



The Future of Protein: Nourishing the World Sustainably

Policy and Information Package

BRIEF No.3 Nutrition and Health

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Introduction

This brief discusses the theme of ‘**nutrition and health**’ as it pertains to the future production and consumption of protein foods. This is possibly one of the most contested and complicated themes relating to the future of protein. For decades the established ‘common sense’ wisdom was that animal proteins, generally speaking, were more likely to pose a risk to health (particularly in cases where they were eaten in excess), mostly owing to their higher saturated fat and cholesterol content.¹ However, a small chorus of health professionals and scientists have contested the common sense narrative, and most recently have been supported by large epidemiological studies which have found no evidence of significant adverse health impacts from moderate meat consumption.² The results of this debate are undoubtedly confusing for every day consumers who – like us – do not have specific training in medicine or nutrition. This brief thus tries to capture the nature of the discussion as objectively as possible – it wades through these debates to help unpack where the future of sustainable protein lies regarding nutrition and health, identifying the core arguments made by various schools of thought on this issue.

As noted in Brief No. 1 (Introduction), we make an important distinction between Animal-Sourced Protein Foods (**ASPFs**), Plant-Sourced Protein Foods (**PSPFs**), and Novel Proteins Food Products (**NPFs**) and further we track the discussion surrounding each theme as it is primarily tackled by three main pathways addressing the future of protein (see Brief No. 1 for further details):

- a. The **REPAIR** pathway aims to ‘fix’ existing problems relating to the protein agri-food subsystem, primarily through an approach prioritizing technological innovations and improvements.
- b. The **REPLACE** approach seeks a broader overhaul of the protein subsystem, prioritizing the replacement of ASPFs with PSPFs and NPFs as the dominant protein source in the human diet, in addition to the introduction of new food commodities and consumption practices.
 - The **RESTORE** ‘school’ aims to address the problem by ‘restoring’ a holistic balance between humans and nature within the protein subsystem. This includes an emphasis on maximizing biodiversity, biomimicry, and natural resilience in the production process, all supported socio-economically through reformed consumption practices.

In this brief, we tackle the following core questions:

- ➔ *What does the latest research tell us about the health benefits and risks involved in consuming animal and plant-based proteins?*
- ➔ *How do the three pathways interpret nutrition and health in the future of protein?*

Toward Sustainable Proteins

The three pathways understand the issue from three different angles and provide different recommendations as a result. Each pathway accepts that growing human populations will increasingly demand protein rich diets, but each differ on the health benefits of the three strands of proteins laid out above. As such there are many scientific studies that have been published which in some instances appear contradictory. This policy brief will attempt to provide some clarity to the ongoing ‘protein problem’ in relation to human health and nutrition.



The **REPAIR pathway primarily sees the problem of health and nutrition as one of measurement and perfecting the scientific method.** Scientific studies on nutrition have advocated many different dietary practices for years – consumers have largely become confused and understandably, many have stopped listening to experts. The repair camp acknowledges that while many studies lack adequate scientific credibility, one of the major problems is that different variables and measurements are used in studies that lead to seemingly divergent outcomes. At the same time, the repair pathways finds scientific promise in the use of technological innovation (including genetic engineering) to produce healthier protein foods.



The **REPLACE camp has garnered significant visibility in recent years through the publicity received around new protein alternative products (like ‘plant-based meats’ and ‘dairy’, or insect powders, etc.).** This school largely suggests that by replacing ASPFs with PSPFs and NSPFs, a more healthy and sustainable balance will be achieved – particularly because of years of studies suggesting red and processed meat can lead to a variety of negative health outcomes, such as cardiovascular disease (CVD), diabetes and cancer. This camp sees a shift in consumer behaviours as the most effective way forward by shifting the balance toward plant-based proteins (as advocated, for example, in the recently updated Canada Food Guide, and the EAT Lancet study).³



Finally, the **RESTORE pathway is primarily concerned with rehabilitating the relationship between consumers and the science of health, nutrition and the planet.** This group points to the industrialization of the global diet (particularly in the ‘West’) as being tied in with the food-related health impacts witnessed in many industrialized and industrializing nations. Those in this camp tend to call for the consumption of whole, naturally-produced foods, eaten in moderation and in balance with regional traditions and seasonally-available options. Restoring this balance, it is believed, will make a significant improvement to the health impacts of people’s diets. As noted below, various types of proposals (which in some cases contradict one another) are made by advocates calling for a healthier more sustainable protein subsystem – based on their worldview of the protein problem.

The Issue in Brief

There are a number of complex challenges when it comes to unpacking just what is and is not “healthy” or “nutritious” food. A number of high-profile studies appear to contradict each another in this regard, leaving consumers increasingly confused and frustrated regarding their food choices. Moreover, a global health crisis related to the ‘double burden’ of malnutrition is evident, and there are growing concerns about further challenges to global food security and nutrition as the world’s population increases by another 30% at some point this century. Here are some of the challenges, in brief:

- The world faces a 'double burden' of malnutrition, where 1.9 billion adults, and 42 million children are overweight; and 462 million adults and some 206 million children suffer from underweight, stunted growth, or ‘wasting’.⁴
- The World Health Organization reports that (in 2013) 38.3 million deaths, or 70% of all deaths, were due to chronic diseases, mostly occurring in developing countries, and in many instances such diseases were driven by changes in traditional eating patterns.⁵
- For years studies suggested that eating less ASPFs could improve overall health outcomes. However, more recent studies involving millions of people have contested this claim, finding that lowering red or processed meat consumption has little effects in reducing risk of cardiovascular disease, stroke, heart attack, cancer, diabetes or death from any cause.⁶
- While previous studies have shown that switching to plant-based or plant-rich diets can lead to better health outcomes, some are concerned about the dangers of a diet devoid of ASPFs – especially for more at-risk populations such as the elderly, youth, or vulnerable populations, since adequate nutrients cannot be acquired from PSFPs *alone*.⁷
- Although there may be health benefits associated with substituting some ASPFs with PSPFs, this does not mean that the further shift to NSPFs will produce the same benefits. Existing studies of these products are based on short timelines and often funded by parties with a stake in outcomes. These ‘plant-based’ meat products are highly-processed and come packed with long lists of ingredients that some nutritionists say might only be healthy in moderation.⁸

Background

Proteins are a nutritional requirement and comprised of both essential and non-essential amino acids. Essential amino acids cannot be synthesized by humans and as a result we need to consume them for their provision. While protein can be derived from ASPFs, PSPFs and NPFs, the latter two categories generally-speaking tend to have an unbalanced EAA content or lack of essential nutrients like vitamin B12, iron and zinc. This implies that to get enough EAAs or sufficient nutrients in our diets, we would need to eat more PSPFs or NPFs (in terms of net volume) as well as ensure supplementation than we would from eating ASPFs.

Aside from the difficulties of knowing what type of protein rich diet is best for the planet, over the years it has become increasingly complex trying to ascertain in any definitive way what type of protein is “best” for overall health. While populations around the world have often chosen intake of ASPFs when they are available, recent negative trends in health (especially in North America) have led raised questions about the benefits of meat consumption. A plethora of **studies over the past decade or so have increasingly pointed to the value of plant-based diets** and most have specifically suggested that these benefits are largely derived as a result of decreased meat consumption.⁹ While it is generally accepted that eating meat is a good source of certain nutrients, especially vitamin B-12 and iron, some studies have linked red meat to a number of health problems including;

- Heart disease
- Some cancers
- Kidney problems
- Digestive issues
- Mortality

At the same time, other studies have shown plant-based diets to include such health benefits as;

- Lowering risk of heart disease
- Reducing risk of certain types of cancer
- Slowing or preventing cognitive decline and Alzheimer’s disease in older adults
- Helping to manage or reducing risk of developing diabetes¹⁰

These findings led the Dietary Guidelines for Americans, United Kingdom dietary guidelines, the World Health Organization International Agency for Research on Cancer, and the World Cancer Research Fund/American Institute for Cancer Research to recommend limiting intake of red meat and processed meats.¹¹

However, while this line of thinking has increasingly been incorporated into food guidelines such as the EAT Lancet diet¹² and the new Canada Food Guide,¹³ new research has found previous findings to be inconclusive. A series of associated studies released in the Fall of 2019 suggest that these recommendations were primarily based on observational studies and as a result held little basis in scientific causal inference. The recommendations that come from this new series of studies thus concludes **that there is insufficient scientific evidence to suggest adults should limit their intake of meat and should instead continue their current meat consumption.**¹⁴

Due to environmental and health concerns, many have given up or have at least thought about giving up or reducing the consumption of red meat and other ASPFs. For many however, this presents a challenge as food is a part of our culture and a way of life (see Brief No. 5). Many companies have understood this, joining the bandwagon in developing new plant-based meat

alternatives (NSPFs). NSPFs such as plant-based meat products have had a great deal of controversy surrounding them in recent years as they have proliferated on the market. Companies market them as healthier alternatives to ASFPs that avoid the supposed health issues that can be caused by meat, as studies have alluded too discussed in the previous section. However, as these meat-related health issues have come further into question the degree to which a meat alternative is necessary or desired for ‘good health’ has become somewhat muddier.

While plant-based meat alternatives vary a great deal and as such, so do their nutritional components, they are often marketed as less fatty and containing less calories. Many studies by a variety of nutritionists have found, however, that this is not always the case. These NSPFs are highly-processed, which does not necessarily make them inherently unhealthy, but some nutritionists argue it becomes integral to take a close look at the often *many* ingredients that go into making them. These often include coconut oil which is a very high source of saturated fat. Some of these products also use soy as the main protein which is a common allergen. Others use pea isolate which most people find easily digestible, but it can also cause gastrointestinal discomfort for some consumers.¹⁵ These are just the main ingredients in many of the NSPFs. The *Impossible Burger*, for example, contains all the following ingredients (including additives and preservatives):

- Water
- Soy Protein Concentrate
- Coconut Oil
- Sunflower Oil
- Natural Flavors
- 2% or less of: Potato Protein, Methylcellulose, Yeast Extract, Cultured Dextrose, Food Starch Modified, Soy Leghemoglobin, Salt, Soy Protein Isolate, Mixed Tocopherols (Vitamin E), Zinc Gluconate, Thiamine Hydrochloride (Vitamin B1), Sodium Ascorbate (Vitamin C), Niacin, Pyridoxine Hydrochloride (Vitamin B6), Riboflavin (Vitamin B2), Vitamin B12.

Although the health benefits of plant-based diets have recently been contested by some, most studies that demonstrate overall health benefits from a shift to plant-based foods do not adequately account for NSFPs. Long-term epidemiologic studies have shown that replacing red and processed meats with nuts, legumes and other PSPFs can produce beneficial health effects. However, products like Beyond Meat and Impossible Foods are much more complex than whole PSPFs.¹⁶

Replacing ASFPs with PSPFs (or some NPFs) could leave humans nutritionally deficient and can also lead to other health related issues. There are many nutrients that are difficult to acquire through PSPFs and NPFs. For instance, the following is a list of major nutrients that one study found lacking from the EAT lancet diet (including the percentage of RDAs this proposed diet would provide):¹⁷

- Retinol (17%)
- Vitamin D (5%)
- Vitamin K 72%)
- Sodium (22%)
- Potassium (67%)
- Calcium (55%)
- Iron (88%)
- Omega-3s (Difficult to quantify as percentage but likely severely lacking)

Most independently-funded studies suggest that the question remains far from clear whether these plant-based meat alternatives can be considered part of a healthy, low-carbon diet.¹⁸ There is still a need for more rigorously designed scientific studies that take into account the many complexities involved. This is needed to do the best job possible of attempting to compare apples to apples, which is especially difficult when comparing meat to plants.

Considerations

Various studies, scientists, data and research have consistently disagreed on what is the “best” diet for human health – and protein foods appear to take a spotlight in the debate. Often discrepancies result from the way scientific experiments are conducted as well as the various measurements and variables that are used and tested. More importantly, the *context* matters – how a food is produced, prepared/cooked, and the conditions in which it is eaten can all influence its metabolic impact. As Chen et al. put it, “it is now evident that both extrinsic factors (such as food, xenobiotics, environment) and intrinsic factors (such as sex, age, gene variations), separately and cooperatively, influence nutrient metabolism and the risk for developing various metabolic diseases.”¹⁹ To some extent, the onus falls on individuals to understand that the issues are complex. This, however, does not negate the need for the scientific community to do a better job of communicating limitations and exceptions to universal dietary advice. The remainder of this brief considers how each of the three pathways confront this challenge:

REPAIR

i) Improve the scientific understanding of nutrition

Decades of research into the health impacts of global dietary trends and practices has not produced the type of scientific consensus that one sees in other areas (like that regarding the known anthropogenic forcing role in climate change). Part of the problem is that nutrition science is often informed by largescale epidemiological studies – but such studies are unable to conform to double-blind experimentation with an independent variable (particularly when



food is involved) – that is, it is good at pointing out trends and correlations (between behaviours, food consumption habits, and food-related health impacts), but it is unable to accurately identify causation.²⁰ The repair camp thus seeks to improve the science of nutrition – to the extent possible – to arrive at a more robust scientific understanding of what practices, foods, conditions contribute to good or poor health.

ii) Seek innovative and technological solutions

The repair camp sees better understanding the health impact of various types of protein foods as pivotal to developing better approaches to meeting increasing demands and improving the overall impact of protein food consumption. Briefs no. 6 and 7 touch on some of these innovations, but generally the idea is to use technological solutions in areas such as: a) changing the nutritional composition of protein foods to yield a healthier product (via, for instance, genetic engineering); or b) using technological innovations in the production process (precision agriculture, genetic modification, etc.) to ensure that food is healthier or that it can be produced without substances that harm health; or c) introducing technologies that cater to individual circumstances (for instance, software or apps which track food consumption and provide personalized dietary advice).

REPLACE:



i) No way around ‘less meat’

The replace camp suggests that traditional ASPFs are both unhealthy and too environmentally damaging to justify continued levels of production and consumption – especially with ever-growing demands. This is where much of the original push away from ASPFs began as many within this camp suggested that it was beneficial for our health to forego meat. Similarly, as the environmental movement has grown, and the dangers of climate change have become increasingly evident this camp has progressively argued that plant-based diets are necessary as part of wider climate action to save the planet.²¹ The replace camp argues that regardless of how you slice up the numbers, a protein transition away from ASPFs is desirable.²²

ii) Going meatless without sacrifice

The replace camp sees replacing ASPFs as both necessary and desirable for health as well as environmental purposes (see Brief no. 6). While that can be done simply and effectively by switching to a PSPF diet, NSPFs have also been developed that allow people to make the necessary changes without having to sacrifice in the way of eating habits and desired tastes. This camp sees the various forms of plant-based meat products as healthier alternatives that have been scientifically engineered to taste like real meat while delivering targeted nutrition and protein needs.

RESTORE:



i) A balanced healthy diet includes both ASPFs and PSPFs

The restore camp is weary of industrially-produced foods, highly-processed foods, and unnatural ingredients. For those in this camp, a healthy diet is one that offers a balance of naturally-produced, regional and seasonally available, whole foods. The concern is less about what categories of protein foods are eaten so much as contextual, quantitative and in particular qualitative questions about how the food was produced, where it came from, and how it is being eaten. Perhaps the now-famed adage by Michael Pollen captured this approach to healthy diet: “Eat real food; mostly plants; not too much”²³ – too which those in the restore camp would add: “local and organic if possible”.

ii) Don’t forget about the context!

Since the restore camp takes a holistic (big picture) approach to health, it is more likely to call for attention to contextual differences between people and places in terms of the health impacts of various food. Similarly, the restore camp is suspicious of ‘one-size-fits-all’ approaches characteristic of the repair and replace camps (which see technological innovation and protein transition as ‘the answer’ to the protein sustainability problem, respectively). As an example, the benefits of ASPFs are more pronounced and necessary for certain population groups (for instance, youth, the elderly and vulnerable populations). For those aged 65 and older, age-related muscle mass loss and strength has significant negative impacts – and ASPFs may be more important to this subpopulation as they typically have decreased appetites and their bodies cannot process PSFPs sufficiently to gain the same nutrients – specifically in the way of EAAs.²⁴ Each person will have a different relationship to their food, and as such the restore camp is cautious about the very idea of a universal ‘planetary’ diet.

Conclusion

To sum up this brief, more than one third of the world’s population are suffering from food-related health problems, and practitioners in the fields of medicine, health and nutrition are keen to find ways to use protein foods to improve human health. While there appears to be considerable agreement that eating less ASPFs could improve overall health outcomes, there is also a heated debate taking place in terms of the extent to which reductions in meat consumption might actually translate into improved (or declining) health, and in what circumstances (with some warning of the health dangers of an enforced protein transition – particularly in developing countries).²⁵ Further, while there may be health benefits associated with a shift in the focus of ASPFs to PSFPs in industrialized nations, this does not mean that the further shift to NSPFs will produce the same benefits.²⁶ Debates about the healthfulness of various protein foods inevitably verges into debates about the healthfulness of common-paired nutrients like fats and carbohydrates. The three pathways advocate starkly different solutions to the problem of health and the future of protein.

NOTES

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