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Contribution ID: **4522** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Cold atmospheric plasma treatment of chronic wounds—investigation of the effects of reactive oxygen and nitrogen species on fibrosis-related cellular signaling pathways.

Wednesday, May 29, 2024 11:30 AM (15 minutes)

A novel treatment for chronic wounds is cold atmospheric plasma. Non-equilibrium plasmas generate highly reactive species at low temperatures. This allows treatment of human tissue in-vivo and can induce locally confined redox-chemistry in biological organisms. Reactive oxygen and nitrogen species are known to play a vital role in cell signaling and influence a range of mechanisms implicated in all phases of wound healing—inflammation, vascular formation, proliferation, remodeling of scar tissue [1]. Plasma gives us a tool for controlling and modulating dosage of the redox species cocktail deposited on the wound bed—by modifying plasma environment and the mixture in the feed gas [2]. By better understanding the effect of reactive species on cells, we can tailor the plasma reactivity to supply the adapted treatment to the tissue. A special focus is put on fibrosis, a form of disrupted wound healing. Reactive species have dual functions depending on the healing phase, their concentrations, etc. This is why a good characterisation of the plasma composition is essential. Plasma composition was simplified to the hypothesis of 2 regimes which could have dual effects on fibrosis—oxygen regime vs nitrogen regime. Reactive oxygen species are known to be pro-inflammatory by increasing the oxidative stress in the environment of the cells, and reactive nitrogen species have anti-inflammatory behavior [3]. Spectroscopy techniques are used to measure key species density in the plasma, informing us on which regime is at play e.g., UV-absorption spectroscopy at 254nm is used for quantifying ozone. Biological experiments are conducted with each regime, analyzing cell behavior as a response to modulated plasma treatment. Tailoring the plasma reactivity to biological needs, to reach a bio-chemical effect on imbalanced healing environment in tissue models will deepen our comprehension on the physiology of chronic wounds. It will also pave the way to a personalized plasma treatment technology greatly beneficing the health sector.

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[3] Feibel, D., Golda, J., Held, J., Awakowicz, P., Schulz-von der Gathen, V., Suschek, C. V., Opländer, C., & Jansen, F. (2023). Gas Flow-Dependent Modification of Plasma Chemistry in μAPP Jet-Generated Cold Atmospheric Plasma and Its Impact on Human Skin Fibroblasts. Biomedicines, 11(5).

Keyword-1

Plasma Medicine

Keyword-2

Atmospheric Pressure Plasma

Keyword-3

Fibrosis

Primary author: Ms LETELLIER-BAO, Juliette (Polytechnique Montréal)

Co-authors: Mr BOUDOUX, Caroline (Polytechnique Montréal); Prof. PHILIP, Anie (McGill University); REUTER, Stephan (Polytechnique Montreal)

Presenter: Ms LETELLIER-BAO, Juliette (Polytechnique Montréal)

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