SUBMISSION to Food Standards Australia and New Zealand

Re: Consultation Paper—Food Derived Using New Breeding Techniques

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Summary

The Advent of new and more accurate methods to edit DNA sequences such as CRISPA has again heightened the debate around the safety of GMOs, as well as genetically modified and produced food additives, flavours, and colourings. The apparent perception is that the additional accuracy of these techniques might aid in the reduction of real and perceived risks associated with the introduction of unlabelled genetic technology into the food chain. However along with advances in genetic editing technology, new research is beginning to uncover dimensions to the process of human digestion and metabolism which indicate that genetic structures of dietary inputs play a greater role in the maintenance of health than previously thought. As a result it is submitted here that genetically modified sequences pose a greater risk to health than previously believed. Therefore this submission finds that research results show that greater not lesser caution is required concerning GMOs. Specifically if new GMO compounds are allowed to be introduced into the food chain without labelling, it will not be possible to identify the source of adverse health effects that occur.

Background: DNA, its evolution context, and the risk to health of GM foods

Along with the animals, we have co-evolved with plants over millions of years. We share DNA with them. Our nervous system, its metabolism and immunity, has been structured through this co-evolution to derive not just nourishment from plants, but also the fundamental evolutionary qualities of stability, adaptability, integration, purification, creativity, and growth.

Let us examine the implications of this understanding in more detail. Plants are experts in converting the energy contained in the minerals and chemicals in the soil, the soil-based biological micro-organisms, the sun, the air, and water into extended structures existing in time and space, capable of reproduction and evolutionary adaptation. It took a billion years of evolution on planet earth to perfect these abilities of plants in conjunction with the world of insects and micro-organisms. Plants fuelled the evolution of the animals in the ocean and on the land, including reptiles and then mammals. These animals evolved over hundreds of millions of years, as they utilised the energy and structure stored in plants; ultimately leading to the emergence of the

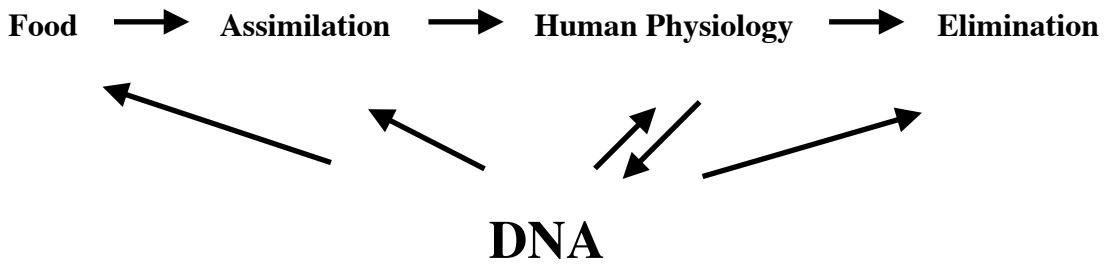
human physiology. This was a very intimate process, a web of mutual dependence was involved. We are even now beginning to understand that there is an epigenetic environment whereby the integrity of the human genome is supported by the wider genetic environment of micro-organisms, plants and animals.

Living systems appear to defy the second law of thermodynamics—the tendency of disorder to increase. They are able to do so because of the extraordinary capabilities of DNA. DNA orchestrates cellular structures, organ systems, and whole organisms, enabling them to extract orderliness from their surroundings. DNA is a molecule which reflects the self-referral qualities of the unified field described by super-symmetric string theory of modern physics. The DNA has the ability of creating through self-interaction and it has the ability of self repair, ***but crucially it maintains this ability through an epigenetic web.*** The components of this web include processes of reproduction, interaction with micro-organisms, and the consumption of plant and animal based foods. Within the epigenetic web, DNA-based information or intelligence is constantly being exchanged or shared. The epigenetic web helps to determine which genes are expressed or activated.

It was over a long period of time that a biological dissipative structure emerged which we know as the human physiology. Energy is constantly flowing through the human body, entering as food and exiting as urine, sweat, and faeces. As a result of this process, 98% of the molecules in the body are exchanged or renewed every 3 months.

But dissipative structures are very dependent on the nature of the input energy. If inputs change even slightly, the orderly structures that have been created can mutate or become unstable very quickly. However long-lived this wider epigenetic system has been, however flexible it can be in the face of adversity, history shows it remains vulnerable to the growth of disorder inherent in the second law of thermodynamics. Climatic and geographic changes and catastrophic events can result in the annihilation of species. The second law, the tendency to disorder, is so ubiquitous, that our physiology is delicately balanced on a knife edge. Our immune system, guided by the intelligence of the DNA contained in every cell, is constantly fighting off challenges to the order, integrity, and longevity of the physiology.

The DNA Guides the Flow of Energy Through the Human Body and is in Turn Sustained by It



The success of the DNA in not only preserving life but supervising its evolution and adaptation comes down to its stable relationship with its environment of food and other experiences. Climate, mineral and chemical composition of soil, water, and air, plant-based DNA, social interactions, internal electro-magnetic fields, etc are all important players in the epigenetic web which protects our species. Our consciousness is accustomed to a set of routine experiences and behaviours. Our digestion and metabolism has evolved by processing a finite set of foods based on DNA. It is important to realise that for millions of years, this has been a relatively stable and finite set. Our physiology has not so much learned to cope with a finite set of compounds, but it has actually come into existence in tandem with this finite, limited set of specific compounds. Any radical change in this finite set, such as the catastrophic climatic changes in prehistoric times which included changes in predominant food sources, did and can lead to the destruction of entire species. The critical element in this finite set is the DNA itself.

All of our traditional food sources have been intimately linked to and derived from DNA. Our survival and evolution over millions of years has been possible because of, has been designed by, is constituted entirely of an interlocking biological web of genetic structures centred on the DNA molecule which is shared by micro-organisms, insects, plants, animals, and humans.

Now in the modern era, we have passed through the nineteenth, twentieth, and into the twenty-first century, a tiny fraction of the 4.85 billion years of earth's existence, and witnessed a sea change in our epigenetic environment. The discovery and deployment of a wide range of novel compounds, chemicals, biochemicals, and now GMOs in food, air, soil, and water is threatening to overwhelm the delicate balance between the second law of thermodynamics and the biology of living systems. And this deployment of chemical compounds is accelerating rapidly.

We are subjecting ourselves to dietary components never before seen in history that are <u>not</u> derived from living systems capable of defying the second law of thermodynamics. Compounds that are not part of our evolutionary history and never have been. Compounds that our physiology, our digestion, and our metabolism are not adapted to. We are ingesting them through the food we eat, the liquids we drink, the air we breathe, the space we live in, and the experiences we have. At the present time, we are being exposed to an additional 2000 novel chemicals each year. As a result, we are creating a health crisis of such proportions that we are sowing the seeds of our own destruction.

Just consider that the incidence of cancer is not only increasing, but accelerating. Cancer was responsible for 12 percent of the nearly 56 million deaths worldwide from all causes in 2000. In industrialised countries more than one in four people will die from the disease, a rate more than twice as high as developing countries. Over 22

million people in the world were treated for cancer in 2000, representing an increase of approximately 19 percent in incidence (cases) and 18 percent in mortality since 1990. The 2003 World Health Organisation (WHO) World Cancer Report expected this figure to increase by 50% by the year 2020. There is no doubt that chemical pollution of our water, soil, food, and air is a major culprit.

Now consider that cancer is a disease originating from the failure of the blueprint of life itself contained in the DNA. The delicate balance and stability of life built up over millions of years is at risk.

The structure of life is in danger of breaking down—our life, not gradually but very quickly. It is an emergency on a runaway train of events. Someone needs to press the emergency stop button and open the doors to safety.

The new paradigm of digestion and nutrition revealed by research

The old model of digestion suggested that food inputs were broken down by our digestive processes and then built up into useful sources of energy and molecular components of metabolism. These include fats, proteins, fibre, vitamins, minerals, carbohydrates, and co-factors of digestion. The body's intelligence centred in the DNA metabolises these building blocks into complex biological molecules integrated into the physiology where they are able to maintain the operation and health of all our organ systems. The emphasis is on the body's intelligence converting a range of inputs into useful biological building blocks of life. This view of digestion suggests that the possible health risks of GMOs may be low. However such a view of nutrition does not fit what we now know about the health effects of foods or what we know about biological evolution. Evidence points towards DNA-based foods playing a critical role in the epigenetic environment of the physiology which may be disrupted by genetic engineering of food compounds. This could occur through four mechanisms:

1) field interactions with the underlying laws of physics that would in effect link species through their connection with the unified level of nature's functioning understood by superstring theory.

2) absorption of biomolecular products of digestion closely related to DNA,

3) horizontal gene transfer, and

4) the transfer of genetic information through communication mechanisms.

We will not discuss the first two of these, the first is a complex subject requiring lengthy discussion and a sophisticated understanding of modern physics, and the second is well known to take place. Let us examine the other two which are more novel and which can be more fully understood as a result of recent research findings.

Horizontal gene transfer. With the advent of genetically modified organisms (GMOs), safety-orientated research focused on the concept of horizontal gene transfer.

Was it possible for harmful genetic sequences artificially inserted into plants, that encoded for antibiotic resistance and other undesirable traits, to be transferred to disease pathogens, soil bacteria, gut bacteria, or other plant types? The answer to this question has been a resounding ***yes.*** GMO sequences have transferred to related plant types and they have transferred to soil bacteria. It was previously thought that genetic sequences would be broken down so rapidly in the gut into the molecular components of digestion, that no horizontal gene transfer could occur. Surprisingly to the researchers, successive studies and reviews have concluded that both the animal and human gut are hotspots for horizontal gene transfer, where the conditions are optimum for bacteria and disease pathogens to acquire gene sequences from ingested food (1, 2). Horizontal gene transfer has been found to occur more readily in the gut than in the laboratory. This gives us a glimpse into the mobility of genetic sequences—an essential component of evolution that persists into the present. Horizontal gene transfer from natural DNA-based foods could be a source of physiological health and immunity. Such a possibility is subject to continuing research centred around the concept of genetic mobility.

Communication between DNA molecules. New research has demonstrated that DNA fields exhibit the integrative and self-interactive quality of the Unified Field described previously. Scientists from Auckland University's Liggins Institute, Otago and Massey Universities have revealed fresh insights into mitochondria and the little-understood role they play in the physiology. Mitochondria DNA are specialised sub-units of cells inherited solely from our mother that supply most of the cell's energy. In their study, published in *Mitochondrion* (3), researchers have demonstrated for the first time that human mitochondrial DNA leaves the mitochondria, travels into the host cell nucleus and communicates with specific genes in the nuclear DNA thereby potentially affecting gene expression.

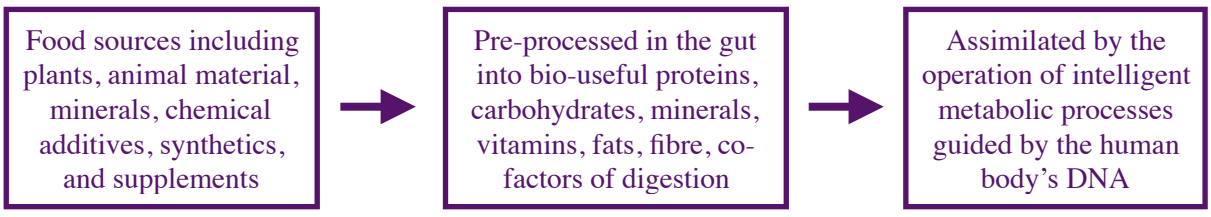
"*We found evidence that mitochondria DNA and nuclear DNA 'talk' to each other, and these interactions aren't random,*" said lead researcher Dr Justin O'Sullivan, a Liggins molecular geneticist speaking to Jamie Morton of the NZ Herald in August 2016. The findings give weight to the idea that mitochondria do much more than supply energy and regulate a cell's metabolism. "*We think the connections we detected are part of a feedback system between mitochondria and the cell nucleus that may influence how humans grow and develop throughout life,*" O'Sullivan said. "*We know that these connections between mitochondrial and nuclear DNA can influence how the nuclear genes work in yeast, and we speculate that the same occurs in humans.*" Interactions between the two sets of DNA within our cells could be one of the ways the environment influences gene expression, he said. "*Mitochondrial dysfunction is linked to highly prevalent diseases such as obesity, diabetes, cancer and heart disease,*" said study co-author Associate Professor Mark Vickers, also from the Liggins Institute. "*This study adds to our understanding of the way in which changes to mitochondria manifest as disease.*" The scientists are now researching exactly how the two sets of

DNA talk to each other, and what happens when they do. This new study follows a discovery by scientists at Wellington's Malaghan Institute, who last year became the first in the world to demonstrate the movement of mitochondrial DNA between cells.

This previously unknown communication between separate genetic structures within the human physiology is a indication that suggests how plant intelligence can benefit our health. It also suggests how rogue GMO sequences could damage our health. Previously, evolution was described as either a linear or a tree-like process whereby, once distinct species had emerged from their phylogenetic origins, they evolved separately according their ability or 'fitness' to survive in different epochs of time and environments. This is now known to be an over-simplification. The human genome in fact enjoys an historical co-evolutionary relationship with plant DNA which continues to the present day. This active relationship is an ongoing aspect of the epigenetic field. Recent experimental and theoretical results suggest that that short transcribed microRNA sequences play an active role in this process (4). mRNA are highly mobile. We must conclude that ***distinct genetic species are not isolated or frozen in evolutionary time.*** Genetic structures form a bio-field of intelligence within which they can supply one another with mutually beneficial support. They are able to do this because of their shared connection with the unified level of physical functioning revealed by modern physics.

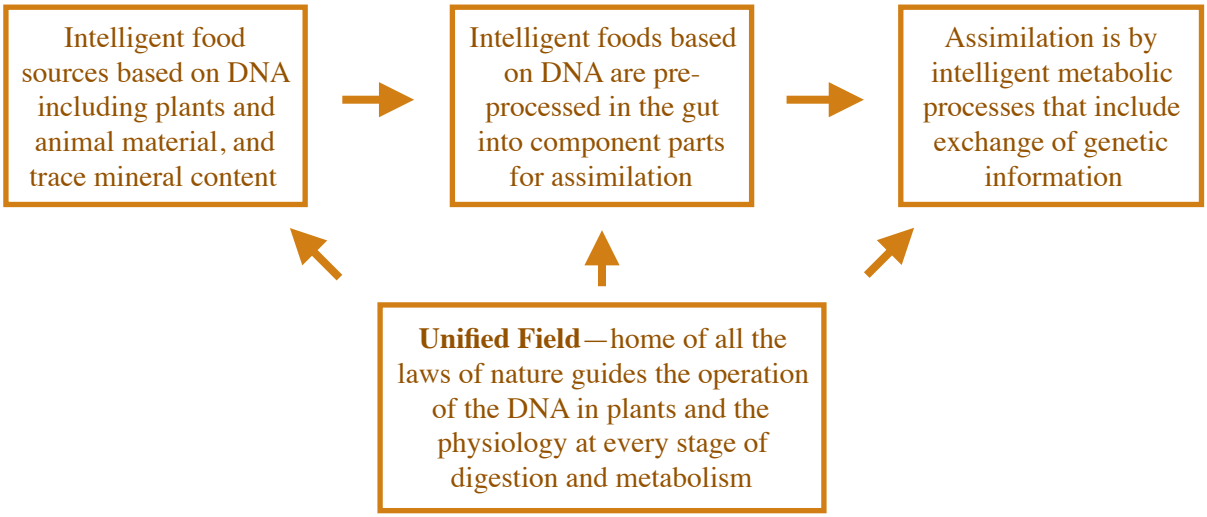
If dysfunction among mitochondria DNA influences disease incidence, it is certainly the case that mitochondria cells, which interact with food sources through metabolic pathways, can and do support health. The preponderance of evidence that DNA based foods are healthy, whilst chemical food and medicinal inputs are highly disproportionately unhealthy (5), certainly points to an underlying mechanism for plant DNA to influence health, just as it has been the co-evolutionary partner to human development over millions of years. **At each stage of evolution, plants have participated in key evolutionary transformations. They now participate in the maintenance of the end results of these transformations in key parts of the human physiology.** Plants are known to provide support in number of ways in the metabolic pathways, in the homeostatic mechanisms, in the growth sequences, in brain and nervous system functioning. This is evident when we consider that these systems break down without adequate nutrition. This does not necessarily involve the transfer of genetic information, but it does involve the transfer of molecular information that is derived from the operation of specific sequences of DNA within the plant. It is also evident that metabolism involves intelligent processes that need the *intelligent* support that plants provide, this support originates in plant DNA. This will helps us to unravel the genesis and cure of chronic disease. It points to a new paradigm of digestion.

Old Paradigm of Digestion



The old paradigm of digestion has led nutritionalists to focus on the need for specific components of metabolism in diet. These are supplemented as vitamins, minerals, proteins, etc. We can call this the *active ingredient* paradigm. Extracted parts are preferred over whole plants. The most likely nutritional candidates are separated from their origin in plants or synthesised and then administered on their own, but many of these components are not readily assimilated. Furthermore many of these nutritional compounds are now being synthesised using genetic technology, which inevitably produces novel differences in chemical structure, They are in a form divorced from their evolutionary context as whole plants, which the body cannot recognise. For example, curcumin, the so called active ingredient in turmeric, is more readily absorbed when administered as turmeric rather than the isolated curcumin extract. Our sophisticated human physiology and digestion came into being in association with whole plants. Therefore our digestion has the ability to recognise whole plants and absorb them more easily. This ability has been acquired over millions of years of evolution.

New Paradigm of Digestion



The whole process of digestion is based on underlying intelligence at every stage.

The new paradigm of digestion is based on the communication and exchange of intelligence between plants and the human physiology at every point guided by the unified level of all the laws of Nature.

Is this new picture of digestion based on the DNA of whole plants credible? Why have nutritionalists focused up until now on components of digestion and ignored the role of DNA? Nutritional theorists have been missing the obvious because the various sciences are all compartmentalised. Science-based education ensures that over-specialisation leaves many scientists isolated in their narrow discipline—food chemists

do not look beyond chemistry, they do not know the physics or biology of digestion. Many PhD students are disappointed to find they know a great deal about very little and very little about everything else. Scepticism about intelligent nutrition based on DNA, flies in the face of evolutionary biology which points directly and unequivocally to the mobility and evolution of genetic information—a process that has happened throughout time, and continues to the present day, although the detailed mechanisms and time scales are not yet all fully understood.

In summary we have seen that new research results are revealing good candidates for intermediate mechanisms supporting continuing exchange of genetic information, such as mobile micro RNA sequences transcribed by bacteria, fungi, plants, animals, and humans which are capable of affecting the expression of a remarkably wide range of genes across species (4).

Conclusion: The risks posed by GMOs to health

Increasingly research is confirming the very serious health hazards of genetically altered food (for an up to date discussion and summary see responsibletechnology.org). These results support the thesis that health relies on ingestion of traditional foods based on the DNA designed by evolutionary processes occurring over millions of years. Most countries have GMO labelling laws, except the USA where consumers are increasingly sourcing foods that say "Non-GMO". Commercialised GE crops include corn, soy, canola, alfalfa, sugar beet, cotton seed oil, papaya, summer squash, and zucchini. Coming soon—apples and potatoes, with anti-viral genes that can permanently turn off vital genetic sequences active in the human genome. Increasingly biosynthetic compounds made possible using new genetic engineering techniques or replicated using engineered yeast microbes are replacing ingredients, flavours, and fragrances. These are being *'passed off'* as natural or bio-identical with misleading labels using undefined or vague terms such as *'made from natural sources'*, *'fermentation derived', 'from sustainable sources', 'inverted sugar', 'vanilla flavour', 'vanillin', 'probiotic', 'nature identical flavours'*, or the sophisticated sounding such as *'patchouli absolu'*. They are different and may contain contaminants, but there is a concerted international commercial effort on the part of food producers to get regulators to accept them as *identical* or *equivalent* to natural compounds without testing. It is clear that the word *natural* has lost any meaning on labels and the only way to guard against unforeseen health effects is for regulators to insist of their identification on labels. Without this it will not be possible to identify inevitable health effects. The call to exclude labelling of certain genetically modified products is not base on any serious scientific assessment of safety, but merely part of general move within the food industry to substitute natural food ingredients with cheaper copies without having to inform the public or assess safety. This is all the more important because genetic modification is permanent, capable of affecting all future generations.

REFERENCES

1 NETHERWOOD, T., BOWDEN, R., HARRISON, P., O'DONNELL, A.G., PARKER, D.S., GILBERT, H.J., 1999. Gene transfer in the gastrointestinal tract. Applied and Environmental Microbiology 65, 5139–5141.

2 KELLY B. G., VESPERMANN A., BOLTON D. J. Gene transfer events and their occurrence in selected environments. *Food Chem Toxicol* 2009, 47, 978–83.

3 DOYNOVA, M. D., BERRETTA, A., JONES, M. B., JASONI, C. L., VICKERS, M. H., O'SULLIVAN, J. M.. Interactions between mitochondrial and nuclear DNA in mammalian cells are non-random. Mitochondrion, Vol. 30, September 2016, Pages 187–196

4 IGAZ, I., IGAZ, P. Possible role for microRNAs as inter-species mediators of epigenetic information in disease pathogenesis: Is the non-coding dark matter of the genome responsible for epigenetic interindividual or interspecies communication?, *Medical Hypotheses,* Vol. 84 (2) pp151-4. Feb 2014.

5 JUDERON ASSOCIATES, Individual Risk Relative to the Use of Food Supplements in EU-27 Countries, prepared for Natural Health Alliance, UK, 2012.