What's in your Salmon: Microbial Diversity of Salmon (Farmed vs. Wild)

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INTRODUCTION

Microbial organisms are undoubtedly everywhere, on your laptop, in your coffee, in the park and in you. Believe it or not, microbes run the biological world. Even if our naked eye cannot see them, their presence is essential for every part of human life, in actuality, all life on Earth. Every process in the biosphere, is touched by a plethora of Microbes. Their function is not only useful in their corresponding environment, but paramount for us, humans, of which we are colonized by an extremely complex and abundant aggregation of microbes, collectively referred to as the gut microbiota or gut microflora which regulates most of the gut metabolism. Culture-independent techniques that are based on microbial DNA sequencing have demonstrated that the mammalian gut microbiota belongs to four major phyla: Bacteroidetes, Proteobacteria, Actinobacteria and Firmicutes; the majority of them belongs to the divisions of Firmicutes and Bacteroidetes(1). Every food source either is farmed or wild more than often contains bacteria in it. Twenty-five percent of the seafood consumption in the United States is salmon , and the average American consumes four pounds of salmon every year. That may be because we consider it to be a healthy form of protein that's low in calories.(3).The popularity of Salmon is evident, although many articles and/or findings, demonstrate that salmon contains bacteria that either are beneficial or detrimental to us (humans). But none of the study has made it clear that which salmon either farmed or wild has the high diversity of bacteria and increased ratio of firmicutes and Bacteroidetes. It is unclear which salmon has higher diversity of bacteria which can affect the microflora in human gut. Thus to clarify this, two different samples of wild and farmed salmon were taken from different locations, Flushing and Westbury, in order to shed some clarity on the microbial diversity of salmon(farmed vs wild) and the ratio of firmicutes and Bacteroidetes.

QUESTION/PROBLEM

It has been reported by several studies that diet can modify the intestinal microbiota which has a significant impact on human's health; therefore, evaluation of existed microbial community in different dietary products is crucial in maintenance of human health and utilizing a significant therapeutic strategy for different diseases.

HYPOTHESIS

We hypothesized the higher diversity of bacterial communities in wild salmon than the other samples based on the differences in diet and habitat of wild and farm salmon.

METHODS

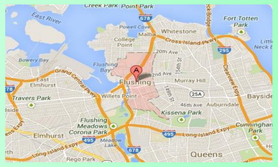
Samples: of wild and farmed salmon were obtained from two different locations, one from Westbury, Long Island and the other from Flushing, Queens and were brought to the lab.

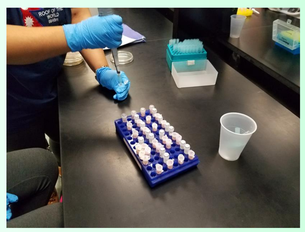
DNA Extraction, Amplification of 16s rRNA Genes, Sequencing, and Identification:
Samples were crushed completely with micropipettes. DNA was extracted using a PowerSoil® DNA extraction kit (MoBio Laboratories, Carlsbad, CA, USA). 16S RNA was amplified using Polymerase Chain Reaction (PCR), and raw data was analyzed using QIIME (Caporaso, J. G. et al. (2010). Gene sequences were analyzed using Basic Local Alignment Search Tool (BLAST).

Site locations

Long Island-Westbury

Flushing-Queens



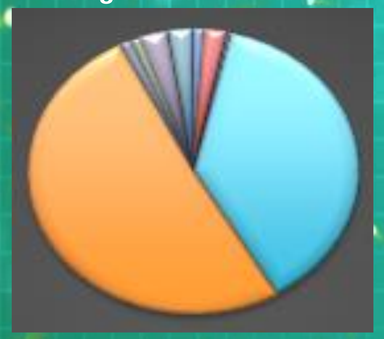


RESULTS

Phyla Level of Microbe-Diversity of Farmed and Wild Salmon in Long-Island and Queens

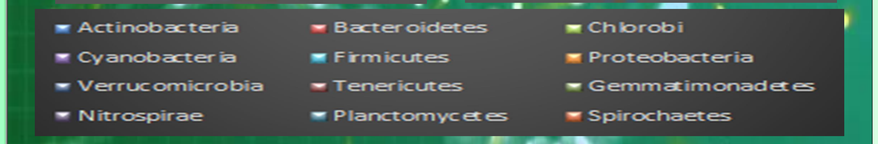
Long Island- Wild

Long Island- Farmed

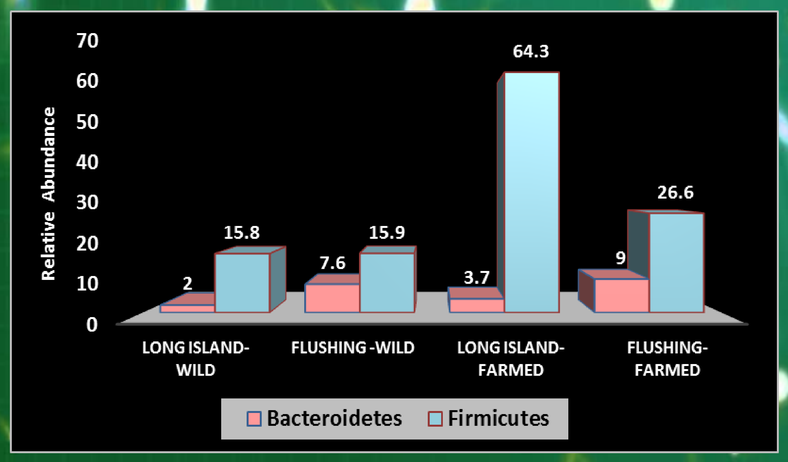


Queens-Wild

Queens-Farmed

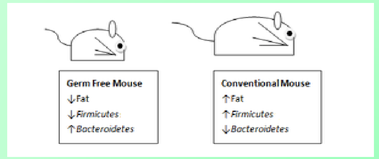


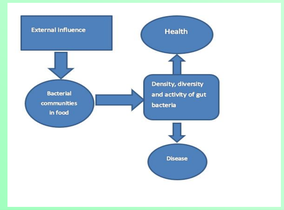
Firmicutes to Bacteroidetes Abundance Ratio



DISCUSSION

- We found that all sample has diversity of bacteria but the farmed one has more diversity of bacteria comparing to others since both farmed sample of Flushing, Queens and Westbury Long Island has higher species under each phyla .
- There is a significant difference between Firmicutes and Bacteriodetes between Farmed and wild ones at both areas.
- Increased and levels of Firmicutes and Bacteriodetes respectively in the human gut have been reported in different diseases such obesity and autism.
- These alterations might have been linked to the changes in gut microbiota.
- It is also proposed that an increased prevalence of Proteobacteria in the gut microbiota is a potential diagnostic signature of dysbiosis and risk of disease. This Phyla had also higher concentrations in farmed salmon than wild ones in both areas.





CONCLUSIONS AND FUTURE STUDY

- ✓ Based on our findings our hypothesis disapproved.
- ✓ There are various phyla of bacteria present both wild and farmed salmon.
- ✓ Overall, the alpha diversity was the same between four different samples.
- ✓ The phylum Firmicutes was more and Bacteroidetes was less in farmed salmon compare to wild ones. Therefore taking too much farmed salmon should be prohibited.
- ✓ Consuming farmed salmon might result in metabolic diseases such as diabetes or obesity.
- ✓ Study with choosing more samples is needed to confirm the abundance of Firmicutes bacteria in farmed sea food.
- ✓ Study of metagenomics in the habitat of these seafood is also helpful for approving our findings in this study.
- ✓ As previously mentioned, research in the micro diversity in popular food products have been scarce, thus further research would examine nutritional food products related to gut microbiota, which can aid in the prevention or cause of many associated metabolic or chronic diseases.

REFRENCES

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