The Microbiome Security Agency (The MSA)
investigates the future of microbiome privacy issues and prepares citizens for a future where our personal information is at risk through our biological datasets.

Empowering citizens to secure their own data, *The MSA* researches and prototypes future scenarios, systems, products and processes for choosing your own microbiological privacy settings.

Research



1. Tracking

2. Destroying

3. Obscuring

Tracking

TRACKING the changes of the skin microbiome over time.

In this experiment the goal was to see if the bacteria we pick up and leave behind can be tracked and traced over time. Do the people and places we come in contact with actually leave a mark on us in the form of new or different compositions of bacteria?

We sampled the skin microbiome of a test subject as well as a range of environments they inhabited, and objects & people that that person came in contact with. The subject collected samples from:

> Lake in Eindhoven
> Eindhoven Airport
> Apartment in Dublin
> Anonymous stranger #1
> Dublin light rail
> Atlantic Ocean
> Refrigerator shelf

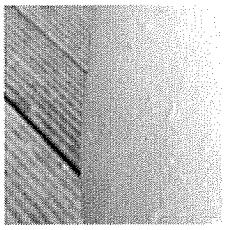
> Pub table
> Community pool
> Anonymous stranger #2
> Bath water
> Pizza place

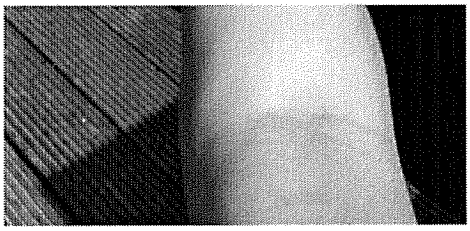
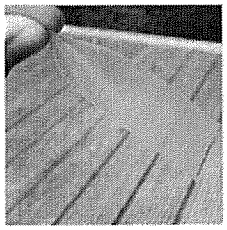
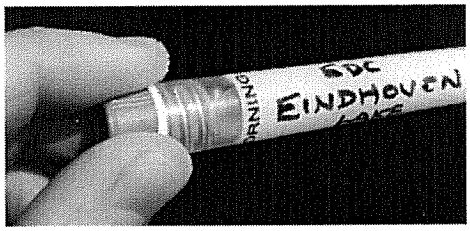
OUTCOMES

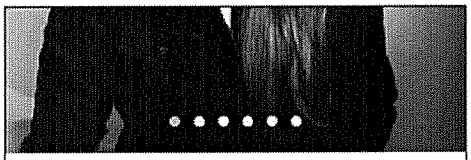
By collecting samples of water and applying tape to the skin and a variety of surfaces to obtain bacteria samples, the test subject collected twelve samples over a period of ten days.

Unfortunately, no DNA was extracted from these samples due to an unknown error, so we were unable to draw any conclusions in this experiment.

Sampling and testing continues...



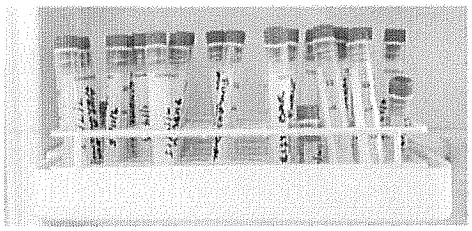



Emma, 27
less than a mile away Active just now

American with lots of ideas and no patience.

May or may not steal your bacteria.

27 Friends For Common Connections




Destroying

DESTROYING the DNA of bacteria in
fecal samples using household products.

A human fecal sample contains a diverse makeup of bacteria, which has been shown to be fairly unique to the donor. The goal of this experiment was to destroy the DNA from the bacteria found in a human fecal sample using household cleaning products. If an individual wanted to insure their privacy on a biological level, could they use DIY methods for wiping out any traces of bacteria found in their feces?

Three people donated six fecal samples each, which were treated with:

1. *Microwave: 3 minutes on high*
2. *Alcohol*
3. *Peroxide*
4. *Aceton*
5. *Ammonia*
6. *Bleach*

The hope was for all of the samples to essentially look the same after being treated with household products.

OUTCOMES

The most effective household product in eliminating traces of bacteria DNA was peroxide. As an extremely aggressive molecule, peroxide is corrosive and can even be capable of mutating DNA. The peroxide-treated samples from donors B and C have a bacteria composition that differs significantly from the other treated samples.

Acetate and alcohol both interfered with the DNA extraction method used in the lab. Thus, no DNA from bacteria was able to be identified in these samples. In some ways, this is also a successful way of protecting your biological privacy, however there are other methods of DNA extraction that could still be used to identify the bacteria.

IMAGE 1:

This tree shows the relationships between the 18 treated fecal samples. Seven of the samples were not able to be processed. The image shows how similar in composition the remaining eleven samples were to each other.

IMAGE 2:

This graph shows the abundance of the top 30 most prevalent bacteria in the treated samples.



IMAGE 1

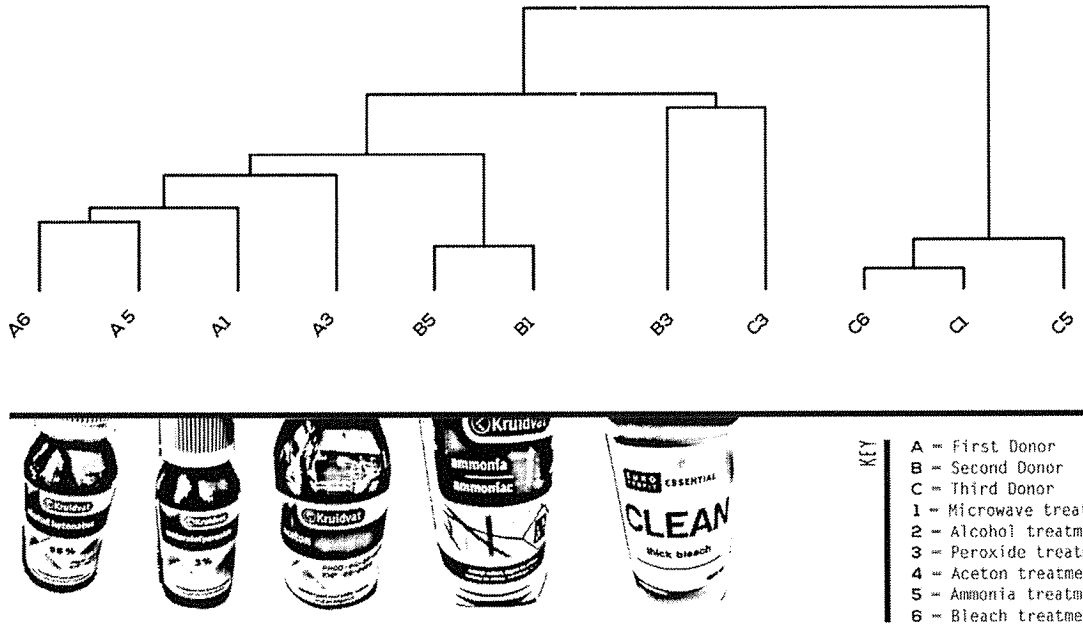
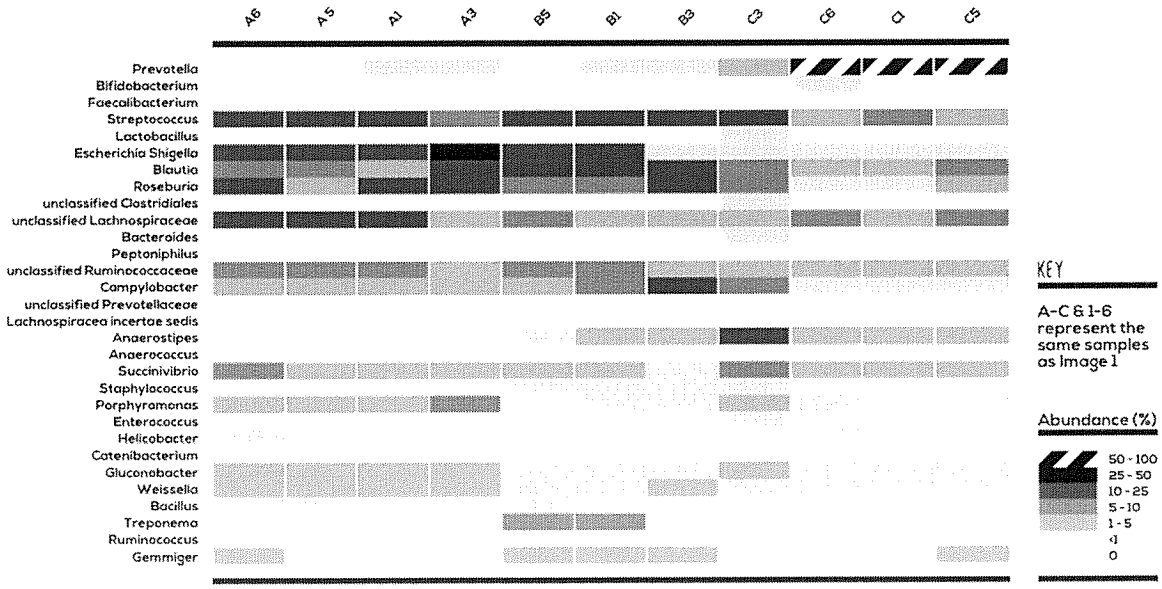


IMAGE 2



Obscuring

OBSCURING the skin microbiome by creating an 'Obscuration Solution' from a diverse selection of bacteria.

In this experiment, the goal was "obscuration by anonymization." The bacteria in and on our bodies is useful and necessary for many health reasons. Therefore, it is better to obscure it than to destroy it. In addition, we found that DIY destruction of bacteria in fecal samples proved less effective than we predicted. In this experiment we aimed to create an "obscuration solution" that would anonymize the bacteria on your skin by essentially adding noise.

The MSA collected a diverse selection of bacteria-rich items from many locations and mixed them into one unique "synthetic ecosystem." Obtaining samples from beaches and zoos, to asian markets and old refrigerators, these bacteria-filled items were combined in a blender and sent to a lab where the DNA from the mixture was extracted, amplified, and then added to mediums to be applied to the skin.

OUTCOMES

For the original "obscuration solution," bacteria from eleven items were combined:

> *red ruffed lemur feces*
> *greater rhea feces*
> *white-faced saki feces*
> *kefir*
> *epoisse cheese*
> *kombucha 1*
> *kombucha 2*
> *natto*
> *compost*
> *kimchi*
> *soil*
> *seaweed*

The result was a DNA solution representing a new synthetic ecosystem of bacteria. When applied to the skin, the information from your own skin microbiome is obscured by this added content. Testing to prove the effectiveness of this "obscuration solution" is currently underway.

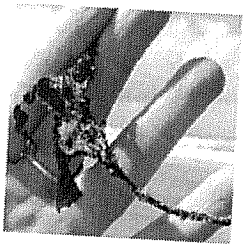
IMAGE 1:

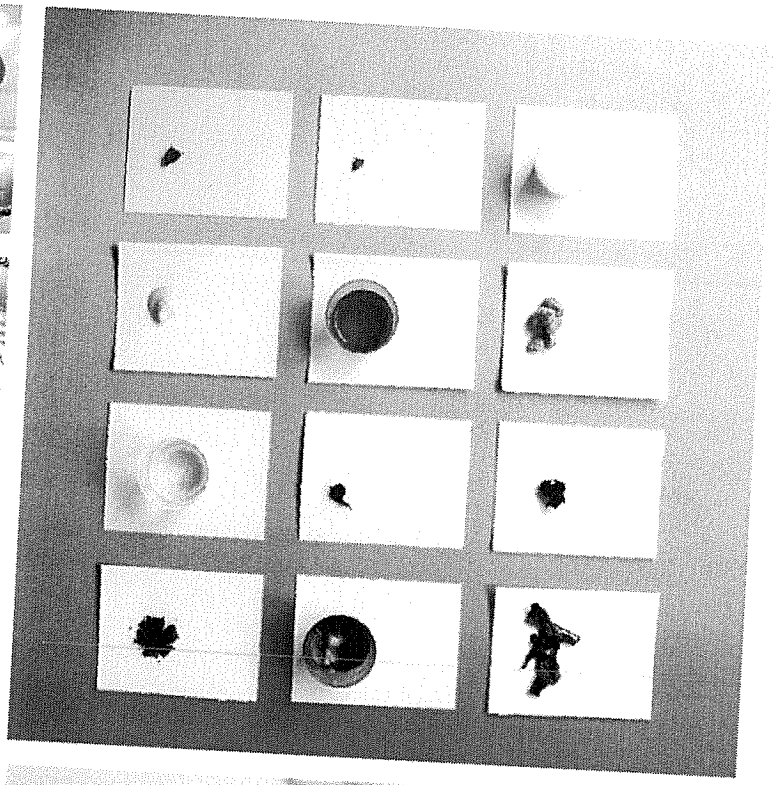
Tree showing similarities between mix items

IMAGE 2:

Abundance of 30 most prevalent bacteria found in the mix

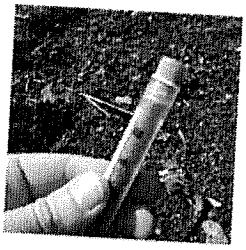

KARMA
KARMA











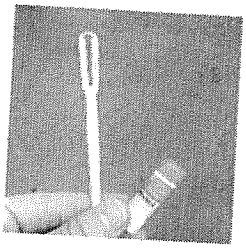
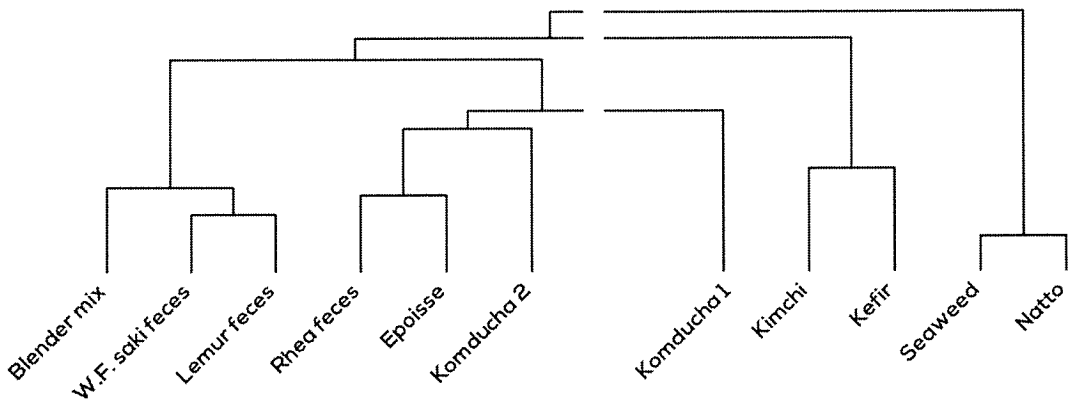






IMAGE 1



This tree shows which items in the blender mix are most similar in bacteria composition. The shorter the branch, the more similar the items were.

IMAGE 2

