

Preventing body odor - study of the armpit microbiome

Introduction

Body odor is created by the presence of specific bacteria which can transform sweat secretions into volatile malodorous compounds. This research identified the main bacterial malodor perpetrators in the armpit and clothes. The axillary microbiome of over 300 people was investigated, where *Staphylococcus* spp. and *Corynebacterium* spp. represented the majority of the total axillary microbiome. The armpit microbiota were identified correlated with a good odor (*Staphylococcus* spp.) and a complete list of bacteria were identified correlated with bad odors (*Corynebacterium* spp., *Anaerococcus* spp., amongst others). The axillary microbiome was quite stable over time, although small differences were seen between left and right armpit for half of the investigated people. Male armpits were characterized with more *Corynebacterium* spp. and less *Staphylococcus* spp. as compared to female armpits. The malodorous axillae instigated a strong psychological impact, resulting in a high repetitive behavior (washing and deodorant use) and significant social and functional impairment. Especially females had a higher sensitivity towards malodor. Axillary osmidrosis is a strongly underestimated taboo issue, affecting the quality of life of affected people on a daily basis.

The use of **deodorants and antiperspirants** resulted in an increase of microbial diversity. The usage of antiperspirants led to an enrichment of malodor-causing species which might lead to a more unpleasant axillary odor. The aluminum salts had a higher impact on the *Staphylococcus* spp. than on the *Corynebacterium* spp.

Additionally, certain clothes were identified as a source of body odor. **Polyester clothes** smelled significantly less pleasant as compared to cotton T-shirts after an intensive 1h fitness session. The clothes developed their own microbiome which consisted mostly out of typical skin-related microbiota. Micrococci were isolated, detected and selectively enriched on the synthetic shirts and regarded partially responsible for the malodor generation.

Laundering of the clothes resulted in a decrease in microbial counts, however, the same bacterial species were still present. Laundering resulted in a microbial selection of typical clothes- and skin-related bacteria on the washed textiles. Malodor-causing microbiota can consequently be further distributed to other laundered clothes.

Technology

Very few research occurs in the field of armpit microbiology. For the first time, **an armpit bacterial transplantation** was carried out by our research group to improve the axillary odor. Axillary bacteria from people without body odor were harvested and transferred to the washed axillae of people who suffer from it. The armpit bacterial transplantation was successful between family members. An induced dominance of *Staphylococcus* spp. was obtained together with a decrease of *Corynebacterium* spp., with a subsequent improvement in axillary odor. The axillary therapy caused an odor improvement on short (one month - 90%) and longer term (three months or longer - 50% of the treated people).

Further research is necessary to obtain a lasting effect for all subjects. The proposed axillary therapy nevertheless forms a valuable alternative for the existing treatments against malodorous axillae. This novel treatment can implicate a significant advance in the field and can be an opportunity in other fields (other skin diseases, etc.).

An **artificial sweat composition** was created which enabled high-throughput microbial, odor and chemical analysis of axillary odors. The sweat solution was able to grow and sustain mixed axillary microbiota and showed similar volatile organic compounds as *in vivo* axillary malodor components.

Lastly, a novel sustained release system for the skin was developed for perfume molecules using **PLA nanocapsules**. The nanocapsules showed a slow and sustained release of fragrances on the skin, especially for hydrophobic compounds.

Status of development

Research projects

Partnership

Ghent University wishes to set up a collaboration with an industrial partner for research and product development.

References

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