

Microorganisms – in and around our body

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The daily struggle against microorganisms goes on but the fact is that we can't do without them. Their busy and invisible work for our well-being passes unnoticeable however their bad behaviour provides headlines, stress and high body temperature. There is talk of bacteria yeasts and fungi.

Microorganisms pertain to the archetypes of life. And our ancestors are ubiquitous. Their biomass is larger than the biomass of plants and animals taken together. Humans accommodate more microorganisms than own cells on and in their body – a well-functioning flat-sharing community with a high potential for serious problems though.

The network of microbial specialists in and around our body is called microbiome. The different representatives have their specific way of life and offer various and useful metabolic services. Microorganisms usually live on the epithelium of the oral cavity, the gastrointestinal tract, the uterus, cervix and vagina, the respiratory system and the skin, or in other words, everywhere where external substances are absorbed, waste products are disposed of or where humans protect themselves against environmental substances.

Give-and-take

As in macrocosm, there are highwaymen, opportunists, profiteers and collaborationists at the interfaces of the microcosm. In the course of millions of years they became accustomed to each other in a way that the synergies prevail however due to cultural influences also disharmonies can occur, as shown in the following examples:

Even the highwaymen who settle on the skin after birth make an important contribution to the protection of the skin and the immune system. The lipid metabolism and the associated release of acids are responsible for the low pH level on the skin of about 4.5-5.5. Thus a specific population stabilizes on the skin which holds external germs at bay on the one hand and trains the immune system by producing endogenic antimicrobial peptides (AMP)¹ on the other hand.

¹ Lautenschläger H, Antimikrobielle Peptide, Kosmetik International 2016 (7), 28-31

Trigger of infections

Both the mentioned processes are interfered with if the hosts or in other words humans insist on deep pore cleansing and sterile skin conditions. A damaged skin barrier and disordered AMP balance facilitate the penetration of pathogenic germs into the skin and consequently also associated infections. This is why rural populations have a statistically lower sensitivity to barrier disorders and infections than urban populations. Dry skin is the first symptom of a disordered barrier. Vice versa, prolonged humidity of the skin surface such as after a pool visit leads to disorders of the local skin flora as well as to swellings and increased permeability of the skin. Hence opportunists as for instance the triggers of athlete's foot² get the chance to penetrate into the skin barrier and start their destructive activity.

Also sweaty skin-to-skin contact areas as for example shaved armpits or sweating in closed shoes or boots facilitate the fast proliferation of bacteria – a fact to be noticed by volatile and odorous metabolic products such as isovaleric acid and sulphurous compounds.³

Trigger of inflammations

In the case of unfavourable skin constitution, the well-intentioned lipid-enriched skin care can influence the skin flora in a way that anaerobic germs as for instance Propionibacterium acnes and Staphylococcus epidermidis have ideal living conditions and then trigger inflammatory responses. This happens if the skin is prone to perioral dermatitis, rosacea and adolescent acne.⁴ In the case of adolescent acne already the increased activity of the

² Lautenschläger H, Die Barriere schützen – Hautpflege bei Pilzinfektionen, medical Beauty Forum 2013 (4), 48-50

³ Lautenschläger H, Kosmetische Pflege bei starker Schweißbildung, Ästhetische Dermatologie (mdm) 2014 (7), 32-35

⁴ Lautenschläger H, Überpflege – Einfach zu viel des Guten, Kosmetik International 2015 (3), 22-25

sebaceous glands is a potential trigger.

Stable flora in the genital area

Microorganisms feel most comfortable in the warm and humid milieu of the body orifices. Hence it is significant that the local flora of vagina and vulva is not destabilized by misinterpreted hygiene conceptions.⁵ The pH level of the vaginal secretion is around 4 and formed by lactic acid bacteria. They form lactic- and acetic acid through degradation of maltose and dextrose. These monosaccharides in turn result from cleavage of polysaccharides such as glycogen.

Moreover, the sebaceous glands of the vulva, i.e. the Bartholin's, Skene and sweat glands, produce secretions which, together with the local flora, form an acidic milieu that inhibits the growth of germs not adapted to this environment; it also protects against opportunistic and facultative pathogenic fungi such as *Candida albicans*. The low-alkaline mucous of the cervical glands consisting of polysaccharides, salts, enzymes and cell residues in turn inhibits the penetration of germs into the uterus.

The gastro-intestinal tract is benefitting

The residents of the gastro-intestinal tract benefit from the rich supply of nutrition and, in cooperation with the digestive secretions, they break down the different substance groups into smaller components which then can be utilized by the microorganisms themselves and absorbed by the body. Their enzyme configuration is highly specialized. Besides metabolic products, also new substances are formed which partly are vital for the human body like vitamin K.

Vitamin B₁₂ forms during digestion of vegetal nutrition, among others also in the human colon from where it only is poorly reabsorbed though. The complex balance among the microorganisms is influenced by viral disorders, medical drugs⁶, imbalanced nutrition, poor nutrition and counterproductive substances.

Food intolerances up to skin alterations⁷ frequently are signs of imbalances and often can be eliminated by discontinuing certain medication, change of nutritional habits or by probiotic food supplements. A trouble-free adaptation of

the digestive processes to the external nutrition after birth is an essential factor in the formation of the individual immune system.

The intense metabolism of the gastro-intestinal tract also implies detoxification of foreign substances (xenobiotics) or vice versa their transformation into harmful substances. A significant characteristic of the complex intestinal flora is the extensive control and elimination of pathogenic microorganisms – a precondition for physical health.

Remember also that nutrition determines our outer appearance. Recently also food supplements for the skin in the form of collagens have been developed to be metabolized into absorbable amino acids in the intestinal system. Even wrinkle reduction is possible⁸ - hardly surprising since a high percentage of the German population never eats meats or sausages.

Mouth cavity and nasal meatus

Traces of unpleasant odorous substances such as for instance indoles, hydrogen sulphide and the related mercaptans that are formed in the intestines, also occur in the mouth odour. Mouth dryness, food residues between teeth or coating of the tongue facilitate bacterial colonisation in the mouth cavity. Also the nasal meatus can be affected (ozaena).⁹

Preservation and disinfection

Bacteria, yeasts and fungi subsist on organic substances. Food and cosmetic products are particularly prone to spoilage. Also virulent germs that form highly dangerous toxins can proliferate in this process. Examples are *Aspergillus* (mold), *Pseudomonas* (water germs) or *Clostridium botulinum* (foul meat). That is why food and cosmetic preparations are preserved for storage¹⁰ and manufacturing equipment and facilities are disinfected on a regular base. There are also plans for occupational hygiene in dermatological practices and cosmetic institutes. They contain regulations such as

⁵ Lautenschläger H, Die Facetten der Intimpflege – Weniger ist mehr, medical Beauty Forum 2014 (2), 35-37

⁶ Lautenschläger H, Einfluss von Arzneimitteln auf Haut und Hautpflege, Kosmetische Praxis 2009 (2), 11-14

⁷ Lautenschläger H, Nahrungsmittelintoleranzen – wenn Essen die Haut reizt, medical Beauty Forum 2012 (4), 18-20

⁸ Proksch E, Schunck M, Zague V, Segger D, Degwert J, Oesser S., Oral intake of specific bioactive collagen peptides reduces skin wrinkles and increases dermal matrix synthesis, Skin Pharmacol Physiol. 2014;27(3):113-9

⁹ Lautenschläger H, Körper- und Hautgerüche, medical Beauty Forum 2016 (6), 12-17

¹⁰ Lautenschläger H, Keimfrei verpackt – Produkte und Methoden, medical Beauty Forum 2017, 12-16

- how and when equipment, floors, areas are to be cleansed and disinfected,
- how hands have to be cleansed and protected (skin protection plan),
- what kind of working clothes has to be worn and how often they have to be changed,
- how treatments such as needling, dermabrasion, depilation, deep cleansings, are effected in order to avoid infections,
- how the waste has to be disposed of and
- how to proceed in the event of staff illness.

Preservatives

Preservation of cosmetic preparations of course also has negative side effects as for instance a modification of the skin microflora after the application; there also is a potential that resistant germs form on the skin in the long term – comparable to a long term administration of antibiotics.

Moreover, allergies are unavoidable in the case of sensitive skin since all the licensed preservatives listed in the German Cosmetic Regulation (Kosmetikverordnung KVO) have sensitizing potential.¹¹ The more disturbed the skin barrier, the higher the risk for sensitization – recognizable by high TEWL values (TEWL - transepidermal water loss). Hence, in these cases it is recommended to use preparations without the preservatives listed in the German Cosmetic Regulation or select non-aqueous preparations¹².

In the domestic environment and particularly in the environment of small children¹³, excessive disinfection measures contribute to the fact that the immune system in children cannot develop. Resistance in the form of biofilms can be observed with the disinfection of equipment and machinery.

Problem-solving approaches

In terms of health but also in terms of economic considerations it is recommended to arrange with microorganisms as far as possible

¹¹ Lautenschläger H, Unerwünschte Nebenwirkungen, *Ästhetische Dermatologie (mdm)* 2016 (7), 50-55

¹² Lautenschläger H, Vorteile von Produkten ohne Wasser und Hilfsstoffe, *Kosmetik International* 2017 (6), 56-58

¹³ Lautenschläger H, Bitte nicht waschen! – Die schonende Hautpflege für Babys und Kleinkinder, *Kosmetik International* 2014 (5), 16-19

and use the potential synergies – cf. also the metabolic performance of bacteria in biotechnology (e.g. in the manufacturing of xanthan gum, hyaluronic acid etc.)

A promising approach in the skin care field is a change to physiological compositions^{14 15} and the exclusion of counterproductive cosmetic additives¹⁶. In this context, the physiological care of the body has to be extended to the surrounding microbiome.¹⁷ Additional steps in the right direction for instance are refraining from tight-fitting and chafing clothes and an intelligent and low-key treatment of pathogenic conditions of the skin as e.g. with the administration of blue and red light¹⁸.

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¹⁴ Lautenschläger H, Geschichte und aktuelle Gesichtspunkte der Korneotherapie, *Kosmetische Medizin* 26 (2), 58-60 (2005)

¹⁵ Lautenschläger H, Angewandte Korneotherapie in der Hautpflege – ein Leitfaden für die Anti-Aging-Behandlung, *Ästhetische Dermatologie (mdm)* 2007 (3), 8-16

¹⁶ Lautenschläger H, Hilfsstoffe in Kosmetika, *Kosmetische Praxis* 2004 (1), 8-10

¹⁷ Lanzendörfer-Yu, Skin Structure and Requirements on Skin Care – From Past to Future, Lecture on 4th International Symposium on Corneotherapy, May 6-8, 2016, Cologne, Proceedings 12-24; Struktur der Haut und Anforderungen an die Hautpflege – Von der Vergangenheit in die Zukunft, *Ästhetische Dermatologie (mdm)* 2016 (8)

¹⁸ Lautenschläger H, Bioengineering der Haut – Die Kombi macht's, *medical Beauty Forum* 2015 (6), 42-45