

## Interview with Danielle Reed

### **Only a handful of receptors identified for perceiving specific flavours?**

- Olfactory receptors have many, many genetic differences; but, what we don't know is how those differences correlate to a person's ability to smell a particular compound. There's probably thousands of different receptors for detecting different compounds, but we only know a handful of them.

### **Boundary between the cultured man and the bestial man (Rozin), is it evident at a genetic level?**

- Current conceptualisation is that we don't need our sense of taste and smell to survive in the current world – we have the FDA and other standards bodies to ensure that the food that we eat is safe. Whether or not that is true is hard to say.
- We can see from our most recent ancestor, the chimpanzee, that there is significant change in the 'gene recipes' that determine olfactory/taste perception acuity.
- DNA recipe for sweet taste perception is full of problems, it's been chewed up by evolution. Pieces missing and changes.
- We're primates, so the fact that we are highly attuned to sweet tastes is likely a product of being fruit eaters. Humans are very unusual in that they occupy almost every habitat on the planet. The fact that our traditional habitats were local, where over the last 200 years we have become globally transient, is a genetic maelstrom that is impossible to predict the genetic effect. If you grew up in Siberia eating 'whatever', now that genotype is all over the world. Humans were specialised, now suddenly they've travelled – that's probably unprecedented in all of biology.

### **Do environmental factors impact DNA or are these only decided by determinant factors?**

- One of the fundamental questions in biology is how our DNA changes in response to environment. The time that the change occurs that's consequential for people is when an egg or sperm is made. So, how does environment change that? Darwinian view is that 'nature' kills off people with a particular genotype so that they can't then pass that gene on (slow process). I.e. if eating a chili pepper kills you, then everyone who doesn't have a chili pepper receptor dies and then there are no such people left to pass their genetics on.
- A new, but not understood process is that – even though the genetic code of our body is the same throughout our bodies, chemical changes, such as those occurring as a result of engaging with our environments, can alter certain parts of our DNA. As such, external chemical influences can alter the 'recipes' of our DNA. These are called 'epigenetics' changes.

### **About chemical receptors in cells and organs?**

- Doesn't need to necessarily communicate with the brain; perhaps the perception of another molecule triggers intercellular processes that are not directly signalled to the brain. Taste and olfaction receptors are all about communication; perhaps to signal changes to other parts of the body. It's also a sort of 'happy accident' that these receptors are also attached to the tongue and nose, which are connected to the brain, because then we get additional information.
- Taste and smell receptors are part of a larger biology.

**Can our bodies override their biology? For instance, demonstrate a preference for bitterness for cultural reasons, despite biological programming?**

- Some people are non-bitter tasters, so there is a lot of subjectivity in flavour preference; therefore; bitter to who?
- Many bitter foods actually offer biochemical reward (coffee/chocolate/etc.)

**Given the strength of individual preference, how then do we manage to find consensus about what is good and not good cuisine, expressed at a very complex level (think of a French food critic).**

- It seems to be about finding the lowest common denominators. I.e. McDonalds or pizza is the least offensive to the greatest number. We work hard to find those foods that the majority of people like. Food processing: really their question is, how do we make something that everybody likes? From their perspective that is very hard (and it is). I.e. How much sugar do you put in a Diet Coke?
- The breadth of food preferences, even in common cultures, is staggering! Almost everybody's food preferences are niche.
- Food choice is often more of a social status choice than a flavour preference choice. Considerations of status is responsible for much of the decision making about food. For example, people can't really tell the difference between a 100 dollar bottle of wine and a 10 dollar bottle of wine. Most people can't really even tell the difference between red and white wine if they are blindfolded.

**For poor sight we have corrective glasses, for poor hearing we have hearing aids, but for taste we do not have a corrective device. Is there an ideal range for taste? A sort of 20/20 vision for these senses?**

- There is a standard for normal in sight and hearing but there's never been an attempt to standardise taste and smell; we don't even know what normal is. Did you ever have a taste test or a smell test as a child? No.
- Is it conceivable or is it a possible ideal? [DR] I think it's a very practical and doable thing. The first issue is the conception that, "If you can't treat, don't test." The second is that, if you want to get normative data then the motivation is not there because these senses are not tied to quality of life in an obvious way, or a health condition. We know from our research that people who have Parkinson's or Alzheimer's lose their sense of smell very quickly, so if there was an obvious benefit to doing the testing then we would probably do it and get normative values.

**You mention that if we understand our genetics of chemical perception better then we could conceivably tailor our food choices for a genetic type, or even an individual; is that the future of dieting?**

- I think that we already do that. For example, there are differences geographically in the concentration of sugar in Coca Cola and other fizzy drinks because it plays to the particular proclivities of those cultures. People tend to think that this is cultural, but our work shows that it is actually genetic preference.

**PTC (Phenylthiocarbamide) testing, while very well documented, tests for a chemical that is not naturally occurring in foods, a sort of 'happy accident'. What new 'taste' frontiers are there in the area of man-made tastants, such as PTC? Is it possible that we will increasingly engineer and create foods that are not naturally occurring in order to suit our tastes?**

- We already do that very aggressively. Once scientists cloned the sweet taste receptor, and also understood the molecular structure of the ligand in high-intensity sweeteners like aspartame, then they made analogues to try to make a 'super-aspartame'. So that is an example of an effort to make a man-made compound that's a super-ligand for the human receptor.

**So, does the creation of new foods to suit the human palette present an obstacle for nature, despite the obvious opportunity for human innovation?**

- So it always was. We think about human societies as eating 'natural foods' but that has almost never been the case. So, while the techniques have changed, but the aggressiveness with which we alter and pursue foods to suit our preferences has always been with us.
  - [R] However, the tools are more potent now than they've ever been before...
  - [DR] I don't agree with that. I think that selective breeding is the most powerful tool to change the way that something tastes that ever existed. Ref. Botany of Desire, Michael Pollan. Selective breeding takes you to very strange places very quickly.
  - [R] So we're already a long ways down this road of altering nature to suit our preferences.
  - [D] I guess that's a valid view point but in fact we are nature, and that is nature.

**Humans seem to have an ability to distinguish manufactured flavours more than natural ones; for instance, the flavour of fluoride from the dentist seems more distinguishable than the difference between a lemon and an orange.**

- I don't agree with that. Humans have a very strong ability to associate flavours with experience. Perhaps the dentist represents a stronger experience for you?
- Although, perhaps Paul Rozin did research into identification of man-made vs natural flavourants? [follow up]
- It might also be a question of intensity as well, as man-made flavours tend to be more intense. But, if you equated for intensity then I don't know. People are generally bad at recognising/guessing flavour percepts.