BIOINORGANIC REACTIONS OF CHLOROXO SPECIES FOR THE TOPICAL TREATMENT OF LEISHMANIASIS WOUNDS

Semra Genç, Rahel Maier, Emelie Meiers, and Philipp Kurz

Institute of Inorganic and Analytical Chemistry, University of Freiburg, Germany

Worldwide, especially in desert regions, people are suffering from non-healing wounds caused by cutaneous leishmaniasis.[1] In cooperation with a local non-profit organization (Waisenmedizin e.V., www.waisenmedizin.org) we are trying to provide these patients with an affordable treatment associated with little side effects - the chlorite (ClO_2^-) containing gel LeiProtect®.

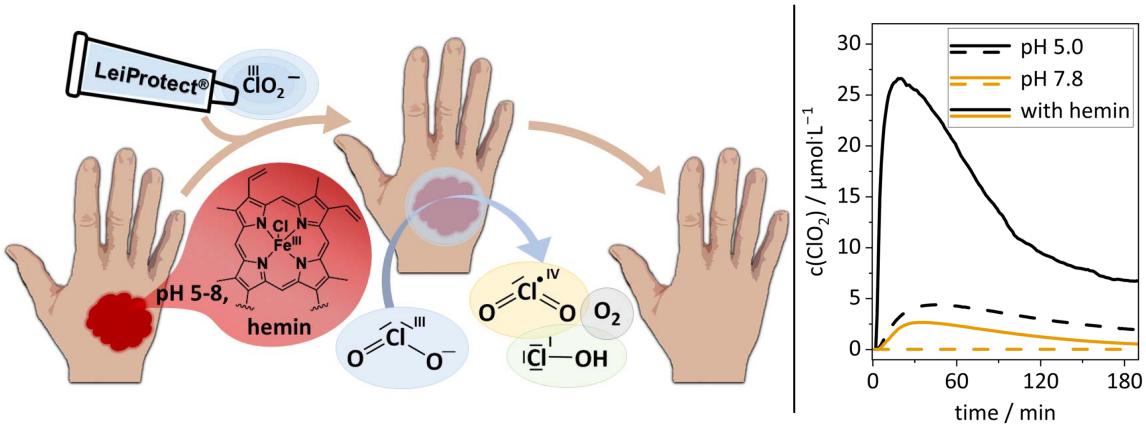

Figure 1: Left: scheme of LeiProtect® gel assisted healing of a cutaneous leishmaniasis wound; right: ClO_2 evolution trace detected with an amperometric ClO_2 sensor from solutions buffered at pH 5.0 (black) and pH 7.8 (orange) containing ClO_2^- (10 mM) and hemin (1 µM); dotted lines: control experiments without addition of hemin.

Early experiments concerning the mode of action of ClO_2^- as wound disinfectant were already performed by Elstner et al. in the 1980s, but remained rather vague concerning the Cl-containing species formed as products from the educt ClO_2^-.[2,3] By using a very sensitive and selective amperometric chlorine dioxide sensor system, we were now able to detect the formation of µM concentrations of dissolved ClO_2 in such solutions after lowering the pH and/or adding hemin (Fig. 1). Furthermore, we were also able to detect oxygen release during the reaction of chlorite with hemin using a Clark electrode. Interestingly, the kinetics of the O_2 release correspond to those of hemin degradation rather than the ClO_2/HClO formation. *In situ* formed chlorine dioxide and/or oxygen could thus be an important active species to explain the well-documented enhancement in wound healing by sodium chlorite.[4,5]

[1] World Health Organization, WHO fact sheet about Leishmaniasis, **2022**, www.who.int/news-room/fact-sheets/detail/leishmaniasis (visited 01.04.2022).

[2] R. J. Youngman, G. R. Wagner, F. W. Kühne, E. F. Elstner, *Z. Naturforsch.* **1985**, *40*, 409.

[3] E. F. Elstner, *Z. Naturforsch.* **1988**, *43*, 893.

[4] S. Molkara, E. Poursoltani, K.-W. Stahl, M. Maleki, A. Khamesipour, C. Bogdan, M. Salehi, V. M. Goyonlo, *BMC Infect. Dis.* **2019**, 19, 1005.

[5] D. Debus, S. Genç, P. Kurz, M. Holzer, K. Bauer, R. Heimke-Brinck, M. Baier, A. Debus, C. Bogdan, K.-W. Stahl, *Am. J. Trop. Med. Hyg.* **2022**.