Pro-You: Microbes that Heal

Abstract:

Our team plans to focus on the technology of bioengineered microbes to aid in medical treatments for both common and rare ailments. Microbes have been used by humans for centuries in the process of making cheese. In the 1970s, scientists discovered how to splice human DNA encoding the production of insulin into the plasmids of E. coli bacteria. The FDA approved this technique in 1982. Today, virtually any protein can be produced with bacteria. Valuable medicines, vaccines, and hormones can be produced in this manner, but it takes ten to fifteen years for the FDA to approve each new bioengineered drug. Our goal for the future is to produce an app called Pro-You that will allow people everywhere to list their symptoms digitally and get a diagnosis. In a short period of time, they will receive a refrigerated shipment of customized probiotics that have been robotically engineered and spliced in a lab.

Pro-You: Microbes that Heal

Present Technology:

Today, scientists can utilize microbes to synthetically produce virtually any protein needed by the human body. There are many valuable medicines, vaccines and hormones that can be made using genetically altered microbes. Unfortunately, medical scientists are severely limited by the fact that since these drugs are bioengineered, they can take up to fifteen years to be approved by the Food and Drug Administration. A few modern medicines that are based on microbes are penicillin, cancer chemotherapy drugs, and cholesterol lowering drugs. We have about one hundred billion microbes in and on our bodies. They help in many ways, such as helping to produce vitamins and digest our food. These microbes also help to create and maintain our immune systems. Another major aspect of modern microbe use is food production. Many fermented milk products use bacteria to perform lactic acid fermentation and produce items such as sour cream or yogurt.

History:

Throughout history, microbes have been used to accomplish tasks. For numerous centuries, humans have used specific microbes to produce cheese and beer. An understanding of yeast has long been utilized in the process of making bread. However, it was not until the twentieth century that the technology of bioengineering microbes to produce necessary proteins began. Insulin was the very first protein to be produced. Insulin was originally harvested from the pancreases of pigs and cows, but some people reacted negatively to it. As a result, scientists searched for a way to provide diabetic patients with actual human insulin. In the 1970s, this goal was realized when a group of scientists spliced the DNA that encodes the production of human

insulin into the plasmids of E. coli bacteria. Because of the way that these microbes reproduce, they were able to be brewed in a vat, similarly to alcoholic beverages. These microbes could finally be distributed to people with Type 1 Diabetes so that they could receive genuine human insulin.

Future Technology:

In the future, Pro-You: Microbes That Heal will be developed. Pro-You will be an app that will allow patients to quickly receive the medical-quality genetically modified microbes they need to promote healing. The app will provide lists of symptoms for clients to choose from as they effortlessly help to determine a diagnosis for their condition. After the client fills out a short waiver, approves the transfer of some of their medical information including a DNA sample, and provides some basic shipping and billing information, the Pro-You lab will be notified of the request. Based on the disease or condition that is diagnosed, the robotic, computerized lab will perform a gene splice into an E. coli bacterial cell to insert a synthetic portion of the human genome that will code for the production of a specific enzyme, protein, or other molecule. These medical microbes will be tailor made so that they can help the individual to experience rapid healing. The E. coli will be designed to target specific areas or systems of the body depending on the client's needs. Specifically, cultures could be produced to aid in recovery from malaria or yellow fever. Others could treat conditions such as diabetes or target the unchecked cells that cause cancerous growths. Normal gut microbes could be generated for ill patients. The personalized E. coli cultures could even be used to treat a common cold or headache. A permanent cure for cancer, tuberculosis, or rubella could be introduced. In a matter of minutes, a culture of the personalized E. coli can be created in the lab. A medical doctor will quality check

the culture and ensure that it will serve its intended purpose. This culture will be added to a sample of probiotic yogurt. Finally, a high-speed drone will deliver the refrigerated shipment of yogurt to the client's doorstep. It will take approximately an hour for the entire process to occur. As a result, the general population will have access to Pro-You quickly enough to assist in almost any situation. The relatively low cost of a culture of personalized E. coli will ensure that most people will benefit from this technology. Overall, we have created a streamlined process that will bring genetics into the home for everyday use in medicine.

Breakthroughs:

In order for *Pro-You: Microbes that Heal* to become a reality, numerous scientific breakthroughs would need to occur. A highly precise and sterile robotic lab would need to be developed and designed so that the DNA could be quickly and accurately spliced out of a healthy human cell and into an E. coli bacteria cell. This lab would cost hundreds of millions of dollars that would need to be raised by the scientific community. Another necessary breakthrough would be the creation of the robots that would constantly, quickly, and accurately perform the gene splicing. These robots would need to perform important yet microscopic procedures on a cellular level, so they would need to be extremely small and precise. The process of analyzing a patient's symptoms and producing a genetically modified microbe to promote healing for the patient would need to be developed and extensively tested so that it could be adopted by the Food and Drug Administration. A patent on the process would be necessary. This future technology of healing microbes does not exist today because of the difficulties involved in both patenting the process and developing the technical equipment necessary to perform the process on a large scale. In order to develop the process of converting a patient's complaints into a genetically

altered microbe, certain investigations would need to be made. Specifically, the symptoms would have to be compared to known symptoms of diseases. The matching diseases would be then tested against the patient's DNA to determine the most likely disease. Using trial and error and some test animals, scientists will determine a way to splice the production of the correct human antibodies into E. coli bacteria, allowing for a cure and healing from virtually any disease. Results for these tests will be largely qualitative.

Design Process:

A variety of possibilities were considered when our team decided upon which features we would incorporate into our design. Originally, we had considered using a number of common microbes to splice DNA into. This consideration was made so that E. coli would not become an extinct species. However, we have chosen to reject this idea because of the difficulties involved with injecting too many different types of cells. If the machinery is set up so that it can use E. coli, it will be challenging, time consuming, and risky to change to a different type of cell. To prevent the extinction of the E. coli species of bacteria, we will simply synthesize conditions that favor its reproduction when this becomes necessary. Another feature of Pro-You that we had initially considered but eventually rejected is a completely open-ended symptom description section in the Pro-You app. We decided that leaving the symptoms open-ended would give way to too many different wordings and interpretations. The speed of the entire process would be much slower since a doctor would have to meticulously analyze each individual request. Because of people's unique word choices, similar diseases would be impossible to recognize. We had also thought of sending the E. coli in pills to patients. Each bottle of pills would come with a replicator that would allow patients to continue their prescriptions without placing additional

orders. This idea was abandoned for several reasons; chiefly, the replication of prescription "drugs" would not be accepted and approved by the FDA. It could lead to genetically modified microbes finding their way into the wrong hands or harming the environment. An additional potential issue with the pills is that the E. coli bacteria might become ineffective if pills containing E. coli were not properly cared for or stored. Our original ideas sounded good, but their drawbacks proved to be too great to overcome in an acceptable manner. Therefore, we have rejected these ideas in favor of the actual Pro-You app and process.

Consequences:

Microbes have been called the source of many antibiotics and vaccines. This would be good for Pro-You if people knew the significance of vaccines and antibiotics having a basis on microbes. As a result of our technology, there would be more support for science and technology worldwide. There are many positive consequences for this app. The biggest one is that people are able to quickly receive the care they need. Along with that, our app will also make it much easier and faster for both patients and doctors to make a diagnosis. However, there is a concern involved with the ease with which patients may describe their symptoms. If patients were to inaccurately describe their symptoms, the wrong culture of E. coli could be created, causing increased chances of harm to the patient. There will not be a reason to make appointments just to get medicines, which saves time for everyone. The drones we would intend to use may be subject to failures, collisions, or crashes. While there only a minimal collision risk involved, there is a significant and noteworthy risk involved with the use of drones: the risk of the microbes falling into the wrong hands. In order to prevent this from happening, the patient would need to sign off, using the app, to ensure they received the medication they need. There would be a tracking

device on the drone and if there is no signature, within a half hour, it would be assumed that the medication had not been delivered. Another dose would be started immediately and the container of microbes would self destruct upon impact of a crash or collision. While there are many good things to come out of this new technology, there are also some negative effects that go along with it. To create the app there would need to be a complete list of any and all symptoms. Then, there would need to be all the possibilities of diseases listed that would go with any number of symptoms. We know that about 30% of infectious diseases are caused by microbes. They are responsible for many deaths worldwide than any one single cause. There are dangers using microbes because they could cause diseases like smallpox, cholera, and pneumonia. If mixed with the wrong food when taking the prescribed drug it could cause fungal infections or worse diseases. Another potential issue could be the effects of mutations caused by the genetic alteration of microbes on a large scale. Overall, however, the immense medical advances caused by our technology would greatly outweigh any potential hazards involved with it.

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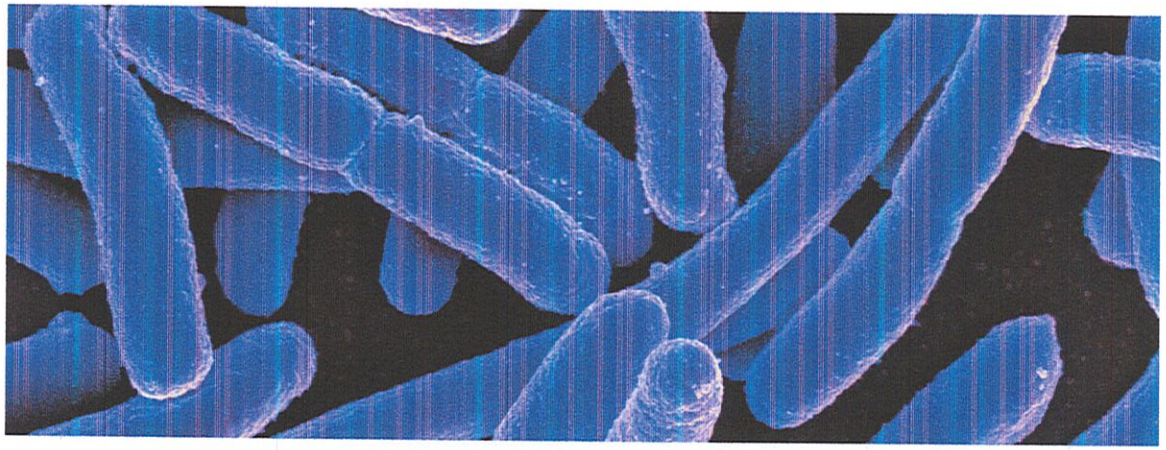
Pro-You: Microbes that Heal



Pictured above are E. coli bacteria that will be used to help cure YOU through our cutting-edge technologies.

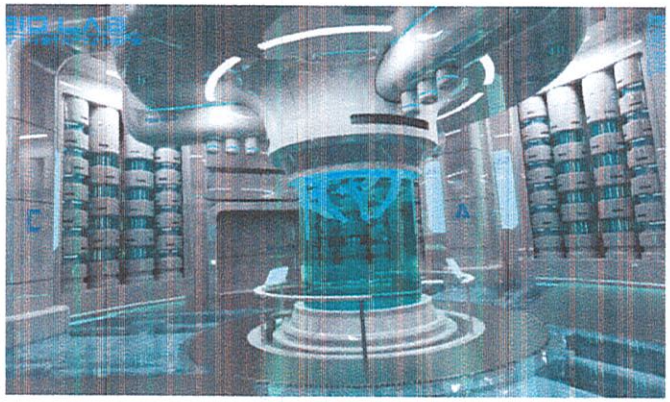
History of Medical Microbes

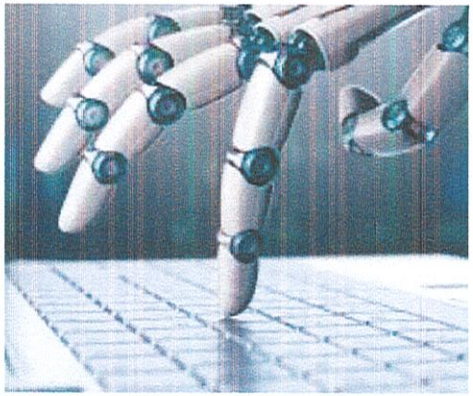
For centuries, cheese and beer have been carefully crafted by artisans using microbes to assist them!

The process began when porcine insulin was injected into humans. Some people reacted to this, so it was partially successful.

In the 1970s, scientists developed a technique of gene splicing. This allowed them to splice human DNA for the production of insulin into E. coli bacteria. These bacteria could be used to mass produce insulin.

Our Technology



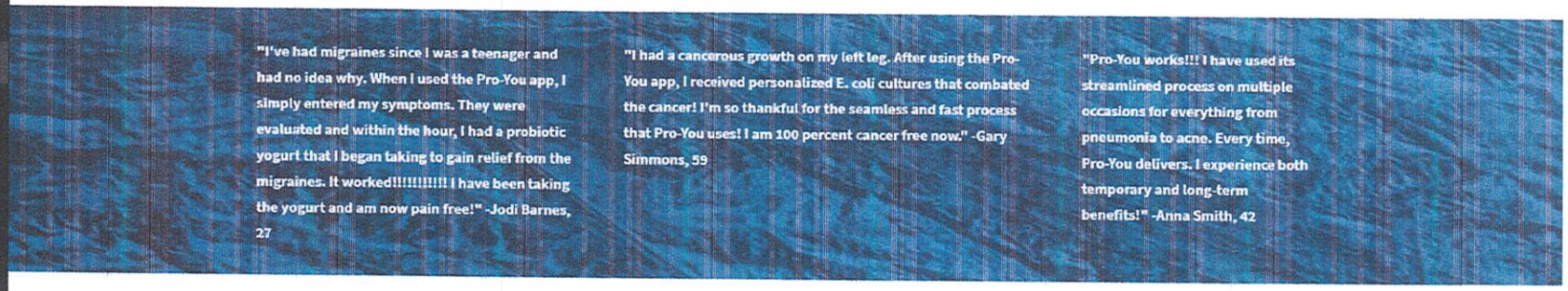


Our robotically controlled lab will take your suggestions and, using our patented process, splice helpful DNA into harmless E. coli bacteria. These cultures will form a probiotic yogurt that will be shipped to you.

Get the App!

Provide your address, symptoms, a waiver, payment information, and favorite flavor of yogurt. We'll take it from there... and you'll be all better! Our super-speed drones will bring the yogurt to you within an hour of your request!

Reviews and Testimonials



"So impressed!!! Pro-You has helped to ease my arthritis!" -Melinda Byers, 74

"I owe so much to Pro-You! Through its quick, yet precise services, my sister survived Scarlet Fever and meningitis! Forever grateful!" -Bill James, 12