

Healthguard

I. Abstract

Our vision is to invent a mouthguard that can prevent cavities and plaque formation from forming, and it can also detect imbalances in your oral microbiome. This is important because it can help prevent diabetes, heart disease, adverse pregnancy outcomes and Alzheimer's disease. This could help many people all around the world. It would work by sensing the abnormal bacteria balances and sending the information to the stand. The information can then be sent directly to your doctor and/or dentist who can help you figure out what to do. If the mouthguard finds any plaque or cavities you can use a spray on your teeth and the bristles will brush the spray onto your teeth.

II. Description

1. Present Technology

Toothbrushes are used for cleaning your teeth, gums and tongue. If you used a toothbrush you would also have to floss and use a water pick. Some limitations to the toothbrush are that they can't detect bacteria that could cause life threatening diseases. A toothbrush also can't save your life by detecting diseases such as cancer.

2. History

“Early forms of the toothbrush are mentioned as early as 3000 BC, when Egyptians and Babylonians used ‘chew sticks’ which were thin twigs with frayed edges used to rub against the teeth.”¹ In China in 1498, where coarse boar hairs were attached to handles made of bamboo or bone. Boar bristles were used until 1938, when nylon bristles were introduced by the company ` Dupont de Nemours. The first nylon toothbrush was called Doctor West’s Miracle Toothbrush.

“While the mouthguard began its journey at the turn of the 20th century in London, it gained its notoriety in America in the 1950s and 60s.”² Over the years, the design and production of the mouthguard has developed significantly. The first mouthguard was developed in 1890 by a London dentist, Woolf Krause. It was called a Gum Shield and was made from a material called gutta percha. It was specifically designed to be worn by boxers to prevent them getting lip

¹ <https://thequirkyshop.com/blogs/news/going-back-to-our-roots-with-bamboo-toothbrushes>

² “<https://corinnadental.com.au/the-history-of-the-mouthguard/>”

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lacerations which were a common injury of this sport at the time. Philip Krause, his son, also a dentist and amateur boxer, refined his father's design and began to form the mouthguard out of vella rubber. By 1927, mouthguards had become prevalent among boxers in America and began to find their way into dental literature. Some years later, in 1947, Los Angeles dentist, Rodney O. Lilyquist, used transparent acrylic resin to form the first acrylic splint and the mouthguard was molded to fit over the upper and lower teeth which made it much less noticeable and more comfortable to wear.

3. Future technology

Diabetes, heart disease, adverse pregnancy outcomes and Alzheimer's disease, are all very deadly diseases. Hundreds of millions of people die every year from these diseases. That's why we invented our mouthguard. It uses artificial intelligence and sensors to find any abnormal balance in your oral microbiome to help detect issues before they develop into those diseases. We will also detect and remove plaque from the teeth before they lead to health issues.

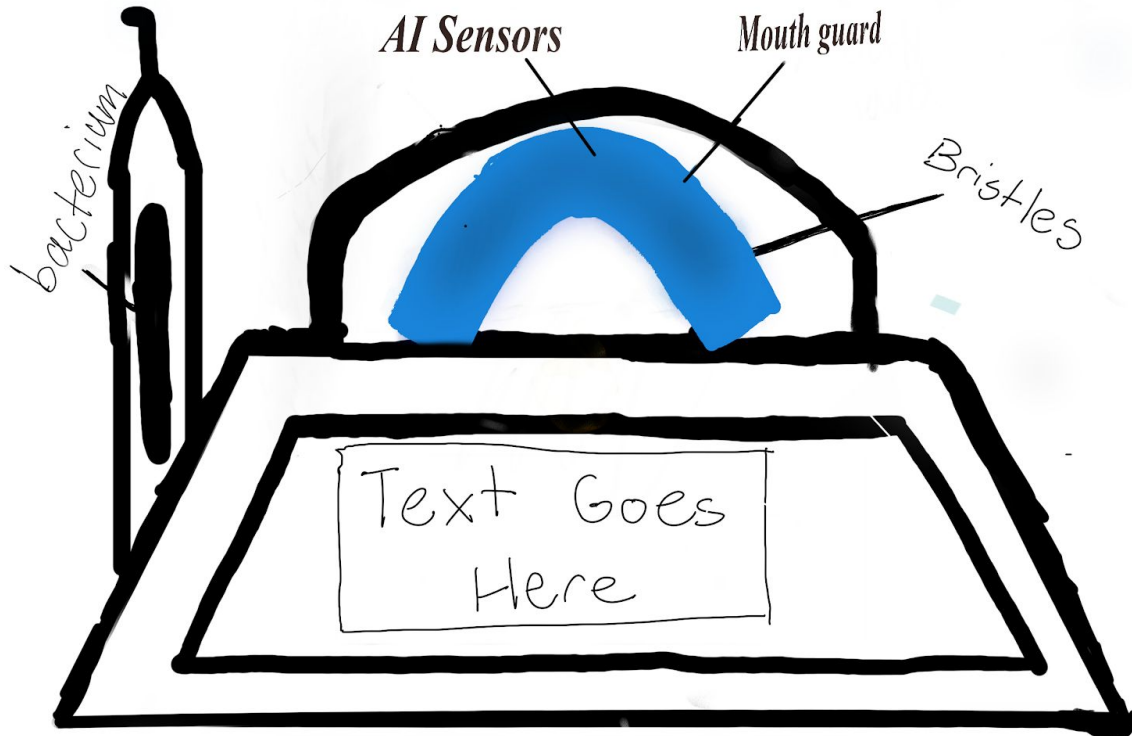
Our mouth guard will help to prevent cavities and periodontal disease through a new approach to cleaning your teeth. If the mouthguard finds any plaque, it will use a bacterium that makes a thin layer of protection that prevents cavities and plaque formations from forming.

We will use artificial intelligence (AI) to help analyze a person's oral microbiome. The mouthguard stand will have a central processing unit and use an AI program to wirelessly connect to the biomarkers and nanosensors in the mouthguard. The biomarkers and nanosensors will send the information to the stand and the AI program will run through the status and find out if everything is normal or not. A status will be displayed on the screen. If it finds plaque forming, it

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will tell you to use the bacterium. If you have changes in your oral microbiome, it will send the information to your dentist and doctor.

We are also going to install a bacterium spray that will work like a water pick but instead of using water it will spray a light coat of bacterium. This will be connected to the stand. The bacterium will work like a water pick but it will spray the bacterium and lightly coat your teeth to prevent cavities and plaque formations. We will apply the salivarius by spray inside the mouthguard.



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4. Breakthroughs

We would need to find or create a sensor that could gather information on multiple types of microorganisms in your mouth. We would need a breakthrough to design a sensor to detect and track over 700 types of microorganisms which include bacteria, fungi, viruses and protozoa in the mouth. We would also need to be able to find a large supply of the salivarius bacterium.

We could give out these mouthguards to multiple people to use for a year. After a year, we can analyze the data and see how much the mouthguard helped and study the person's health and dental hygiene. Then we can see if those things improved from the previous years. This can then tell us if our invention works.

5. Design Process

First, we started out making a toothbrush that could find cancer cells in your body. We decided to focus on the oral microbiome to help prevent health challenges like diabetes, gum disease, plaque, cavities, cancers, etc. We had an idea of using this thing called salivarius, which can prevent plaque formation. It could eventually lead to the development of toothpaste that harnesses the body's own plaque-fighting capabilities. We learned this through an article. ³

³ <https://www.sciencemag.org/news/2011/04/bacterium-acts-toothbrush>

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6. Consequences

The benefits of this invention are that it could help prevent things such as diabetes, heart disease, adverse pregnancy outcomes and Alzheimer's disease. It will also clean your teeth and stop plaque formation and cavities.

IV. Bibliography

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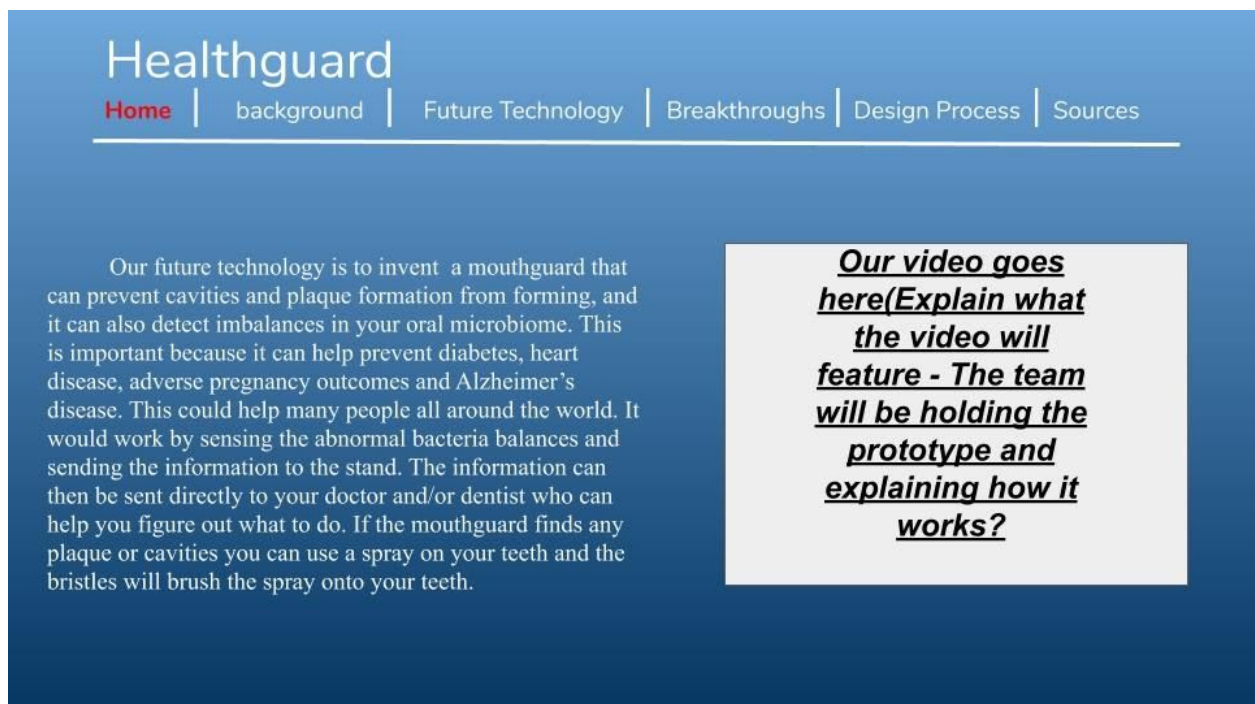
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IV. Web Design


Page 1.



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Limitations to the modern day toothbrush



It's battery runs out a lot.

You can not detect diseases while using it.

It does not guarantee clean teeth every day.

This page features a video of our vision. If the buttons under "What's available today" is clicked, a pop up will appear and explain the topic and its limitation. The arrows will allow you to scroll to all the additional technologies that exist today.

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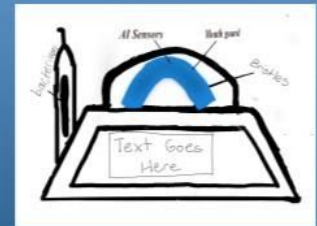
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The screenshot shows a website with a blue background. At the top, the word "Healthguard" is written in white. Below it is a navigation menu with links: "Home", "Background", "Future Technology", "Breakthroughs" (highlighted in red), "Design Process", and "Sources". A horizontal line separates the navigation from the main content. The main content area has the heading "Breakthroughs" in white. Below this heading is a paragraph of text. To the right of this text is a grey rectangular box with the heading "Study" in bold black text, followed by a paragraph of text. Small white arrows point left and right from the bottom of the grey box. At the bottom of the page, a white box contains the text "Arrows allow you to scroll to the left or right to view additional ??".

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Home | Background | Future Technology | **Breakthroughs** | Design Process | Sources

Breakthroughs

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Study


We could give out these mouthguards to multiple people to use for a year. After a year, we can analyze the data and see how much the mouthguard helped and study the person's health and dental hygiene. Then we can see if those things improved from the previous years. This can then tell us if our invention works.

Arrows allow you to scroll to the left or right to view additional ??

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We started with a toothbrush that could detect cancer. We focus on the oral microbiome used to find the cancer.



Our next idea was to make a mouth guard that would clean our teeth and detect cancer.

Then we realized that our device should detect more than cancer it should detect all sorts of diseases

We also decided that the mouth guard should send the information to a dentist or doctor.



The diagram illustrates the design process of Healthguard through a horizontal timeline arrow pointing to the right. The arrow has four blue circular markers. The first marker is positioned above a photograph of a toothbrush. The second marker is above a text box describing the idea of a mouth guard. The third marker is above a text box describing the expansion of the device's detection capabilities. The fourth marker is above a text box describing the decision to send data to a professional. The background of the slide is a solid blue color.