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The biology of buccal cells and the buccal micronucleus (MN) cytome assay

Bolognesi

Environmental Carcinogenesis Unit. Ospedale Policlinico San Martino, Genova, Italy
claudiabolognesi@yahoo.it

The buccal mucosa forms the primary barrier for the inhalation or ingestion route representing a preferred target site for early events induced by genotoxic agents entering the body. The oral epithelium, composed by multiple layers of cells, maintains itself by continuous cell renewal whereby new cells produced in the basal layer by mitosis migrate to the surface replacing those that are shed. Basal cells impacted by genotoxic agents express the genetic damage, as chromosome breakage or loss, during the cell division.The daughter cells differentiate then exfoliate into the buccal cavity and can be easily collected and analysed. The micronucleus assay applied in exfoliated cells represents a minimally invasive approach to evaluate genomic damage in biomonitoring studies.

The micronucleus(MN) assay in buccal cells was established in 1980 to evaluate the genotoxic effects induced by chewing tobacco at the site of exposure. The buccal MN assay has been largerly applied in the last 40 years in biomonitoring human populations exposed by inhalation to a variety of genotoxic and carcinogenic agents or by oral continuous . The MN test was also used to evaluate the effects of anti-cancer chemopreventive agents, the impact of nutrition and lifestyle factors. A large number of studies appeared more recently on the application of the buccal MN assay in the follow-up of cancerous and precancerous oral lesions and as a biomarker of chromosomal instability in patients with cancer or with different chronic diseases. Based on the data available, the association of MN in buccal cells with some diseases appears to be as robust as MN in lymphocytes.

The MN assay was successfully applied to evaluate the MN frequency as a marker of chromosome damage. More recently the MN assay evolved in the “buccal MN cytome” including the scoring of the different cell types and nuclear anomalies providing a comprehensive evaluation of the biomarkers of DNA damage, biomarkers of cell death, biomarkers of cytokinetic defects or arrest. The data collected in biomonitoring occupational or environmental exposure and in clinical studies suggest an added value for the evaluation of the cytome biomarker profile.

Keywords:
Buccal mucosa, exfoliated cells, micronucleus, biomonitoring, clinical studies.