

# Cosmetic devices & products – what is beneficial and what is unnecessary?

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Cosmetic devices – the bigger and the more recent they are – demonstrate modernity. Digital displays are more convincing than words when it comes to skin diagnosis, treatment and consultation. They are a major key to success not only for customer acquisition but also in the daily routine. When cosmetic devices are combined with the application of cosmetic preparations we can even speak of a dream team.

**C**ombinations of cosmetic devices with preparations ideally prove to be beneficial for all those involved, manufacturers, cosmeticians in charge and customers and patients. Ideally in this context means that diagnoses are more precise, treatments accelerated and more effective and product recommendations can be automated.

Sometimes reality turns out different, though: Investments are apportioned and added to treatment costs, devices and preparations sometimes do not match or even cause counterproductive effects, and incorrect handling of devices leads to irreparable damages in extreme cases. Latter mentioned fact even caused legislative action, with the German “Act to protect against Non-ionising Radiation used on humans” (NiSV), which will come into effect as from 31.12.2020. The regulation stipulates which professional groups are qualified for which treatments under which respective framework conditions, and which specific qualifications with professional knowledge certificate are required for the personnel in charge. It is a rather complicated matter and hence vigorously discussed in expert groups and organizations.

The following survey confines itself to describing device/preparation-combinations in terms of their effectiveness, showing the limits and pointing out equivalent, non-instrument-based alternatives.

## Skin diagnosis and preparations

The treatment starts with the instrument-based skin diagnosis carried out with specific probes for skin hydration, lipid content, skin elasticity and pH level of the skin, just to mention the simplest of analyses. The diagnosis readings are required for the selection or preparation of individualised products. At present there are three different types of devices:

1. After entering the probe data, a mixing unit compounds an individual prepara-

tion out of a limited number of individual components consisting of pure substances or solutions respectively dispersions.

2. Based on the measurement readings of the probes, the software in the skin diagnosis device calculates the recommendations for existing finished products.
3. Based on the measurement readings, individual preparations are composed – for the most part by using separate software including problem skin parameters. The preparations consist of bases (base creams, -gels, -lotions) and active agent concentrates (sera) that are own products declared in compliance with the German Cosmetic Directive. Also practical knowledge can be implemented in this case.

The latter mentioned variant is universally usable since causal indications can also be considered besides the skin condition. In cases where the dermatological therapy is followed by cosmetic prevention, there is no need to change the bases. Legal aspects have already been discussed.<sup>1</sup>

## Treatment and preparations

While skin diagnosis and treatment are separate processes, the direct linkup of devices and preparations is focused on intensifying and above all, accelerating the effects of the preparations through physical processes. The advantage is that the effects already become visible during the treatment instead of a gradual improvement after the treatment. This instant effect is a knock-down selling point and can be achieved in a variety of ways:

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<sup>1</sup> Lautenschläger H, Eine gute Basis – Pharmazeutische und kosmetische Basiscremes, *medical Beauty Forum* 2016 (5), 12-17

- Energy is applied on the respective skin areas in order to stimulate the metabolism and make the skin more permeable. This energy can come from thermal procedures such as steaming and body wrapping, from mechanical energy such as ultrasound and shock waves, or electromagnetic radiation in the form of microwaves, radiofrequency and infrared radiation.
- The skin becomes more permeable for adequately charged active agents by generating a voltage field (iontophoresis). Uncharged larger molecules can pass through the skin barrier by opening the lamellar structures with pulsed electric fields (mesoporation); charged components are not appropriate for this specific procedure. In the case of medical needling (dermaroller) and mesotherapy treatments (microinjections) the active agents are directly delivered into the skin.
- Other procedures combine abrasive techniques with simultaneous or subsequent active agent applications. The partial removal of the skin barrier facilitates the penetration of active agents, but also impedes the depot effect of the skin barrier that counterbalances peak concentrations. Examples are sanding with a rotating abrasive tool, microdermabrasion with aluminum oxide or silicon dioxide ("sandblasting"), water jet abrasion ("high pressure cleansing principle") and skin scrubbing.

How effective the techniques are in particular and after being applied over a longer period of time depends on the individual case.

Cosmetic needling using needles of 0.2 – 0.3 mm is more likely to involve complications due to the latent risk of infections and in terms of effectiveness, it can be compared with the application of penetration enhancing components (liposomes, nanodispersions, acid amides, D-panthenol). Similar can be said for the iontophoresis while medical needling with longer needles can be successfully applied against scars and senile skin. Simultaneously applied active agents are immaterial in the context of medical needling, though. It is all the more important applying an AMP booster (AMP = antimicrobial peptides) before the treatment to provide for aseptic conditions and using recovering products such as the vitamins A, C, E and D-panthenol in lamellar bases after the needling treatment.

With abrasive techniques the dosages of some of the cosmetic components have to be re-

duced since the irritative and allergenic threshold concentrations are lowered after the abrasion of barrier layers. This also applies to the subsequent initial treatment at home. The artificially damaged skin barrier also should be particularly protected against radiation and unwanted pigmentation – by applying UV filters and tyrosinase inhibitors respectively antioxidants.

In the context of electric techniques it should also be mentioned that alternating current treatments to stimulate nerves, muscles and cell metabolism should not be combined with preparations because of inappropriate active agent penetration.

Beyond that, certain treatments also depend on the specific type of device. Monopolar radio frequency units can improve the efficacy of aqueous and lipid-containing gels while bi- and multipolar units are limited to the use of non-aqueous, lipophilic media and active agents. With heat generating units there is a general risk of excessive energy input that can lead to local damage, burns and scar formation.

### Cosmetic additives

A further criterion concerning penetration enhancing devices is that the cosmetic preparations used in combination with them should be free of cosmetic additives. Similar to the active agents also cosmetic additives penetrate easier into the skin, however in contrast to active agents their dosage cannot be reduced due to the risk of instabilities during storage of the finished products, a fact which is also known from the preservatives listed in the German Cosmetic Directive which all have allergenic potential. The same applies to perfume components that are subject to declaration, to alcohol denatured with phthalic acid esters, endocrine disruptors and strong, AMP-counterproductive complexing agents such as EDTA. It should also be made sure that the treatments are not linked to the preparations of device manufacturers and that there is no disclaimer of liability for the units if more appropriate, other products are used.

The mentioned criteria vice versa also apply for cases where preparations only have auxiliary functions. Just to mention an example: lubricants in the ultrasound treatment. Particularly this example illustrates that medical products often contain critical additives in contrast to the cosmetic ultrasound gels.

### Counterproductive combinations

Many of the instrument-based treatments do not need additional preparations or can be administered with or without preparations. This sometimes leads to the fact that preparations

are used in good faith although they are opposed to the intended effects of the devices. Some examples from dermatology are listed in the following:

- Red light (630-635 nm) stimulates the skin metabolism. Similar to the photodynamic therapy (PDT) to treat actinic keratosis and skin cancer, this treatment leads to the formation of radicals that also can trigger skin irritations and erythema. Simultaneously administered skin care products with a high dosage of strong antioxidants (radical scavengers) are counterproductive in this context.
- Also counterproductive for the same reason is the use of antioxidants together with blue light (425-475 nm). The radical formation initiates the healing of bad and acne-prone skin.
- Analogous considerations apply to the phototherapy with UV-A radiation (315-380 nm) after oral or topical application of 8-Methoxypsoralene (PUVA = psoralene + UV-A), for instance in the case of psoriasis.

### Synergistic combinations

- In the case of laser treatments that lead to a stimulated melanin formation, the local hyperpigmentation can be suppressed with liposomal ascorbyl phosphate (INCI: Sodium Ascorbyl Phosphate). Free vitamin C (ascorbic acid) is not beneficial here. The situation is similar with IPL treatments.
- Similar to the medical needling, the vitamins A, C, E and D-panthenol in lamellar bases are beneficial in the pre- and after-treatment of abrasive procedures. High concentrations of strong antioxidants should be avoided as they can interact with the interlinking disulphide bonds of the filaggrins.
- If irritations can be expected, nanodisperse sera with essential fatty acids can be useful. With radical generating radiation, the pre-treatment is contraindicated due to the risk of peroxide formation.
- If the skin is the passage organ in the context of medical gamma radiation (cancer therapy), preparations for dry and inflamed skin are administered.

### Prospects

Device manufacturers currently go extra miles in introducing plenty of (sometimes pretended)

innovations on the market. Convenient probes, as for instance hyaluronic acid pen, plasma pen and inexpensive products made in Far East are the vogue. There is a latent risk, however, that the promises of the manufacturers come upon little experience on the part of professionals with shortened training. The sector is very creative on the one side but on the other side, it has to be mentioned that the knowledge in physics and chemistry is not a main focus. Hence it cannot be excluded that treatments may lead to temporary or even lasting damages.

Further details on specific features of the devices, also without the application of cosmetic preparations have recently been published.<sup>2</sup> Also available is a plea for non-instrument-based antiaging treatments.<sup>3</sup>

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<sup>2</sup> Lautenschläger H, Bioengineering der Haut – Die Kombi macht's, medical Beauty Forum 2015 (6), 42-45

<sup>3</sup> Lautenschläger H, Anti-Aging-Behandlungen – gibt es sie auch noch ohne Geräte? Kosmetik & Pflege 2017 (1), 22-23