Wounds have become one of the major problems resulting in death worldwide. An acute wound is an injury to the skin that easily heals at a predictable and expected time frame. Chronic wounds occur as a consequence of prolonged inflammatory phase during healing process, which precludes skin regeneration. Therefore, great attention has been focused on the wound dressings that are able not only to protect the wounds from environmental effect but also promote skin regeneration and accelerate the healing process.

Conventional wound dressings lack the ability to actively respond to physiological signals such as electrical signals. These physiological signals regulate cell growth and promote wound healing. Small electrical signals have been detected in biological systems and these signals play a very important role in controlling cell migration and proliferation during wound healing. In addition, oxidative damage caused by reactive oxygen species (ROS) in chronic or/and burn wounds delays the healing process. Another important issue concerns prolonged inflammation and excessive matrix metalloproteinases (MMPs) activity related to alkaline pH at the microenvironment of chronic wounds.

**The aim of the project is to provide an antioxidant and electroactive wound dressing for the skin that supports the healing process and releases antimicrobial peptides AMPs against a set of major bacterial and fungal pathogens with importance in hospital acquired infections. The films will be immobilized on the smart hydrogels showing light-induced proton release and temperature responsive properties**, resulting in the pH control of the wound environment and painless detachability from wound surface. The polydopamine and polypyrrole will be used as antioxidant and electroactive components immobilized on oligo(ethylene glycol) methacrylates and dopamine - based hydrogels containing the photoacid, merocyanine form. The wound dressing performance is shown schematically in Figure below.

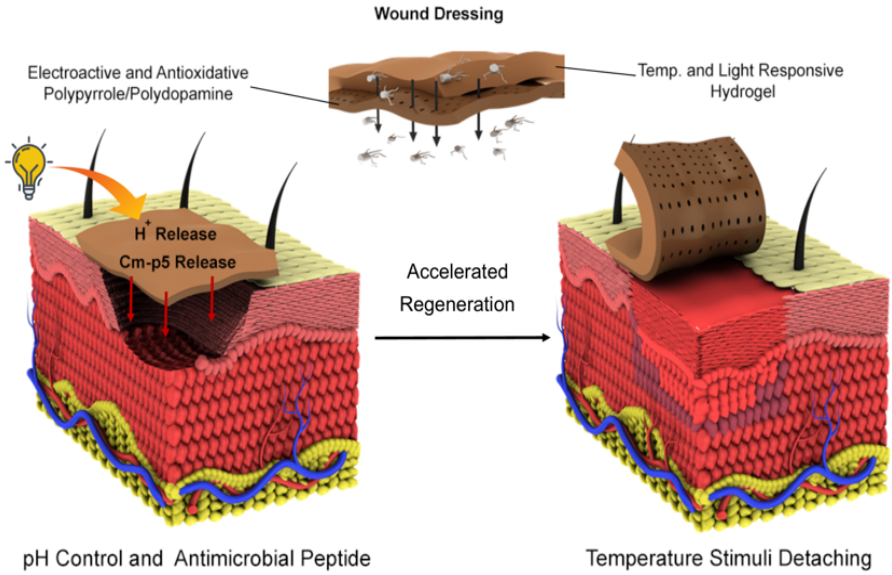


*Figure 1. The general concept of the designed wound dressing.*

The proposed research project for the first time combines three individually important concepts in the preparation of wound care materials in a novel strategy, i. e. responsive materials, nanosheets and the release of peptides from the novel composite material as last resort antinfectives against resistant pathogens. The intended proof of concept material as well as the individual components of the concept will open general new directions for the next generations of tailor-made wound dressing materials for different types of wounds and for fighting life threatening infections with specialized drugs and thus novel treatment concepts to significantly improve wound healing. On the material site the combination of the activity of an antioxidant and electroactive ultrathin films with the performance of the smart hydrogels with durable mechanical properties showing light-induced proton release and temperature responsive properties, resulting in the pH control of the wound environment and detach from wound surface, is a completely new class of wound dressings.