Phase Imaging Microscopy for the Diagnostics of Plasma-Cell Interaction

Phase images of biological specimens were obtained by the method of Quadriwave Lateral Shearing Interferometry (QWLSI). The QWLSI technique produces, at high resolution, phase images of the cells having been exposed to a plasma treatment, and enables the quantitative analysis of the changes in the surface area of the cells over time. Morphological changes in the HTori normal thyroid cells were demonstrated using this method. There was a comparison of the cell behaviour between control cells, cells treated by plasma of a nanosecond dielectric barrier discharge, including cells pre-treated by catalase, and cells treated with an equivalent amount of H2O2. The major changes in the cell membrane morphology were observed at only 5 min after the plasma treatment. The primary role of reactive oxygen species (ROS) in this degradation is suggested. Deformation and condensation of the cell nucleus was observed 2-3 hours after the treatment and is supposedly related to apoptosis induction. The coupling of the phase QWLSI with immunofluorescence imaging would give a deeper insight into the mechanisms of plasma induced cell death.