



Fundamentals of Functional Nutrition Course

HISTORY OF NUTRITION TRENDS

MODULE

1

History of Nutrition

Trends

Lesson 1



DNA Genetic technologies

Vitalism

DNA breakthrough

Scientists have made revolutionary breakthroughs in being able to alter DNA sequences and modify gene function. The groundbreaking technique called Clustered Regularly Interspaced Short Palindromic Repeats (or CRISPR) enables scientists to 'snip' out faulty DNA sequences and insert the corrected DNA sequence in mice with a rare liver disorder. This study published in the prestigious *Nature Biotechnology*¹ offers the first evidence of being able to successfully reverse disease symptoms in animals.

Professor Daniel Anderson, the senior author of the paper commented: "What's exciting about this approach is that we can actually correct a defective gene in a living adult animal". More recently, CRISPR has been used to target sickle-cell anaemia in humans^{2,3}. Sickle-cell anaemia is an inherited disorder that affects haemoglobin, the protein

involved in carrying oxygen in red blood cells. These studies used CRISPR technology to enhance the production of foetal haemoglobin and subsequently relieve patients of the debilitating episodes of pain crises that come with sickle-cell disease.

CRISPR technology is also being used to treat patients with severe forms of the related inherited blood disease called β -thalassaemia². Patients receiving CRISPR treatment have not required the blood transfusions usually needed to manage this disease.

What makes these discoveries remarkable is the potential for this technique to treat a wide range of genetic disorders in humans. IVF doctors believe this technique can be used for human germline modification to prevent inherited disease in families⁴.

Learning Objectives

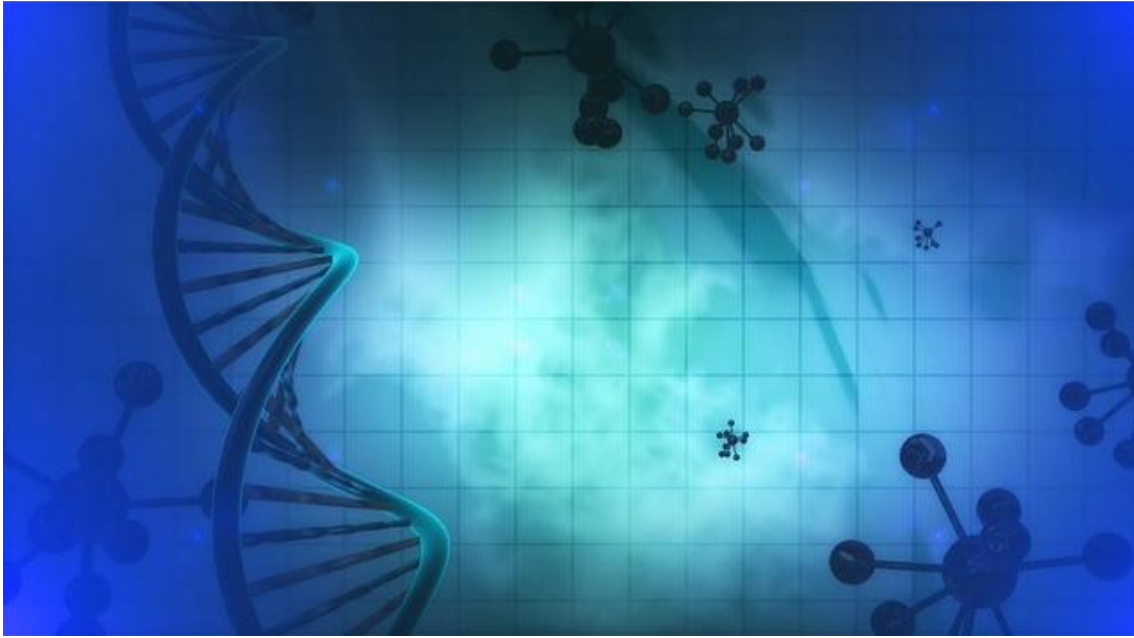


Following Lesson 1 you will be able to:

1. Have an appreciation of the historical perspective of vitalism.
2. Define reductionism as it relates to biology.
3. Discuss the dichotomy between vitalism and reductionism



Vitalism: the theory that the origin and phenomena of life are dependent on a force or principle distinct from purely chemical or physical forces.



DNA: the blueprint for life

Vitalism

DNA breakthrough

Advances like this and others in the 21st century are dominated by understanding the mysteries of life. New scientific disciplines have emerged including bioinformatics, molecular evolution, and nanotechnology, that accept that the key to the “secrets of life” are characteristic of the chromosomes and the genetic material, deoxyribonucleic acid (DNA).

Indeed, the history of Western science has preoccupied itself with reducing nature to simpler components to understand them. This **reductionist** view in the biological sciences has made it possible to discover amazing insights into the vital processes of cells, molecules, and organisms. It has had a major influence on understanding disease mechanisms and the design of medicines to treat disease.

However, reductionism also assumes that once the elementary mechanisms of a system are accounted for, there is little room for additional causes ⁶.

Alongside this reductionist approach is a philosophy based on living organisms as dynamic and complex systems that are essentially in flux with the environment on a scale that ranges from cellular to physiological, biographical, social, and cultural. This philosophy is **vitalism**.

Vitalism respects the complexity of living things while also recognising that there is an “**innate intelligence**” or a “**vital force**” functioning in the living organism that cannot be reduced or explained simply by physical or chemical factors ^{7,8}.

Vitalism versus Reductionism

Reductionism “holds that, although organisms are more complex than inorganic substances, they are nevertheless fully explicable in terms of laws and principles which operate in inorganic nature” ⁵.

Vitalism “holds organisms to be inexplicable in these terms and thus drastically diminishes the relevance of inorganic sciences to our understanding of organic phenomena. Typically, vitalists of this kind postulated some special forces or drives that are only operative in organisms and not in the rest of nature” ⁵.



Reductionism versus vitalism argument

Vitalism

A brief historical perspective

Numerous primitive and more developed societies have for centuries believed in a vital force or energy permeating the universe. It was thought that this vital life force was essential for all living things for health and life. To the Hindus, it is called *prana*, to the Chinese *qi*, to the Japanese *ki*, and the Hawaiians, *Mana*. Hippocrates referred to it as *Vis Medicatrix Naturae*, and Galen called it *Pneuma* ⁹. Galen suggested that blood vessels carried air to the heart where it was then converted to “vital spirits” or *Pneuma* that was sent to the rest of the body.

Aristotle (384–322 BC) is often credited with the first formal expression of vitalism and established four principles of vitalistic tradition ⁹:

- I. That the life of an organism and its psyche are intertwined.
- II. The organism has purposive activity.
- III. There is organic unity (the idea that a specific thing is made up of independent parts, for example, a body is made up of its constituent organs).

- IV. Embryological development (where the brain is the very first organ to develop and sends creative power to every cell in the body, and therefore controls all healing processes).





Early Philosophers in the Raphael Rooms, painted by Raphael (Raffaello Sanzio da Urbino, 1483-1520, age 37)

Vitalism

A brief historical perspective

Aristotle thought that there was a hierarchy of self-organisation where the inorganic matter was at the lowest level of self-organisation, organic matter in plants has higher levels of self-organisation, animals still higher, human beings still higher, and immortals the highest ¹⁰.

The Catholic theologian, St. Thomas Aquinas (1224-1274), provided the first amendment to Aristotle's ideas on vitalism⁹. Aquinas recognised the importance of the five senses and that "*A human being is an animated body in which the psychic principle (anima) is distinctive of the species and determines that the material is human; man's soul in his substantial form*".

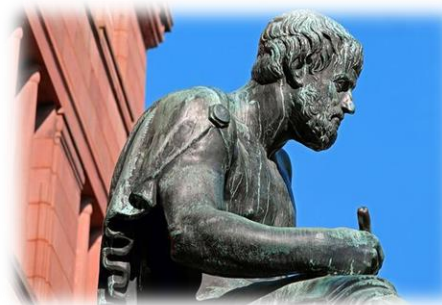
Centuries following Aristotle saw the emergence of the shaman, a village leader who served as a healer, priest, and a wise man. The shaman would treat a patient's illness using supernatural methods and rituals. The success of the shaman depended on suggested therapy and the fact that many of the illnesses healed naturally in an environment that was supportive and closely monitored ⁹.

In 1766, F.A. Mesmer proposed that a fluid or force existed that filled the whole universe but was concentrated in magnets and an animal's nervous system ⁹. He thought that the planets and stars produced fluctuations in cosmic body fluid that led to disease. Moreover, a therapist's hand or a magnet passing over the affected area would calm these cosmic fluctuations and heal the patient. Various forms of magnetism and healing fluctuated throughout much of the 19th century and components of this practice branched out into hypnotism.

However, it should be noted that the history of science has been in constant flux between those who adopt a purely reductionistic philosophy wherein the laws

of nature are expressed solely in the language of mathematics and physics, and those that argue reductionism can explain the 'what' and 'how,' but never the 'why' ⁸.

The 19th century also saw the emergence of dowsing



(water witching). This relied on the use of a pendulum to find water or to diagnose and treat disease. It was thought that all matter radiated at specific wavelengths and living

things in particular emitted energy at wavelengths and intensities indicative of their state of health ^{9,11}.

By the early 19th century, views on the nature of living things were divided into two categories: **chemical** and **vitalist**. The chemical view held that life is a consequence of complex, but ultimately comprehensible physicochemical processes. In contrast, the vitalist view hypothesised that some unnatural, conceivably unknowable properties of living systems existed that could not be explained by conventional science. By the 20th century, the properties and biological mechanisms of living systems became more evident, and vitalism was no longer suggested to explain them. At the end of the 20th century, genetics was a major theme among biologists who explained the role of DNA as the "blueprint" for life ¹².

The historical account of vitalism is covered briefly here. However, it is important to note that vitalism and reductionism overlapped for many years before advances in technology allowed scientists to test ideas and theories. Suggested readings: **Bruce Lipton**: the biology of belief, ISBN: 0-9759914-7-7 and **Sarah Farrant**: the vital truth, ISBN: 978-0-9803185-0-0.



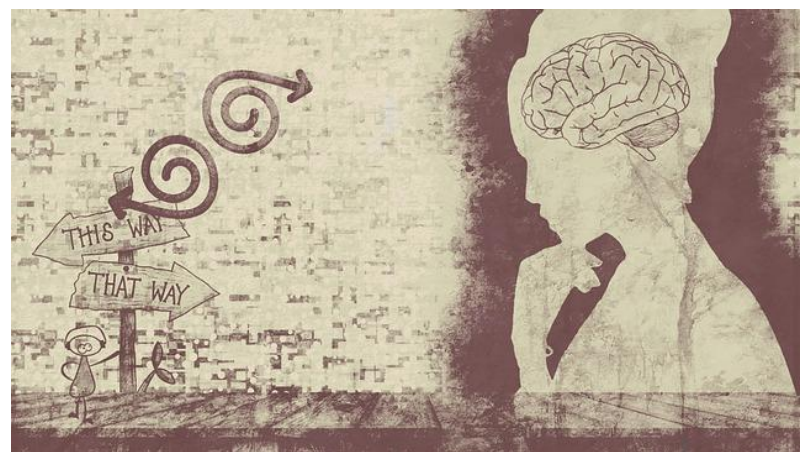
Man and the universe.

The biological age and human sciences

Vitalism and reductionism

The history of the biological sciences has been profoundly shaped by the dispute between vitalism and reductionism¹³. While the life sciences reductionist practices analyse individual components of an organism to understand the whole system, vitalism supports the hypothesis that an organism is an emergent, dynamic, and complex system that has an innate ability to self-regulate and self-heal itself¹⁴. Thus, the focus on the vitality of the living human organism emphasises life and human vitality. That is, human rights to life, the equality of all humans as specific kinds of living creatures, the value of life, the future of life, and what can be done to help the lives of others.

These characteristics of life and human vitality have therefore provided a sense of direction and purpose for our role in society. Rose (2013)¹² suggests that this is because, in the face of ecological and environmental uncertainty, our sense of precariousness as a species is being threatened and challenged. Rose also notes that in this biological age, contemporary biology does offer the opportunity for a new relationship between the human sciences (e.g., vitality) and the life sciences. For example, in the life sciences, the advances in genetics and our understanding of the cell, and the use of animal models to understand disease pathologies and evolution processes reveal multiple affinities between humans and other organisms. Yet alongside this reductionism, the emergence of the vitalistic properties of living organisms has taken place where organisms exist in an environment that ranges in scales from intracellular to psychological, biographical, social, and cultural¹².



Accordingly, these thought processes of vitalism find themselves wedged into novel **biopolitics** (politics of biology) which needs to address a common problem associated with the biological sciences, that is, to deem something biological is not to assert all events of biology to fatalism but provide an opportunity to understand life¹². On one hand, vitalistic proponents must recognise how the philosophies of biology operate and engage with the sciences to help address local, national, and global inequities. On the other hand, reductionists must move beyond description and develop a positive affiliation to the new ways of understanding the dynamic relationships between the vital and the environment¹².

Summary



Reductionism in the sciences has no doubt led to many discoveries that have benefited humans, particularly in health. The philosophy of reductionism suggests that if we understand the mechanism of each component of a system, then that is all we need to know to predict the system's behaviour. However, we understand that an organism is more than the sum of its parts. Vitalism, on the other hand, recognises that biological systems are in flux with their surroundings and have an innate intelligence and ability to self-regulating. While the two philosophies are hotly debated about their connectedness to each other, the future of health and wellbeing is often a personal blend of reductionism in the form of western medicine, and

vitalism where an integrated approach that is individual-specific is needed to meet cultural, social, religious, and placed-based needs.

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