

How does the intake of fermented food improve one's health?

Ryan Chan Tsz Ho

Impact & Research Fellowship Program, Harvard Student Agencies, In collaboration with Learn with Leaders

ABSTRACT

The cliché “you are what you eat” has been used for hundreds of years to illustrate the link between diet and health. Now, an international team of researchers has found molecular proof of this concept, demonstrating how diet ultimately affects immunity through the gut microbiome. Besides immunity, how does the change in microbiomes and its environment affect other factors of human health, such as weight, blood pressure, fat percentage and rate of metabolism. Some people pursue their dreams of weight loss via extensive diets and exercise, or even consuming nothing at all. Instead of a complicated and expensive diet, which rebounds right after the stop of usage of such diets, does the consumption of relatively natural, nutritious fermented food benefit its consumer the same way a diet does? This research paper explores the effects of fermented food on the health and microbiome of humans through an experiment of dieting.

Keywords: Diet, health, immunity, microbiomes, microbial diversity, fermented foods

Subject: Biology

INTRODUCTION

The human gut has many organs functioning with distinct purposes. The bowels of the human body are in charge of digesting, breaking down, and absorbing nutrients from the food we ingest. Organs are the well-known parts of the bowel that absorb and digest our nutrients, but the one part which is important is not as well-known are the *microbiomes*. According to the Cambridge Dictionary, “microbiomes are microorganisms that exist in a particular environment or a particular part of the body”. This paper discusses the ones present in our guts. Each individual has a unique microbiome, composed of different microorganisms due to different diets, different lifestyles, and many more factors. The question arises: how does changing our diet benefit our gut microbiomes, and ultimately benefit ourselves?

First, it is important to realize that there is a lot of diversity in microbiomes, which is called microbial diversity. According to the Cambridge dictionary, microbial means “relating to microbes” while diversity means “the fact of many different types of things or people being included in something; a range of different things or people”. Therefore, microbial diversity can be defined as the range of different kinds of unicellular organisms, fungi and other microbes. The gut tracks contain many different types of microbes or bacteria. For example, *E.coli* and helicobacter pylori are a few well-known microbes. However, not all kinds of microbes are harmful. Lactic acid bacteria and bifidobacteria are commonly found in humans and they help break down food, as well as absorb and intake nutrients.

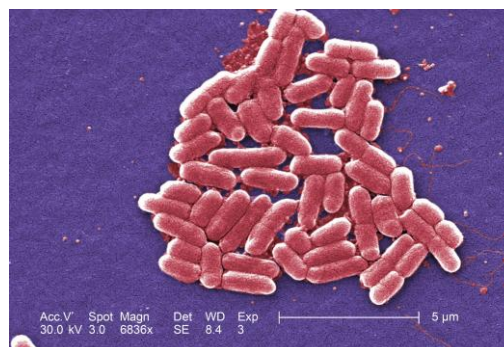


Figure 1: Picture of an *E.coli* microbiome in the guts of a human

Body

The content and proportion of good bacteria compared to harmful bacteria are directly proportional to the kind of food that humans ingest. According to research done by Sungwhan (2021), a principal investigator at the Center for Experimental Therapeutics and Reperfusion Injury at Brigham and Women’s Hospital and a former postdoctoral fellow in the Kasper lab, they did an experiment on mice. They fed them dietary amino-acid-rich foods and observed how the gut bacteria reacted to the sudden increase in amino-acid-rich foods. In the end, they found that an immune signaling cascade occurred within the mice triggered by the gut bacteria's breakdown of amino acids within the bowels. This experiment proved that different diets with different nutrients can affect one’s physical responses, and may damage or benefit the host in return. This same rule could also apply to humans.

To humans, there are different kinds of “benefits”, such as an improved immunity system, weight loss, and blood sugar regulation. To prove this, an experiment was conducted to show how a change in diet (from regular to fermented diet) can benefit us humans in various ways.

Experiment

According to research from Stanford medicine, diets high in fermented foods boost microbiome diversity and improve immune responses, which include weight loss/ gain and blood pressure differences as well. Therefore, as a self-participant in this experiment, I ate fermented foods like kimchi for 2 weeks in a row for every lunch and dinner, with only a little carbohydrate in the morning.

Here are the details.

- Breakfast: one slice of toast with cheese
- Lunch: A bowl of kimchi, a cup of sugar-free yogurt and miso soup
- Dinner: Sauerkraut with rice/ noodles and some meat. E.g., chicken breast

To keep other factors constant, I only went out for tutorials during Thursdays and Saturdays, and went to the gym every Monday, Tuesday, Wednesday and Sunday. The amount of food eaten was also kept constant. Below are the results in terms of weight and blood glucose level.

RESULTS

Table 1.1: Effects on weight after fourteen days of eating fermented food

Weight (kg)/day	1	2	3	4	5	6	7	8	9	10	11	12	13	14
9 am	92.5	92.4	92.6	92.5	92.2	92.0	91.8	91.7	91.3	91.2	90.7	90.3	89.8	89.2
9 pm	92.7	92.5	92.5	92.3	92.2	92.1	91.9	91.5	91.1	90.8	90.3	90.2	89.4	89.1

Table 1.2: Effects on blood sugar levels after fourteen days of eating fermented food

B.S. (mmol/L)/day	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Blood glucose level at 9pm	7.2	7.3	7.1	7.0	7.1	6.9	6.8	6.8	6.7	6.8	6.7	6.5	6.4	6.5

Clarification

To be precise, I did the same tasks every day while waking up and sleeping at 8am and 11:30 pm respectively. The data is also collected at the exact time of 9 am and 9 pm, with the intention to ensure that the data is as precise, accurate and uniform as possible.

CONCLUSION

According to the data collected. My weight went down from 92.5kg to 89.1 kg, which is a 3.4 kg difference while my blood glucose level decreased from 7.2 to 6.5 mmol/L in two weeks. As shown, the fermented diet consumption decreased both my weight and blood glucose levels. Keeping other factors constant, we can see that the diet of fermented food benefits our microbiomes and bodies, and consumption of it can make a person more “healthy” such as having a lower blood glucose level and weight loss, which can help and decrease the risk of diseases, including heart diseases and cholesterol blockage.

REFERENCES

- [1]. Ekaterina Pesheva (16 Nov 2021) Diet, Gut Microbes, and Immunity <https://hms.harvard.edu/news/diet-gut-microbes-immunity>
- [2]. Sungwhan Oh | Harvard Catalyst Profiles <https://connects.catalyst.harvard.edu/Profiles/display/Person/38059>
- [3]. Janelle Weaver (12 July 2021) Fermented-food diet increases microbiome diversity, decreases inflammatory proteins, study finds
- [4]. <https://med.stanford.edu/news/all-news/2021/07/fermented-food-diet-increases-microbiome-diversity-lowers-inflammation>
- [5]. Sungwhan Oh (10 Nov 2021) Host immunomodulatory lipids created by symbionts from dietary amino acids <https://www.nature.com/articles/s41586-021-04083-0>
- [6]. The editors of the encyclopedia Britannica (18 Nov 2022) E. coli <https://www.britannica.com/science/E-coli>