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Influential phenotypic traits of living cells and tissues using atm cold plasma source as biocatalysts

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Abstract

Atmospheric pressure (atm) cold plasmas could be utilized as biocatalysts in various bio-medical applications due to their unique properties, such as their ability to generate reactive oxygen and nitrogen species (RONS). Plasma biocatalysts on living cells and tissues have been studied extensively, and researchers have identified several influential phenotypic traits at a proper plasma dose.

Some types of atm cold plasmas have been used as biocatalysts in the studies, including gliding arc discharge, Tesla coil, and plasma jet. Each of these sources has unique characteristics that influence their results. E.g., for chicken eggs, Tesla coil plasma treatment has been shown to improve hatching rates, increase the survival of embryos, and even influence the sex of the offspring. Also, in tropical fish eggs treatment via DI water, changes in skin color are crucially distinct. Similarly, gliding arc and H2/N2 plasma jet treatment on plant tissue have been found to have a range of beneficial effects, including enhanced growth and body development, and plausible resistance to diseases.

One challenging atm cold plasma source has its ability to produce a quantifiable oxidizing/reducing agent, inorganic form for wound disinfection and healing. "Nightingale"is an IEC standard/CE-certified, cold air plasma device to provide significantly higher RONS production rates and better handling of larger reaction volumes. Nightingale was able to operate in laboratories and/or clinical purposes with settable plasma-exposed power at 0.28, 0.43, and 0.62 W over an mmˆ2 to several cmˆ2 sample coverage.

Perspective, thus, researchers can tailor the treatment to achieve the desired dose. However, more research is needed to deeply understand the underlying mechanisms and potential risks associated with this upcoming technology.

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