

Part 3 - COLD PLASMA: How does cold plasma improve wound healing?

This is how cold plasma triggers processes that promote healing.

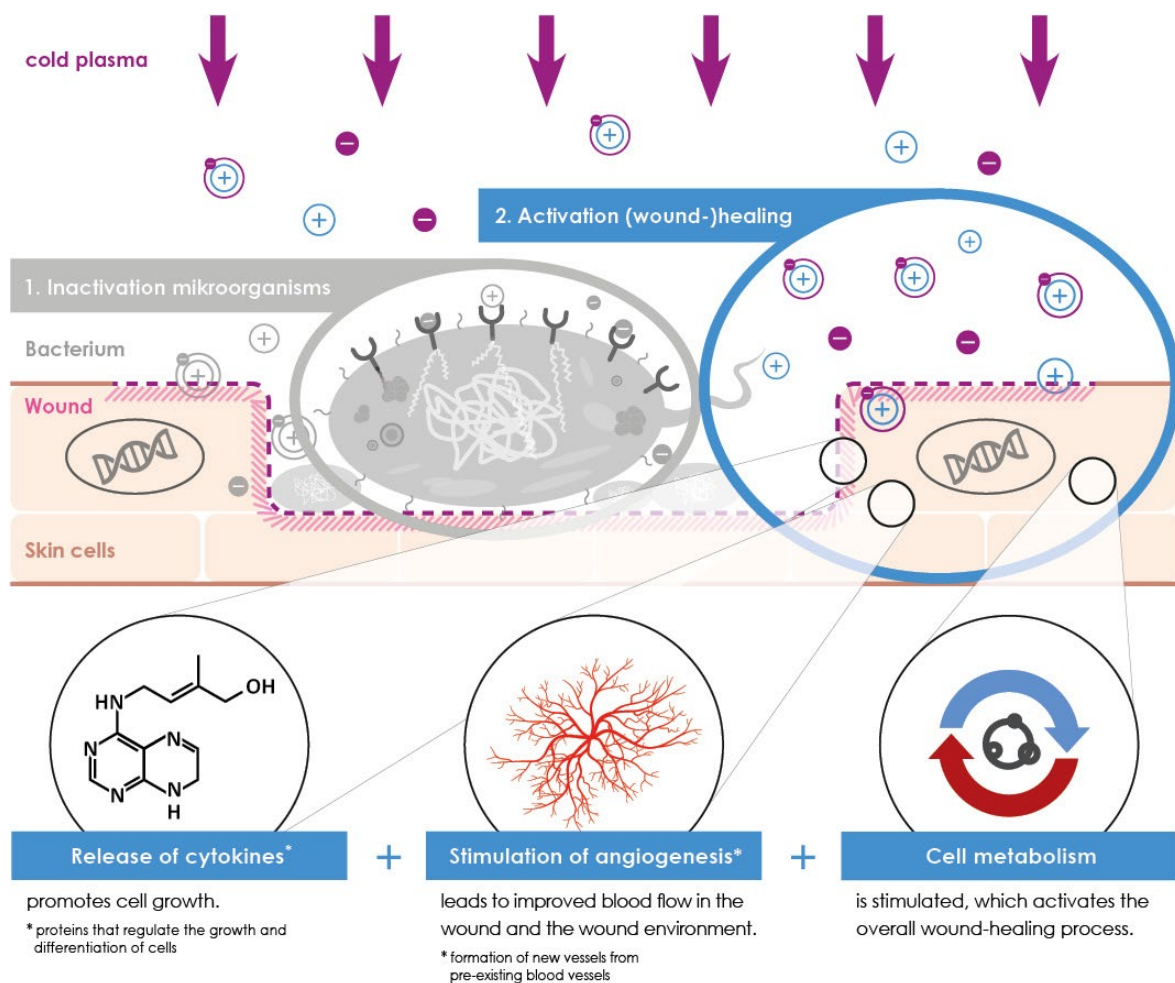
It is the smallest functioning unit of our body: the miracle cell. What it is capable of becomes particularly apparent in crisis situations - for example, when it is exposed to oxidative stress. This is the term used to describe, among other things, the effect of reactive species during a plasma care® treatment.

Whereas bacteria and viruses are ready to lay down their arms and surrender to their fate, healthy human and animal cells are now more active than ever. This is because the plasma stimulates mechanisms in the cell and activates signalling pathways that promote cell growth and thus wound healing.

Cells in top form

Like the membrane of prokaryotes (bacteria), the cell wall of healthy human cells also interacts with the reactive species of cold atmospheric plasma (CAP). However, their reaction does not lead to cell death, as described in Part 2 for bacteria, but sets the following survival mechanisms in motion. 1:

1. the release of cytokines, which stimulates healthy cell growth.
2. the formation of new vessels from already pre-formed blood vessels (angiogenesis) is promoted.
3. cell metabolism is stimulated.



For the wound, this means better blood circulation in the wound environment and a more active healing process overall. Together with the bactericidal effect of the cold plasma, it ultimately leads to the wound healing faster.

The genetic information of the cell lies safely in its nucleus. The reactive species cannot harm it. In addition, intracellular mechanisms protect mammalian cells from the negative effects of oxidative stress.

Fast, faster, reactive

The molecules owe their name "reactive species" to their extremely high reactivity. That is why they only act on the uppermost cell layers. By the time they reach deeper layers, they have long since reacted. However, the decisive factor for the effect of cold plasma is which types of reactive species are formed.

CAP is initially generated by electrical discharges in the air. This produces species such as hydrogen peroxide (H₂O₂), nitrogen monoxide (NO), nitrogen dioxide (NO₂) or ozone (O₃). Some of them also occur naturally inside the cell, as "waste products" of cellular respiration. In this case, experts speak of free radicals.

Depending on the nature of the surface on which the reactive species meet, different interactions occur. So very different end products can result from the reactions. Scientists see this as the reason why the condition of the wound surface has a decisive influence on the effect of the cold plasma treatment.

In the next part of this series, you will learn how exactly the wound treatment with plasma care® device works.