Genotoxic substances in the food- Aflatoxin B1, N-Nitrosamines, Polycyclic aromatic hydrocarbons(PAH), Heterocyclic amines (HCA)

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Introduction: AFB1, N-Nitrosamines, PAH and HCA are classified as genotoxic after undergoing metabolic activation in the human body. They lead to DNA damage and can cause mutations. Hence, different types of cancer are associated with these substances. Therefore in vitro and in vivo studies should provide further evidence and could contribute to a reduction of the cancer incidence.

Materials and methods, experimental design, other methodological information: Risk assessments, as well as epidemiological studies were used to investigate their impact on human carcinogenesis. Also studies using FFQ and biomarkers to assess the estimated exposure through human diet of those substances were included.

Results and discussion: The International Agency for Research on Cancer classified AFB1 and Benzo[a]pyrene as carcinogenic, some compounds of N-Nitrosamines, PAH and HCA as probably carcinogenic and some N-Nitrosamines, PAHs and HCAs as possibly carcinogenic to humans. Epidemiological data in sub Saharan regions and Southeast Asia show an implication of AFB1 in the aetiology of Hepatocellular carcinoma especially in populations where hepatitis B virus is prevalent. Animal trials indicate a correlation between N- Nitrosamine dietary intake and cancer of lungs, liver, kidney, gastric, bladder, esophagus and mammary gland. PAHs cause gastric, skin and lung cancer in rats and are associated with high meat consumption. Grilled meat is also a main source for HCAs. Target organs of HCAs are colorectal, stomach and mammary gland in animal trials. Although animal trials show evidence for the carcinogenic impact, studies on humans still have to be improved to achieve more valuable information. Furthermore evaluating the role of each substance exposure is challenging because quantification of each of them in a large number and variety of food samples is not an easy task.

Conclusion: AFB1 exposure is still a challenge especially in developing countries. To reduce cancer risk a moderate meat consumption as part of a balanced diet is preferable. Since scientists have focused on only one aspect of one group of mutagens it is time for a new approach to investigate the impact of those substances in conjunction. Also synergistic reactions have to be considered, as well as protective substances in the diet. Improvements in epidemiological studies with large case numbers and cohort study design will be necessary to gain further evidence on the carcinogenesis in humans.

References:


