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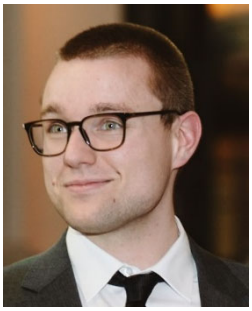

DEVELOPING "SKIN" FOR IN VITRO ADHESION TESTING – COMBINING MATERIAL SCIENCES, ANALYTICS AND DATA SCIENCE

ABSTRACT
Adhesive patches are an integral part of the everyday life. However, their origin and development are not questioned, despite occasional inconveniences if a patch does not adhere properly. A patch that peels off easily is as unfavorable as one that rips off the skin during removal.

Balancing both, removal and adhesion, is the subtle art of the adhesive industry. To find this balance, human wear studies are common in industry despite ethical issues, significant economical as well as temporal expenses and highly individual results. Additionally, the reproducibility of manufactured patches is determined by in vitro testing of adhesive strength on steel set by standards for self-adhesive tapes on steel [1,2]. Unfortunately, both, in vivo and in vitro tests, show only a limited correlation.

This leads to the need for specialized skin substitute materials being able to give reproducible results and a significant correlation to the adhesion to human skin. Unfortunately, the dependencies between different adhesive, adhesion and substitute/skin are still unknown. In order to develop skin substitute materials, these interdependencies need to be elucidated and, therefore a complex, novel development process is needed.

As skin is a complex biological material, a vast variety of material characteristics needs to be imitated by a skin substitute material. Therefore not only are these characteristic analyzed but compared to skin as well. This multidimensional comparison is incomprehensive for the human mind and needs to be compressed to the highly sophisticated "Skin Similarity Index".

However, not all material characteristics have the same influence on the adhesion behavior and are of the same relevance during development of a skin substitute material. Therefore, all characteristics need to be weighted. Unfortunately, different adhesives adhere differently to human skin and hence, the material used to substitute skin may vary. Therefore, common types of adhesives are characterized too as well as tested for their adhesion to skin, before implementing a weighting system.

If both, skin substitute materials and adhesives, are characterized, all data needs to be correlated. From this, the relevance of each material characteristic for imitation of the adhesion between an adhesive and skin are concluded. Such conclusions are the foundation for the final development and optimization of a functional skin substitute for in vitro adhesion testing. The whole process from the first step to the final results is discussed in detail.

References:
[1] DIN ISO 29562:2018 (2018)
[2] DIN ISO 29863:2018 (2018)