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Thesis title: *In vitro* chemically-induced DNA damage in cancer patients and healthy individuals

Keywords

Comet assay, micronucleus assay, sister chromatid exchanges, FISH, food mutagens, nanoparticles

Abstract

In the present study DNA damage was measured in peripheral blood lymphocytes from polyposis coli and colorectal cancer patients, treated with different dietary and environmental compounds and compared with lymphocytes from healthy individuals. In addition, confounding factors such as age, gender, alcohol intake and smoking habits were taken into consideration. The assays used in this study included the Comet assay, the Micronucleus assay, the Micronucleus – FISH assay and the sister chromatid exchange assay.

The food mutagens, PhIP and IQ, as well as titanium dioxide nanoparticles (TiO_2 NPs) induced a dose dependent increase in the DNA damage and chromosomal abnormalities in all tested groups regardless of confounding factors. Prior to experiments physicochemical characterisation of nanoparticles was conducted. In the presence of the flavonoids, quercetin and rutin that were acting in an antioxidant manner, the DNA damage resulting from the highest doses of food mutagens was significantly reduced. Thus, dietary supplementation with flavonoid-rich vegetables and fruits may prove very effective in protection against oxidative stress.

The polyposis coli and colon cancer patients were more susceptible to food mutagens, PhIP and IQ, as well as TiO_2 NPs, and in the majority of cases had a higher level of DNA damage in the Comet assay and higher cytogenetic damage in the Micronucleus assay.

In the final project, twelve frequently encountered (NewGeneris) chemical compounds were evaluated to establish their damaging potential in lymphocytes and spermatozoa from healthy donors. The highest damage was produced by DNA reactive aldehydes, food mutagens and benzo[*a*]pyrene when assessed with the neutral and alkaline Comet assay with and without metabolic activation.