The Evolution line in diet and health

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Abstract
A practical case is made for the selection of nutrient and energy sources for diet and health along the lines of natural selection, with the ultimate aim of choosing corrective or sustaining paths for our health maintenance. A slim line of scientific findings highlight a progressive connection, tracing out the underlying proposal.

Introduction

In late 2019 a talk was delivered at the University of Sydney on aspects of the low carbohydrate diet, based on a scientific evaluation as well as clinical aspects of medical health care [1]. The talk centred on biochemical findings underlying glucose's promotion of insulin and its relationship to fat mobilisation in the body [Noakes, T], whilst highlighting medical findings of patients in a private medical practice [Unwin, D.]. [1] Both speakers referenced aspects of a low carbohydrate diet, obesity and insulin factors.

Science Thrust

The science trail highlighted carbohydrate digestion and the production of glucose, with glucose being the main and pre-eminent source of energy. If that glucose is not consumed by exercise, it pushes the production of insulin which lowers fat mobilisation, which is then stored in fat cells of the body. [1]

The effects of a high carbohydrate intake is of considerable concern when considering weight gain and obesity matters, however, examination of wider nutrient intake suggested an alternative focus should be adopted. Rather than carbohydrates being the single source of energy, it is one of three possible sources; carbohydrates, fats or proteins.

> *"The major absorbed end products of food digestion are monosaccharides, mainly glucose (from carbohydrates); monoacylglycerol and long-chain fatty acids (from lipids); and small peptides and amino acids (from protein). Once in the bloodstream, different cells can metabolise these nutrients."* [2]

These may be called upon in times of specific food or nutrient shortages, or in climatic changes or relocation to different geographic areas.

A more relevant labelling for these nutrient sources, rather than the singular metabolic flexibility, is that they are *'alternative energy sources'*. This then identifies them in this pivotal biological role in life. What is not apparent, however, and what appears not to be have been clearly delineated so far, is how these source options are initiated. They appear to be unstructured and open-ended, but act in a Darwinian-like adaption manner, where different circumstances create modified processes.

Research by Others and the Bigger Picture

A research paper by Rutger's University published recently in a scientific journal [phys.org Nov. 2020] suggested that the genetic code be attributed as an energy source. The full title of the paper is, *"Genetic code evolution and Darwin's evolution theory should consider DNA an 'energy code' "* [Todd Bates]. [3] This surprisingly links Darwin's theory of evolution, propounded some 163 years ago, to genetic science of 2020. Scientists obviously see a continuing and relevant connection between the two.

Advances in science now enable us to look even deeper. It seems as though DNA, as a distinct entity, is not the be-all and end-all of our processes and inheritance characteristics. Scientific investigation has now taken the DNA and genome process further into the field of epigenetics. For example, Darwin's Galapagos finches and their species' variations are now being re-examined within this deeper area of genetic variation.
What caused the variation in beak enlargement in other Galapagos island finches; their diet or the circumstances? - or the circumstances and their diet?

"Whilst diet is known to influence epigenetics [Michael Skinner]" [4], results of field analysis noted that;

"... some methylated regions were associated with genes associated with beak growth." [Sabrina McNew] . [4]

Lately (2023);

'Researchers have discovered a gene – HMGA2 – that affects the variation in beak size in Darwin's finches.' [Leif Andersson] [8]

Part of the course of the biochemistry is highlighted here. DNA is inherited as a double strand of nucleotides held in store, whereas the RNA consists of a single strand only, and works as the mechanism for the creation of amino acids and proteins. The methylation activity is part of the RNA switching *on* or *off* certain nucleotides in the biochemical processing. This can have a direct affect on 'variation' potential, without any change in the DNA structure. The molecular *methyl group*, responsible for this action, is part of the essential amino acid methionine and is found mainly in meat, broccoli and fish. Hence, we have a direct connection between 'variation' and food.

Biochemistry to Genome

With the recognition of the importance of actions like the methyl group in the delivery of certain gene affecting actions, and the fact that methionine needs to be ingested, a broader picture emerges; the biological functions join together in a circuit-linear fashion, forcing a link between diet, biochemistry and genetics.

There are some hiccups along the way albeit not overtly apparent. The RNA has certain weak points in its copying ability -

"A single-stranded genome tends to yield more mistakes during replication, meaning a high rate of mutation" [Quammen, 2014]. [5]

".... this may lead to changes in the function, expression or structure of the protein it encodes for." [wikibooks.org 2013]. [6]

However, this is the very nature of the genetic makeup, in that it supplies the openings for molecular variations, that it supplies the opportunities to source different nutrients or energy supplies and provide different gene modification opportunities, and thus different inheritance capabilities.

Evaluation and Testing

This is a simple compilation of factors for such a hefty proposal. As such, science should further scrutinise these major transformations. As the fabric of the science interactions is complex and involved, however, a wide spread of technical skills would be required for absolute proof.

This integrated ***diet-biochemistry-genetics-diet*** connection suggests an Evolution line in our biological structure, thus crystallising an immediate and orientating framework for our dietary and health actions, now so very close to home.

References: Full or assist

1. Noakes, T. and Unwin, D. (2019) *Medical aspects of the low carbohydrate lifestyle*, Lecture, Sydney University, 10.10.2019
2. Da Poian, A. El-Bacha, T. et al. *Nutrient Utilization in Humans: MetabolismPathways*, Nature Education, 2010
3. Bates, T. (2020) *Genetic code evolution and Darwin's evolution theory should consider DNA an 'energy code'*, @Phys.org Nov 16, 2020
4. @GrrlScience (2017) *How Do Darwin's Finches Change Their Beak Size So Quickly?*, Forbes, Sept 6, 2017, with particular reference to:

Skinner, M. McNew, S. et al (2017), *Epigenetic variation between urban and rural populations of Darwin's finches,* BMC Evolutionary Biology, 23 August 2017

5. Quammen, D. (2014) *Ebola - The Natural and Human History of a Deadly Virus*
6. en.m.wikibooks.org (2013) *Biochemical Structure in Genetics*
7. Discussion with Prof. D. Raubenheimer (2021), with particular reference to:

Smith, R. et al (2018) *Metabolic Flexibility as an Adaptation to Energy Resources and Requirements in Health and Disease*

8. Andersson, L., *Genome study reveals Darwin's finch evolution,* Science, Sept 2023