LIGHT4LUNGS - Inhalable Aerosol Light Source for Controlling Drug-Resistant Bacterial Lung Infections

The growing resistance to many antibiotics and the emergence of multidrug-resistant bacteria calls for the development of alternative antibacterial therapies. Currently, bacterial drug resistance is the leading cause of morbidity and mortality in patients with cystic fibrosis and hospital-acquired lung infections. The EU-funded project will develop new treatment for bacterial lung infections using inhalable light sources that excite bacterial endogenous photosensitisers (porphyrins), killing the bacteria via the photodynamic effect (local production of reactive cytotoxic oxygen). The treatment will be safe for host tissues and effective against drug-resistant pathogens. Research involves the development of inhalable luminescent particles, the method for delivery to the lungs, and evaluation of the treatment parameters in relevant clinical models.

Light4lungs addresses the problem of antimicrobial resistance in the treatment of chronic lung infections, which are the leading cause of morbidity and mortality in patients with diseases such as cystic fibrosis and hospital-acquired lung infections. The goal is to develop a novel therapeutic scheme for the treatment of the infections, whereby antibiotics will be replaced by inhalable light sources that will excite bacterial endogenous photosensitisers (e.g., iron-free porphyrins), eliminating the pathogenic bacteria by the photodynamic effect (local production of cytotoxic reactive oxygen species by the combined action of light, a photosensitiser and oxygen) irrespective of its multidrug resistance profile. The treatment will be safe for the host tissue because of its lack of self-photosensitising ability.
Light4Lungs departs from current paradigms: (1) bacterial infections will be treated without antibiotics, which will be replaced by breathable light sources; (2) bacteria will be eliminated without any externally-added drug, taking advantage of endogenous photosensitisers; (3) a breathable light source will be used to elicit the therapeutic action, avoiding the use of invasive physical tethers to deliver light to the lungs. The project encompasses the development of particles with persistent luminescence, the aerosol technology for activation and delivery to the lungs, and the definition of the treatment parameters through toxicity and efficacy tests in clinically relevant models of respiratory infections. The project combines several different scientific expertise from photonics to medicine. The results will be useful for patients with recalcitrant respiratory tract bacterial infections and will eventually be extended to other diseases in the lungs and in other internal organs. The impact reaches beyond antimicrobial resistance itself and will affect many other fields such as healthcare, nanomedicine, materials science and nanotechnology and lightning

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Find out more: **https://cordis.europa.eu/project/id/863102**