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Cytotoxic, genotoxic and mutagenic effects of a complex mixture of substances generated by laser irradiation

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Laser therapy has gained wide application in multiple medical disciplines. Recent chemical analysis of the laser pyrolysis aerosol revealed that at least 250 substances contribute to this complex mixture, among them irritants and potential carcinogens. Therefore aerosols generated by pyrolytic decomposition of tissues might be potential health hazards.

We analysed the cytotoxic and genotoxic effects of aerosols from different types of porcine tissue. Laser pyrolysis products were sampled on glass fibre filters and tested in the comet assay, the SCE test, the micronucleus test and the hprt gene mutation test.

The ability to induce cytotoxic and genotoxic effects turned out to be strongly dependent on the type of tissue that has been irradiated. Genotoxic properties of the aerosols analysed with comet assay, SCE test and micronucleus test can be aligned as follows: adipose tissue < skin < striated muscle << liver. Mutagenic effects in the hprt test can be aligned as follows: skin << adipose tissue < striated muscle << liver. From our experiments it can be concluded that the laser pyrolysis products originating from various types of porcine tissue differ in their composition because they differ in their extent to induce DNA damage. However, since all exhibit strong genotoxic and mutagenic properties they have to be considered as potential health hazards for humans.