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A TWO-WEEK FEEDING STUDY OF BHA: EFFECT ON CELL KINETIC PARAMETERS IN THE RAT GASTRO-INTESTINAL TRACT.

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The synthetic food antioxidant 2[3]-tert-butyl-4-hydroxyanisole (BHA) is carcinogenic in the forestomach of rats, hamsters and probably mice. Sequential changes are dose-dependent and involve lesions, hyperplasia, papillomas and carcinomas, the development of which is accompanied by an increase in forestomach labelling index (L.I.). In the present study, subcellular markers of cell kinetics were assessed in the rat gastro-intestinal tract after short-term consumption of BHA. Groups of five male Wistar rats (306±17 g) were fed a diet containing 2% BHA or basal diet (control group) for two weeks. Subsequently, rats were injected i.p. with 25 mg/kg 5-bromo-2'-deoxyuridine (BrdU), a thymidine analogue, and killed after four hours. The gastro-intestinal tract was removed, opened longitudinally, cleaned and fixed in 70% ethanol. After pepsin digestion of random samples of the fixed tissues, labelled cell nuclei were visualized by means of a monoclonal anti-BrdU antibody technique. Cell kinetic parameters were determined by bivariate BrdU/DNA analysis using flow cytometry.

Forestomach L.I. and potential doubling time (Tpot) in random samples were 10.0±3.4% and 2.7±0.8 days for the control group and 20.7±3.9% and 1.2±0.2 days for the group fed 2% BHA respectively (mean ± SD; p<0.001). Mean transit time through the S-phase was not altered. Glandular stomach, ileum, caecum and colon were not affected. Thus, we confirm proliferative effects of BHA on rat forestomach as indicated by an increase in L.I. and additionally report a decrease in Tpot following short-term dietary BHA administration.

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MUTAGENIC ACTION OF SOME ISOCYANATES AND THEIR AMINE ANALOGUES TO SALMONELLA TYPHIMURIUM

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Organic isocyanates are highly reactive chemicals characterised by the general formula R(CN)=O. The isocyanates are widely used for the industrial production of polyurethanes. Exposure to isocyanates is known to cause pulmonary and skin irritation as well as immunological sensitization of the respiratory tract. In contrast to these well studied toxic effects, little is known about the mutagenic and possible carcinogenic effects of the isocyanates.

We present a study of the mutagenic action to Salmonella typhimurium of three isocyanates extensively used in polyurethane industry: toluene diisocyanate (TDI), 4,4'-di-phenylmethane diisocyanate (MDI) and hexamethylene diisocyanate (HDI). In addition, the closely related tolylsicocyanate was also studied. Isocyanates easily form amines in a reaction with water. Therefore the amine analogues (TDA, MDA, HDA and toluidine) were incorporated in the Ames-tests.

The mutagenicity testing was carried out with the plate incorporation assay as described by Ames et al. (1). The tests were performed with S. typh. strains TA 100, TA 1535, TA 98 and TA 1538 both with and without metabolic activation (99% mix containing rat liver homogenate (9000 g)).

The isocyanates, particularly HDI, showed a large toxic effect on the Salmonella bacteria. Mutagenicity was observed with TDA, TDI, MDI and MDA in TA 100 and TA 98 with 99% mix. In both cases the amine was more mutagenic than the analogous isocyanate. This finding suggest that the mutagenic effect of isocyanates can be attributed to reactive metabolites of the amines formed during hydrolysis of the isocyanates.

1. B.N. Ames, J. McCann and E. Yamasaki, Mutation Research, 31 (1975) 347

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