Nutrition and Disease – Interview with Professor Don Huber – Part 1

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I recently attended a one-day presentation in Toowoomba by Professor Don Huber. A capacity crowd was treated to memorable sharing. This remarkable microbiologist delivered a compelling summary of his lifetime study of minerals and microbes and their interrelationships. He also shared details of his research related to the herbicide, glyphosate. The room was often left in stunned silence in recognition of the enormity of his findings. After a long hard day, Don graciously agreed to a comprehensive interview – here is part one of that conversation.

Graeme: Thank you for agreeing to this interview. You have just had a full day on stage and a full evening answering questions over dinner. Now, at 10 pm in the evening, you have agreed to talk with me for a couple of hours. Your energy at 82 years of age is inspirational – in fact, you have just become my new hero. I have now decided that my new goal is to peak in my eighties. Do you have a secret to share that has enabled you to sustain such energy and mental agility?

Don: Actually, I am not yet back to my best. I am still recovering from a very suspicious "accident" where I was hit by a truck while helping to pull a car from a drain with my tractor. The truck disappeared and the driver I was helping to rescue gave false names and addresses to the police. I was left with a broken back and many other injuries and it has been a long recovery process.

Graeme: I guess you have trodden on many toes with your unrelenting search for the truth. I know that I was one of many in the room today who vowed to eat more organic food when we understood the scale of the glyphosate toxicity issue. Many of us shuddered when recognising the vast contamination of our food chain. Do you try to eat organic food?

Don: We have always had our own vegetable garden and much of our food comes from that, and of course it is all organic and well mineralised. I also believe that bread makes a big difference because it is such a big component of most diets. We grow our own, non-hybridised wheat, which is stone ground immediately before baking. It is a very old variety with over 18% protein and a wonderful nutty flavour. It is so different to the current commercial grains.

Graeme: I don't think most people are aware of some of the issues with the green revolution grain. Norman Borlaug won his nobel prize for irradiating wheat to fast-track the hybridisation process. He delivered a more squat plant which was much less prone to lodging, but at what cost? The mutant that became our daily bread is much less capable of nutrient uptake and this has compromised the health of many. It is one of the reasons I would rather have an ancient grain like spelt, which is alkalising and much more nutrient-dense. Your open-pollinated wheat sounds like a great choice. What was the name of the variety?

Don: It is an old non-hybridised variety called Ridit. My wife can start off with some of this grain and within 8 minutes she can have eight loaves of bread ready to rise and bake.

Graeme: My mouth is watering. The smell of freshly baked bread is second only to the sweet smell of a healthy soil. I had better ask some of my soil questions now. You are a much accomplished microbiologist and you have become involved in a legendary David and Goliath battle against the large multinationals driving GMO technology. However, it has been your work with plant nutrition that has seriously impacted my life. One of the books for which you were responsible, Mineral Nutrition and Plant Disease, has been something of a bible for me over the years. You have linked mineral balance and nutrient mismanagement to many of the most destructive crop diseases. I was interested to hear that, in one meta-analysis of many studies, you found that nitrogen excesses were shown to increase disease in 233 cases, while improved nitrogen management was linked to reduced disease in 120 cases. I am interested to know which of the two nitrogen forms was most likely to cause trouble – nitrate nitrogen or ammonium nitrogen?

Don: The two forms of nitrogen are metabolised quite differently and this impacts microflora. Nitrate nitrogen metabolism generates an alkaline effect in the root zone. In general, the acidifying effect of the metabolism of ammonium N is desirable, but there are some exceptions. Calcium nitrate has been shown to reduce the likelihood of Fusarium in melons, for example. However, the nitrate form is known to increase potato scab, so ammonium nitrogen is a much better choice here.

Graeme: The ginger growers in our region have recently suffered serious problems with Pythium. It seems strongly linked to their move from urea to a more nitrate-based liquid nitrogen. The other main issue with an oversupply of the nitrate form relates to the nutrient dilution factor. Nitrates are taken up with water and this dilutes other minerals and reduces brix levels (which are effectively a measure of nutrient density). We find it is impossible to have high nitrates in the leaf and achieve desirable brix levels.

Don: It is important to understand that part of the link between high nitrates and increased insect pressure relates to higher levels of reducing sugars in the plant. These are the kinds of sugar that insects really love. The conversion of nitrate nitrogen to amines in the leaf takes up to 16% of all of the glucose produced through photosynthesis. This is a very energy intensive process and it can create a carbon stress within the plant. This conversion problem can be further complicated by a lack of molybdenum and this deficiency is very common.

Graeme: It certainly is! We find that around 80% of soils around the globe are deficient in this trace mineral.

Don: Even if you had enough molybdenum, there is another complicating factor, and that relates to heat, moisture stress and drought. The first enzymes that shut down in dry conditions are the nitrite and nitrate reductase enzymes.That is why you see such high levels of nitrate nitrogen in plant tissue during drought. You have a lot of nitrogen in the plant, but none of it is physiologically available.

The plot thickens, however, because the high nitrates also tie up manganese. When manganese is bound, then you struggle with sucrose synthase. This is a manganese-dependent enzyme that converts glucose into sucrose. Instead of sucrose, you now have an excess of the reducing sugars, glucose and fructose. The insects rejoice because they just got invited to dinner.

Graeme: How do brix levels, measured with a refractometer, relate to those reducing sugars?

Don: You are measuring your sucrose levels with brix. Hence, the higher the brix levels, the lower the insect pressure.

Graeme: Thanks for clarifying this. I did not fully understand the issue about reducing sugars.

Don: Interestingly, much of the early N researchers never quantified the form of nitrogen involved in their research. It was just called “nitrogen”. Complex mineral interrelationships are often at play when we try to interpret links between nutrition and disease. The potato scab story is a good example. Ammonium nitrogen increases manganese availability. Manganese is hugely important in disease resistance. Rice blast, take-all, root rot and corn stalk rot are all linked to a lack of manganese.

Graeme: I am beginning to realise the scale of the problem with glyphosate, because this herbicide impacts manganese availability with a double whammy. It kills the organisms that make manganese available to the plant and it also ties up manganese within the plant.

Don: I was involved in research with sugar cane, relative to glyphosate. In this study, we demonstrated that the manganese within the plant tissue is tied up, chelated and immobilised within 4 to 6 hours of the glyphosate application. Plant tissue levels of manganese actually dropped by 90% within that short period of time. The associated effect of this huge drop is an increase of fructose and glucose and a reduction of sucrose within the plant. As I have described, insects are much more attracted to the reducing sugars than sucrose.

Graeme: Returning to the nitrogen story for a moment. There are still many agronomists out there claiming that nitrogen is only uptaken in the nitrate form. How does the plant best manage these two forms of nitrogen and is there an ideal balance between the two?

Don: There is an ideal balance in the soil. Nitrate will serve as a buffer against ammonia and ammonia against nitrate.The plant can use either form of nitrogen equally well if it just has one and not the other. However, it will always do best if it has access to equal amounts of both.

Graeme: Our Soil Therapy™ soil analysis reports suggest ideal levels of 20 ppm of both forms of nitrogen, but we have not focused upon trying to maintain a 1:1 ratio. That's food for thought.

Don: There is a difference between C3 plants and C4 plants, like corn and sorghum. In the C4 plants, the efficiency is in the ammoniacal form of N. The nitrates require a lot of carbon to drive their conversion to protein and, as a result, yield will suffer if nitrate nitrogen dominates.

Graeme: I am just thinking about some of these mineral relationships, now that you have highlighted the importance of manganese for disease and insect resilience. I recall a link between silica and manganese mobility. Could it be that the disease resistance linked to the use of soluble silica is actually related to this improved transport of manganese into the plant?

Don: There is most certainly a strong link, as silica mobilises manganese. You will see silica move manganese across the cell wall or move it to an infection site. Without this silica push, manganese struggles to get to an infection site in time to help activate the shikimate pathway, which functions to produce the phenolics and other protective compounds that stop that invasion.

Graeme: I would like to focus a little more on the shikimate pathway. The grim conclusion from your exhaustive summary of multiple, published papers is that we have made a terrible mistake with glyphosate. We have compromised our entire food chain with this chemical. It is

now linked to most of the degenerative diseases and even some of the infectious diseases that are decimating the modern world. It seems to be linked back to this shikimate pathway. Could you please elaborate on this?

Don: The mode of action of glyphosate is to shut down the shikimate pathway. We have now deactivated a major defence system. There are a couple of other pathways involved in resilience, but the shikimate pathway is a major player in protection. In fact, it is essential to life. When you shut down this defence pathway you essentially have AIDS. You have essentially shut down plant immunity. The consequence is an increased prevalence of a wide range of diseases and that is exactly what is happening.

Graeme: My goodness, it would be a masterly marketing strategy to use one chemical to generate the need for many others. It sounds like some kind of conspiracy theory, but it is effectively what has been happening for many years.

Graeme: I see that you have a recent paper where you have demonstrated an increased likelihood for 40 different plant diseases, simply through the use of glyphosate. What do you think it will mean for the multinationals driving this disaster, as the world awakens to the mistake. Will Monsanto still exist in ten years' time?

Don: I think they are definitely concerned about their future. We have seen the recent release of the World Health Organisation (WHO) report classifying glyphosate as a "probable carcinogen". Then, more recently, we have seen a report that showed that Monsanto's own research had revealed a predisposition towards seven different forms of cancer associated with their herbicide. There is now a much broader liability that is opening up.

Graeme: Are you seriously suggesting that this company were fully aware of the cancer link before foisting this toxin onto an unsuspecting world?

Don: According to new data released by highly credentialed scientist, Dr Anthony Samsel, they knew about it right back in 1981. It would be a good idea for your readers to check out the interview with this researcher on mercola.com. It's a real eye opener. The only reason the WHO report concluded that it was a "probable" rather than a definite carcinogen was because the research has been constantly stifled.

Graeme: It is a huge issue for many growers because they believe they are shackled to the glyphosate rig. There is no doubt that this input has made life a whole lot easier for many farmers and no-till has been pretty much glyphosate-based. It will obviously have to go, but as it is slowly forced from the food chain, there are some simple strategies that can reduce some of the negative impacts. For example, if you drop the pH of the diluted glyphosate spray down to a pH of 2.9, you can reduce the amount of the chemical required by up to 30%. If you also combine a little fulvic acid in the mix, you increase membrane permeability (and associated uptake of the chemical). It is important to be pragmatic in these situations. Do you have any suggestions that can help reduce some of the negatives associated with glyphosate?

Don: Well, if you grow wheat and use glyphosate, you may have noticed an increase in diseases like ergot and powdery mildew. They are both related to a lack of copper in the plant, because this mineral has been shut down by the herbicide. It can be a very productive strategy to foliar spray copper to help avoid this problem. People misunderstand the use of copper as a fungicide. They drench the plant and often create excesses of this mineral in the soil. 75% of the copper response comes from within the plant, rather than on the leaf.

Graeme: I couldn't agree more. We have developed a uniquely chelated, copper liquid called Nutri-Key Copper Shuttle™. In one large-scale Spanish trial, this product was tested against the two most common copper fungicides, copper hydroxide and copper oxychloride. There was also a very popular local biological product included in the trial. The Copper Shuttle™ totally eclipsed the others in terms of fungicidal performance (even though it is not marketed as a fungicide), with a fraction of the copper involved. It is all about getting copper into the plant rather than on the plant, and this is not widely recognised. I consider copper fungicides to be amongst the worst of the bunch, because they so often create soil excesses. Copper does not leach and it can kill much more than fungal pathogens. High soil levels of copper compromise bacteria, beneficial fungi and protozoa. It is a broad spectrum biocide.

On that note, I will conclude the first segment of this interview. I would like to take this opportunity to thank the Healthy Soils Incorporated Group – Rockhampton, who were responsible for bringing Don Huber to Australia, and who kindly provided the photographs for this article.

I trust you have gleaned some pearls of wisdom from this remarkable and courageous gentleman. We should all be grateful when an accomplished scientist stands up to be counted for the benefit of us all.