaningful, processed carbohydrates), but protein. Or rather, lack of protein, as a result among other reasons of ultra-processing.

Relevant here is the famous key and light joke featuring the 13th century Seljuk Sufi sage, Mullah Nasrudin (1). One late evening he was walking home. Upon arrival he was obviously upset. A young man observes his distress. ‘Mulla, pray tell me: what is wrong?’ Nasrudin replies ‘Ah, my friend, I seem to have lost my keys. Would you help me search them? I know I had them when I left the tea house.’ For quite a while the young man searches here and there but no keys are to be found. He looks over to Nasrudin and finds him searching only a small area around a street lamp. ‘Mullah, why are you only searching there?’ Nasrudin replies ‘Why would I search where there is no light?’ In this analogy, the key is the solution to a problem, and the light is the illumination shone by evidence from the results of series of scintillating statistically significant randomised controlled trials and cohort studies. The nutrition and chronic disease wars are between fats and their fractions, and carbohydrate (and
alcohol, sometimes). Protein has been ignored, left to those scientists concerned with ‘classic’ undernutrition (2). But absence of evidence is not evidence of absence.

**The primal appetite for protein**

So this season’s *Update* prize for the most wonderful idea in our field that really might be true, goes to nutrition ecologist David Raubenheimer (last picture above) and his colleagues at the University of Sydney, for their Protein Leverage Hypothesis (3,4). This proposes a unified causal link between burgers, bottle feeding, climate disruption, pet chow, the nutritional composition of plants, night shift work and poverty, with the global epidemic of obesity. It also implicates transnational corporations, which we at WN should declare as one of our interests. WN has constantly developed and resolutely championed the thesis indicting corporate-generated ultra-processed products since 2010, in our *Food System* series.

At the centre of the hypothesis is protein. The reasoning is as follows. Humans are evolved with a primal appetite for protein. In nature, sources of protein both from animal sources and from combinations of plant sources are adequate. But anything that depletes protein in food systems will cause compulsion to eat too much food in order to gain adequate protein. So the other two macronutrients contained in food, fats and carbohydrates, whose function is to supply energy and also to be stored as body fat for use at times when food is in short supply, will be over-consumed.

**But what about infant formula?**

So what about infant formula, which is higher in protein than breastmilk, known to be a cause of overweight in infancy which often tracks into later childhood and adult life? Surely this destroys the hypothesis? Not at all. The Sydney team proposes that consumed as it is at the very beginning of life, formula feed is liable to induce artificially high levels of appetite and hunger for protein, which persist into childhood and adult life. Exquisite! As they say (4):

> Diet early in life and *in utero* has a profound impact on the amount of protein we need throughout our lives, which in turn influences our energy intake. Anything that influences how much protein we need can increase our risk of becoming obese. Increased protein intake could lead us to process protein less effectively throughout our lives, which means we'll need more protein. To get the amount of protein we need, we'll be forced to eat more, and by eating more we are more likely to become obese.

Climate disruption? The more carbon in the atmosphere, the lower the ratio of protein in plants. **Climate disruption dilutes nutrients in plants.** In high temperatures and in an environment high in carbon dioxide, levels of protein in leaves drop, and of sugars and starches increase.

> The result of this decline in plants’ protein content is that we need to eat more of them… Since more than 80 per cent of the calories we consume come from plants, changes in plant composition will have a major impact on the human diet.
The fat cat theory

This also seems to contradict the hypothesis, because plant foods are low in dietary energy and high in nutrients. But this is only when they are consumed whole, or minimally processed within meals. Now though, plants are increasingly substrate for ultra-processed products formulated using very cheap industrially processed oils, sugars and syrups, and which are depleted in protein. These (4):

Bypass ecological constraint… on the availability of non-protein energy, concentrating these nutrients into foods that are easily obtained (cheap and highly accessible through vending machines, fast-food chains and supermarkets), rapidly ingested (refined and highly palatable), quickly extracted into the body (easily digested with high glycaemic loads) and that readily contribute to positive energy balance (because limited physical activity is required for their acquisition).

[They] result directly in an increased intake of non-protein energy [and] can also detract from counterbalancing the diet with additional protein. They do this through the addition of savoury flavours that are usually associated with protein-rich foods, thus mimicking complementary foods and deceiving the food selection mechanisms into further intake of non-protein energy. The global rise of ultra-processed products, largely driven by powerful transnational corporations, began in the 1980s and thus coincides closely with the period in which there has been a doubling in the rates of obesity.

Poverty? Ultra-processed products are made from very cheap ingredients and often sold cheap, so impoverished people buy more of them. So do shift workers. Animal feed? This is increasingly ultra-processed and depleted in protein. We will hear more about the Protein Leverage Hypothesis. Let’s call it the Fat Cat Theory.

Note and references

1 A modern variation features a drunk, a lamp-post, and a policeman.
2 In the 2003 World Health Organization ‘916’ report on Diet, Nutrition and the Prevention of Chronic Diseases, for instance, the table on dietary constituents and risk of weight gain and obesity ranks ‘protein content of the diet’ as ‘possible no relationship’, with no words in the accompanying text.

The Update team. The fat cat theory. Idea. Protein
[Update]. World Nutrition April 2015, 6, 4, 246-248