Garching b. München, June 1st, 2021 –

Innovative technology is hope for 3 million patients with open wounds

Cold atmospheric plasma can effectively inactivate bacteria, multi-resistant pathogens and also fungi by means of physical-chemical processes. Its use in medical device technology can either revolutionize, complete or even replace conventional treatment methods, such as in post-operative surgery to prevent infections. In the field of wound care, it offers a therapeutic option in the treatment of chronic wounds, which often persist for many years. In dermatology it is used against neurodermatitis, acne, psoriasis and herpes. Cold plasma treatment reduces the use of antibiotics or cortisone, does not cause any allergic side effects or pain. In the future, the plasma care® product line using cold atmospheric plasma as a medical device technology and developed by terraplasma medical GmbH for this purpose will be distributed exclusively by Viromed GmbH.

terraplasma medical and VIROMED have committed to cooperate as sales and distribution partners. This sales cooperation aims at achieving a broad market penetration of plasma care® technology in clinics and care facilities in Germany, Austria and Switzerland.

Clinical experience in recent years has shown that this new form of therapy, in addition to its bactericidal and healing-promoting effect, offers further advantages for the health care system: e.g. a reduction of nursing and dressing costs for treatment of chronic wounds or wounds contaminated with multi-resistant pathogens. Postoperative use can prevent longer periods of patient hospitalization. With reduced use of antibiotics, resulting resistances can be avoided. In dermatology, fewer anti-inflammatory ointments would be used. Ultimately, the healing of chronic wounds such as diabetic foot or venous leg ulcer significantly improves the quality of life of patients.

terraplasma medical GmbH developed plasma care® as medical device for wound treatment in 2019 and plasma derma care® in 2021. Viromed GmbH has been supplying several thousand acute clinics, general and rehabilitation hospitals and retirement homes with infection control products for many years.

This collaboration unites scientific know-how in cold atmospheric plasma and medical device technology with professional sales and distribution competence. Jens Kirsch, CEO of terraplasma medical GmbH, is looking forward to the sales cooperation with Viromed GmbH: "With VIROMED, we have gained an extremely strong sales partner who will achieve a broad market breakthrough for plasma medicine and our plasma care® products."

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terraplasma medical GmbH *was founded in 2016 by terraplasma GmbH and dynamify GmbH. The idea: using the bactericidal and fungicidal effect of cold atmospheric plasma in medicine and care. As a consequence, the most complex plasma technology, formerly exclusively used in the clinical sector, was implemented in a small portable medical device for mobile use. In 2019, plasma care® was approved for the treatment of chronic wounds, followed by plasma derma care® destined for the treatment of skin diseases induced by bacteria and fungi. Currently, plasma intensive care®, a medical device for reducing the bacterial load in the mouth and throat of mechanically ventilated intensive care patients, is undergoing the approval process.*

Viromed GmbH *has been producing disinfection devices for professional use in hospitals and medical practices for over 15 years and is the only manufacturer recommended by the German Federal Association of Pneumologists and the Association of Respiratory*

Physicians. Viromed Group works in the development and production of disinfection devices in the field of plasma and ionization. As early as 2005 Viromed commissioned research on SARS viruses in safety laboratories.

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Background information:

What are cold atmospheric plasmas (CAP)?

Plasma is an ionized gas- the so-called fourth aggregate state (after solid, liquid and gaseous) and is generally produced by heating up matter, usually to 100,000 degrees Celsius or more. Natural examples of plasmas are our sun as a huge ball of plasma, or the lightning on earth that is produced by a short electrical discharge.
Cold atmospheric plasmas (CAP), on the other hand, are partially ionized gases. The advantage of these cold atmospheric plasmas is that on the one hand they are "cold", i.e. have body temperature, and on the other hand they can be produced at the atmospheric pressure prevailing on Earth.[1]
When plasma is generated by means of surface micro-discharge - a technology for generating CAP - many millions of micro-discharges (expansion of a few mm, duration of a few nanoseconds) are triggered in a controlled manner, which ionize the gas (e.g. the surrounding air) locally. A non-equilibrium chemistry is initiated that creates a reactive "plasma cocktail" composed of electrons, ions, excited atoms and molecules, reactive oxygen - and nitrogen species (such as O3, NO, NO2, etc.).

How do cold atmospheric plasmas work?

Cold atmospheric plasma (CAP) is a type of plasma, which does not cause any unspecific cell damage due to its low temperature and therefore is generally suitable for medical application.

The exact characteristics of cold atmospheric plasma depend on how it is generated.
The active components (reactive species) generated by cold atmospheric plasma can interact with cells in various ways.
The effects are physical (e.g. recombination or de-excitation of excited molecules/atoms at the cell surface) as well as chemical processes (e.g. hydrogen denaturation through interactions of hydroxyl radicals).

In prokaryotic cells this leads to direct destruction of cellular macromolecules including DNA thereby inactivating the bacteria. A special characteristic of cold atmospheric plasma is its effect on bacteria that have already developed antibiotic resistance.[2-4] In this context various stable reactive species of the cold atmospheric plasma interact with the cell membrane of the bacteria.[5] Furthermore, an antiviral effect of the reactive oxygen species produced by cold atmospheric plasma has been observed.[6]

In human eukaryotic cells, DNA is protected by nucleus and its membrane as well as cyto-biological repair mechanisms.

In addition, eukaryotic cells are protected within their cell compounds.
This means that there is no risk of cell damage. Quite the opposite: the reactive oxygen species in human cells even stimulate the growth of tissue or mucous membrane, thus triggering wound healing.
The positive effect of cold atmospheric plasma on human cells is due to the stimulation of intracellular processes initiating cell growth through reactive species.[7-9]

This effect is locally limited to the uppermost cell layer: due to the very short half-life of the reactive species and since the reactive species will have already completely reacted by interacting with the upper cells or the surrounding cell liquid.[10,11]

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