

Abstract

SERSENOVÁ, Dominika. *Investigation of the effects of cold plasma to cancerous and normal cells using molecular methods* [Dissertation thesis]. Department of astronomy, physics of the Earth and meteorology. Faculty of mathematics, physics and informatics. Comenius University, Bratislava. Supervisors: doc. RNDr. Zdenko Machala, PhD. Consultant: doc. Ing. Helena Gbelcová, Ph.D., Bratislava: FMFI UK, 2021.

Plasma medicine is a new area of research and medicine focused on biomedical and clinical applications of the cold physical plasmas, especially their antimicrobial and anticancer effects. The cold plasma can be used directly or indirectly in the form of plasma activated liquids (PAL). We tested the effects of plasma activated cell growth medium (PAM) and phosphate buffered saline (PAPBS) activated with a portable plasma pen generating streamer corona discharge in ambient air on various cancer cell lines (melanoma A375, glioblastoma LN229 and pancreatic carcinoma MiaPaCa-2) and non-cancerous cells (human dermal fibroblasts HDFa). Decreased cell viability and induction of apoptosis were detected in all cancer cells after incubation in PAL. In melanoma cells, we focused in more detail at the apoptotic pathways and we confirmed the depolarization of mitochondrial membrane and activation of caspases 3 and 7 in A375 cells after using PAL. The first 30 minutes of incubation in PAL were sufficient to initiate the processes leading to cell death. We did not observe the apoptosis induction in fibroblasts, only PAPBS activated for a longer time slightly reduced their viability. The effects of PAM and PAPBS on cancer cells have shown selectivity over normal fibroblasts depending on the correct time of action and PAL concentration, which is a very promising result for effective clinical applications. This selective effect of PAL is, in our case, probably induced by plasma generated hydrogen peroxide.

Key words: cold plasma, plasma activated liquids, cancer, apoptosis