PLASMA-GENERATED CLUSTER IONS' EFFECTS ON INDOOR MICROFLORA

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The health implications of indoor microbial contaminants have become an issue of increasing concern in recent years. Most of the people spend much time indoors, which makes indoors an important microenvironment in terms of air pollution. Many air pollutants access the body via inhalation of indoor air because of both the percentage of lifetime spent indoors and higher indoor pollution levels. Some biological contaminants cause infections, trigger allergic reactions, including hypersensitivity pneumonitis, allergic rhinitis, and some types of asthma. Recently, SHARP corporation has developed the world's first "Plasma Cluster Ions® (PCI)" air purification technology, which uses plasma discharge to generate cluster ions. The new Plasma Cluster Device releases positive and negative ions into the air, which are harmless to humans and are able to decompose and deactivate airborne substances by chemical reactions. In the past, phenomenological tests on the efficacy of the PCI air purification technology on microbial cells have been conducted. In most cases, it has been shown that PCI demonstrated strongly pronounced killing effects on microorganisms. However, the particular mechanisms of PCI action still have to be uncovered.

We studied variations in resistance to PCIs among gram-positive airborne micro organisms as well as some dose-dependent, spatial, cultural and biochemical properties of PCI actions using *Staphylococcus spp, Enterococcus spp and Micrococcus spp*.. According to our time/dose-dependent experiments, the inhibitory effect became apparent after a few minutes of PCI emission and lead to an irreversible 99 % killing rate during the first 2-3 hours of treatment. Furthermore, particular changes in total protein composition have been observed using one-dimensional SDS PAGE and red-ox enzymes (catalase, superoxiddismutase) activity detection methods. Furthermore, the effects of PCIs were studied in long-term cultivation studies based on liquid media. The cell population growth rate and the kinetics of substrate consumption were used as indicative parameters. The chemical nature of PCI core as well as PCI interaction with individual cell components have been investigated using specific free-radical detection systems.

These data allow us to suggest possible chemical and biological mechanisms, particular targets of PCIs in cells and possible cases of relative resistance.