

The Pinkerton Foundation

# Heroes of the Bacterial Biome: An Investigative Study of Probiotic Supplements

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### Abstract

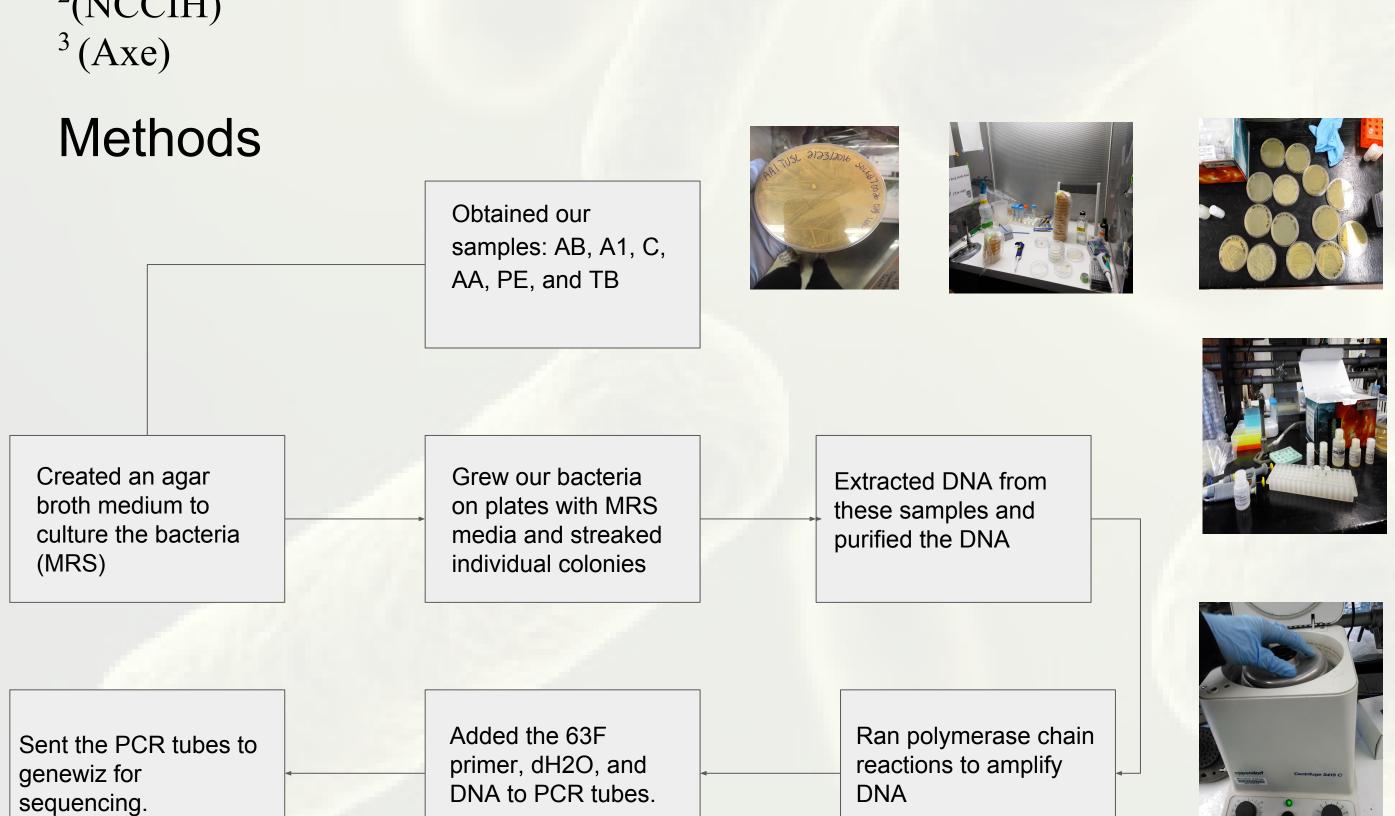
The basis of our experiment started with a question from our mentor, who himself takes probiotics to aid in the reduction of cholesterol. When you think of bacteria, you probably think of the harmful "germs" that accumulate from dirty things. However, most bacteria are harmless or even beneficial. There is a natural flora of bacteria that exists within you and on you in a mutualistic symbiotic relationship: the human microbiome. As it turns out, you have more bacteria in and on you than you have cells in your body. If you've ever had a yogurt with the word "probiotic" on it, and have been told they're good for you, have you ever stopped to think about what they are? They're exactly what they sound like: good bacteria. Comparatively, have you ever wondered if the supplement you are taking is truly present in the product? Probiotics help suppress endogenous and exogenous probiotics, relieves food allergies in infants, lowers cholesterol, reduces the risk of colon cancer and much more<sup>1</sup>. Probiotics have multiple uses, whether to help digestive help or to build the immune system, millions of Americans consume them to better their lives.

<sup>1</sup> (Researchgate)

### Introduction

With all pros, there are cons to probiotics: biologically, economically, and morally. The FDA is not required by law to regulate the production and distribution of probiotic and other dietary supplements<sup>2</sup>. This causes concerns for consumers in terms of trust and health. Some probiotic companies replace actual probiotic DNA with cheap fillers that can be hazardous to health. Such include hydrogenated oils which can cause heart attack or stroke for those at risk, artificial colors which come from toxic coal tar and titanium dioxide which can lead to a decrease in immune health<sup>3</sup>. This is the most cost effective way to create probiotic pills and numerous companies practice such techniques. The industry is so saddles and jailed with this money saving mindset that the health of their consumers seem secondary. Our project poses such a question of whether or not these industries include true Lactobacillus or Bifidobacterium DNA in their supplements.

<sup>2</sup>(NCCIH)



## Results We sent in eight of our samples for sequencing: C, AB, A1-2, AA-4, PE-4, TB-4, AA-3, and PE-2. All eight samples came back as failures as a result of no priming. 527 527 83% 1e-145 82% CP011105. 523 523 83% 2e-144 82% FQ958210. FIGURE 1 FIGURE 10 FIGURE 2 FIGURE 3 FIGURE 5 FIGURE 4 >AA-4 UBRP-63For D08.ab1 >PE-2\_UBRP-63For\_H08.ab1 TCTGGAANANCAAAAATGANNTAAATGTGGATTTCTNCAGGCCGAAAATCCATGCCATCCNTATCAATAAAAAANTCNAC CAGCCCCAAANTGANGATTTTGTNCTTGCGCTTNAAGNACTTANNGATGCANGGTACTGGCATCCTGATTTGGCCNGTAA GCCTTATCCTATTACTCCTCANNCCCTGATTGCACCATAACAAATGGTACATACTAGTGATCTTGATGGTGGCNTTCGGT CCATCNCNTCCCNNCTAGCCNCCCCNCCNATTAAGGNGGANNNANCAATTCTNTTGNANNGNCCGNATAAANAAANNNN ACCACNNGGGTAANAGTTGGATGNTCNCNNNNNNNNNNCTCTTGNTCNTCNNNNNATCATTGGCCNNNGTCTNNNATTCCA AGNAAAATAAAAAANCCGNNNNNNTNCCGAAAANNCANCNGNNTGCCTCNNTGGTGNCNNGNAGGGNNNNNNNNGTGNNN ANNNNNNTNNNANNNNTTTTGNTGNNNNGTTTTAGTNNNNTGNCCGCNNGNTANNNNCNN FIGURE 6 FIGURE 7 >TB-4\_UBRP-63For\_F08.ab1 NNNNNNNNNGNNCTTGNTNTANTTTTGAACGAGTGGCGGACGGGTGACTAACACGTGGGTAN NNGNGACTANCAATCNCCNNNNACNNACNAAGTTNNTANGNTCGNACAGGATANAATGAAGCNNNNNATTNNGNTGTGAT GAAGAAANACAAGGGGCTGCNCTGACACTGNTGGTTGTGANGACTTGTNTCCTGCATTGGATTNTACTGNNATTGGACAA GCCGGACCTGNAATTGAATANGCAAAANTCNNTTNTTACCCTNCCCTTNCGGCCGTGGCANNGTCCTCATTGTTTTATGT AGACGNNNACTANNTAATAGGNNTTTTTCCTTTTTNCTTAGTANNNNAGNATNCATAANACTTTGNTNTNGATTCTTGAA NNNCAAAANNGAGGTACTTGTGTATATCTTCGGCNNACNNTTNTGCCCNTATGANTNNNGACNGGCCCGACNTTGCCGNG NTTTCANNNNCACAANNNATACCTTGATGATCTCAGNTGGNNNTCTCTNNNTTATTGTTAATATTNCTTACCTNATGTCT ATANTTTCNNCNNNNNNNCNTNNNNNANNNAGNNTCNNNNAATNTNNTGGNNAAGTCACTNTNNANAAATGCTCTGGAAA FTNNNAANTTGGNNCTGCTNTAAAGATGCTTGNGGATGCNTNCNCAGNGGCA FANNNNNNNANTCTTNATCNATNATTCTNTTTNNTTTGNTTCAATTTANCANGACGNATTTATNTNNANTC FIGURE 8 FIGURE 9

### Discussion

Though we lack a concrete answer to our claims, we are certain that there is bacteria in the probiotics we selected. There was adequate growth on the plates when we grew our samples out, indicating the presence of bacteria. However, we do not know which species of bacteria they are.

In the diagrams above, there are trace files and the sequences of the samples that we have collected. The results aforementioned could be correlated to experimental error. (Figures 1-9)

Through the course of this experiment, we were set back by unforeseen delays. Had this gone according to plan, we could have had more information about whether or not these probiotic supplements were true to their ingredients. However, we did find a potentially groundbreaking discovery. When conducting a BLAST search, we found that the sample C, which was only supposed to contain Lactobacillus reuteri had DNA that was 83% correlated with the pathogen Legionella pneumophila. We conducted BLAST searches with the other samples, but did not get any results. This match could have been an error due to poor preparation of samples for sequencing, or it may be product fraud. However, we will not know the answer to this question unless we were to run this experiment again.

## Acknowledgements

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