Determining the Link Between Diet and Cancer

Dr T. Colin Campbell

Scientia

DETERMINING THE LINK BETWEEN DIET AND CANCER

Cancer is a leading cause of death worldwide and understanding the development of the disease is essential for prevention and treatment. **Dr T. Colin Campbell** from Cornell University's Division of Nutritional Sciences proposes the intriguing theory that cancer is not primarily a genetic disease but a nutrition-responsive disease. By conducting numerous animal and human studies, he is providing convincing evidence on the importance of diet, particularly the consumption of animal-based protein, in the development of cancer.

Challenging the Current Understanding of Cancer

Cancer is a leading cause of morbidity and mortality worldwide and is responsible for approximately 9.6 million deaths globally per year according to the World Health Organization. A better understanding of the disease is necessary to ensure the provision of targeted and effective treatment as well as to prevent its onset.

Cancer is typically considered a genetic disease, starting with a gene mutation in the DNA of a cell which can be inherited or acquired. Acquired mutations occur as a result of environmental cancer-causing agents (carcinogens) which are activated by enzymes within the body to give products that subsequently bind to and alter the DNA, causing genetic mutation. As cells with mutated DNA continue to multiply, more mutations develop and the cells begin to display characteristics typically observed in cancer, such as limitless replication, evasion of cell death, and drug resistance.

It is believed that these mechanisms by which cancer occurs are irreversible. Current cancer treatments, such as surgery and chemotherapy, are based on this theory of irreversibility and aim to remove or kill cancer cells, rather than reverse their pathogenesis.

Dr T. Colin Campbell in the Division of Nutritional Sciences at Cornell University refutes this theory of cancer development, deeming it as 'reductionist'. His research is demonstrating that cancer is not merely a genetic disease, but rather, that nutrition controls the expression of these genes in the development of cancer and possibly suspend and even reverse further development. Over the past six decades, Dr Campbell has examined the existing evidence for a relationship between nutrition and cancer and elucidated the optimal diet for the prevention of cancer.

Examining the Existing Evidence

In a 2017 publication, Dr Campbell delved into the history of research surrounding the association between diet and cancer, which appeared

as early as the 1800s. He discusses more than a century of work in which numerous researchers cite a diet rich in protein (particularly meat), fatty foods, and a lack of fruit and vegetables as a primary cause of cancer. Some reports concluded that diet was responsible for a large proportion of avoidable cancers.

Despite this long-standing research, progress in understanding the role of nutrition in cancer has been slow and these conclusions have largely been forgotten or overlooked. Dr Campbell attributes this to a reluctance to

challenge the widely accepted genetic theory of cancer, resistance from the food industry, and because 'nutrition is not respected as a legitimate science, especially in medical practice communities'.

Two relatively recent periods of nutrition research have revolved around the potential of specific vitamins to prevent nutritional deficiency diseases and chronic diseases such as cancer. However, in trials investigating this, nutrients are examined in isolation, usually in the form of supplements. In doing so, the complex interactions of nutrients with other compounds in whole foods are ignored and, as Dr Campbell explains, 'isolated nutrients, when consumed as supplements for example, often do not have the same functions as they do when present in whole food'. Dr Campbell critiques this reductionist view of nutrition and believes it has led to a diversion of attention away from the true potential of whole foods to combat disease.

The association between diet and other diseases such as diabetes and cardiovascular disease has been well documented. Furthermore, it has been observed that when people transition from simple diets of rural cultures to Western diets that are high in fat, rates of heart disease, diabetes and cancer increase. This association has been attributed to the consumption of dietary cholesterol and saturated fat in high-fat diets. However, this theory overlooks the fact that cholesterol and saturated fats are primarily found in animal-based foods. Dr Campbell suggests that the culprit of the disease-promoting diet is not cholesterol and saturated fat, but instead, the consumption of animal-based foods obviously characterised by protein.

This theory arose from an observational finding during a programme in the Philippines coordinated by Dr Campbell that was designed to resolve childhood malnutrition by ensuring sufficient protein consumption. However, Dr Campbell found that the children at higher risk of dying of liver cancer tended to come from the wealthiest families – those that consumed more animal protein.

Investigating the Role of Diet and Nutrition

To investigate the effect of animal protein consumption on cancer development, Dr Campbell and his team conducted a series of laboratory experiments on animal models in which cancer had been induced by aflatoxin, a potent carcinogen. Cancer grew when animals were fed a diet in which protein comprised 20% of total calories, but growth was repressed when animals were fed a diet in which protein comprised just 5% of total calories. Switching between 20% and 5% protein diets successively turned on and turned off tumour development during the first 12 weeks of pre-cancerous growth in animal models.

Furthermore, in a lifetime study on rats and mice conducted over 2 years, by the end of the study, all animals on a 20% protein diet had died as a result of liver cancer whereas all animals fed a 5% protein diet were alive and without liver cancer. The protein used in these studies was casein, the main protein in cow's milk. The same tests were conducted using vegetable protein rather than animal protein and the researchers found that even at 20%, the vegetable protein diet did not induce any pre-cancerous cells.

On the basis of these studies, Dr Campbell and his colleagues concluded

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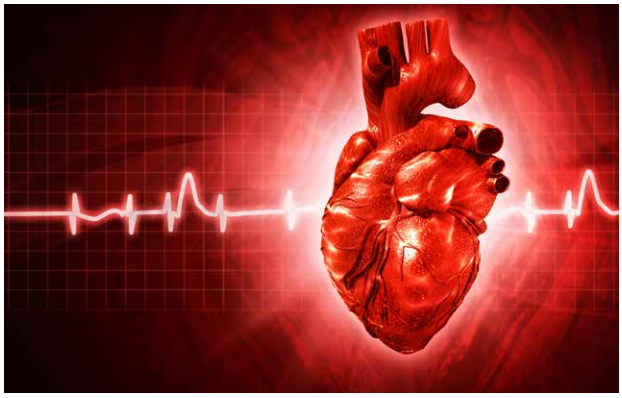

that cancer development was responsive to nutritional exposure to protein, in both directions, at the early and late stages of cancer development. Describing the findings of his work, Dr Campbell explains that 'experimental cancer development could be turned on and off by increasing and decreasing, respectively, animal protein consumption'.

To explain the mechanisms behind these findings, Dr Campbell and his team conducted further experiments in rats and mice. They found that dietary protein intake was positively correlated with the amount and the activity of the principal enzyme that activates carcinogens. Dietary protein also increased the chemical bonding of carcinogen with DNA, leading to genetic mutations. In conclusion, the researchers found that high dietary protein of animal origin up-regulated mechanisms that increase cancer development and down-regulated the cell's normal ability to reverse development.

These experiments were particularly noteworthy because it demonstrates that cancer causation involves multiple mechanisms working in synchrony to cause the cancer response. In a human setting, when consumption of animal-based protein increases, plant-based protein decreases, also relying on the same multiplicity and synchronicity of mechanisms, thus accentuating the apparent animal protein effect on cancer development.

Dr Campbell and his team have also conducted several human population studies to investigate the role of diet in cancer, the most notable of which is the China Study. This study is regarded as one of the most comprehensive population studies ever conducted and comprised a 65-county, 130 village cohort in rural China for which data were collected in 1983 and again in 1989.

It was discovered that the incidence of primary liver cancer was not associated with aflatoxin exposure. Instead, the most highly correlated lifestyle factor with liver cancer was the level of blood cholesterol, which itself is associated with greater consumption of animal-protein based foods. The researchers concluded that counties with higher consumption of animal-based foods (still only about 10% of Western consumption) were more likely to have higher death rates from 'Western' diseases, while the opposite was true for counties that consumed more plant-based foods – quite a condemnation of consuming animal-based food. Plants provide all the protein we need, oftentimes even more.

Seeking a More Effective Strategy for Cancer Prevention and Treatment

Dr Campbell hypothesises that cancer is primarily a nutrition-responsive disease, an intriguing theory that has been met with controversy. He advocates a whole-food, plant-based (WFPB) diet to protect against an array of diseases, including cancer. As he states, 'my main finding of most relevance, based on epidemiological and clinical findings on humans, mechanism studies on disease formation in experimental animals, and research findings of others during the past two centuries, is that the human diet ideally should rely on the consumption of whole, plant-based foods'. Very few studies have investigated the impact of a WFPB diet compared to animal protein-based diets on the prevention of disease, though evidence to date also supports the reversal of heart disease, diabetes and chronic kidney disease. Dr Campbell states that more intervention trials in human patients are required to test his broad-based hypothesis.

Given that current cancer treatments are costly to develop and often have negative side effects, a whole food-nutritional approach to cancer prevention and treatment could be more effective. Dr Campbell encourages the rejection of reductionist theories of cancer and nutrition and argues for a better understanding of the complexities of cancer development and nutrient interactions within whole foods to map a more effective strategy to cancer prevention and treatment. Dr Campbell's recently published book, 'The Future of Nutrition: An Insider's Look at the Science, Why We Keep Getting It Wrong, and How to Start Getting It Right', provides a stimulating account of his perspectives on nutrition and health.

Meet the researcher

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Dr T. Colin Campbell was the first in his family to attend college, obtaining his PhD in nutrition, biochemistry, and bacteriology from Cornell University. Following ten years as a faculty member at Virginia Tech University, he was recruited back to Cornell University in 1975 as a professor with tenure where he currently holds an endowed chair as the Jacob Gould Schurman Professor Emeritus of Nutritional Biochemistry in the Division of Nutritional Sciences. His research focuses on the relationship between diet and disease and comprises both laboratory experiments and large-scale human studies, including The China Study; the most comprehensive epidemiological study on nutrition ever conducted. As a result of his extensive research into nutrition and health over six decades, Dr Campbell has received multiple lifetime achievement awards as well as several humanitarian, courage, and related awards. Dr Campbell strives to communicate evidence-based information on nutrition and health.

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FURTHER READING

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