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Letter to the Editor

Food mutagen and gastrointestinal cancer

Dear Editor,

Each year, tens of millions of people around the world are diagnosed with cancer, and more than half of them die from it[1].

The causes of cancers are understood to be mainly tobacco smoking – especially for lung cancer[2-4], dietary factors, and infection/chronic inflammation, each of these accounting for up to one third of all tumors[5]. Iatrogenic factors, accidents, pollution, food additives and sunlight exposure are among the other etiological agents[5].

Several lines of evidence indicate that diet and nutrition can contribute to human cancer risk, because of carcinogenesis process[6-10].

Carcinogenic processes themselves are known to involve multi-step processes (initiation, promotion, progression) and to be influenced by various factors. Food mutagen is working through genotoxic and non-genotoxic pathway in carcinogenesis.

Genotoxic pathway works on the level of DNA, causing DNA damage. Moreover, non-genotoxic pathway affects the cell through tumor promoters such as inflammation, immunosuppression, free radical and so on. The greater is the exposure to both pathways, higher are the risks of carcinogenesis[10]. On Table I is reported the multistep process of carcinogenesis and mutagenesis,

In fact diet and nutritional factors are two of several major causes of carcinogenesis. Human beings are often exposed to carcinogenic factors during their life, whether they realize it or not.

Foods and dietary behaviors are thought to increase cancer risk, partly due to the consumption of food mutagens.

The mutagens include those of natural origin, those caused by human manipulation of food (e.g., cooking and adding preservatives), and those formed after food has been consumed (e.g., nitrosamines).

Moreover the mutagenesis process is divided in endogenous mutations, induced by natural changes, and exogenous mutations, caused by external agents. The exogenous mutations are those induced by a mutagen agents (e.g., chemical, fisical or biologica agent). Generally the mutations are dangerous and detrimental to health, in fact only a small percentage of there is useful for an organism.

These mutagens contribute to cancer along the route of exposure (oral cavity, esophagus, gastrointestinal tract) and in organs that are distant to the route of exposure (e.g., liver). In the Figure 1 are shown the classification of mutagens agents.

Table I. Definition and classification.

Cancerogenic substances classification (EU)	
Category 1	Substances known to be carcinogenic to man. There are sufficient evidence to establish a causal relationship between human exposure to the meds and the development of tumors.
Category 2	Substances that should be regarded as carcinogenic to humans. There is insufficient evidence for a strong presumption that human exposure to the substance may result in the development of cancer, generally on the basis of: adequate long-term studies in animals, other specific information.
Category 3	Substances to be considered carefully because of the possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There aresome evidences from appropriate animal studies, but these are insufficient to place the substance in Category 2.

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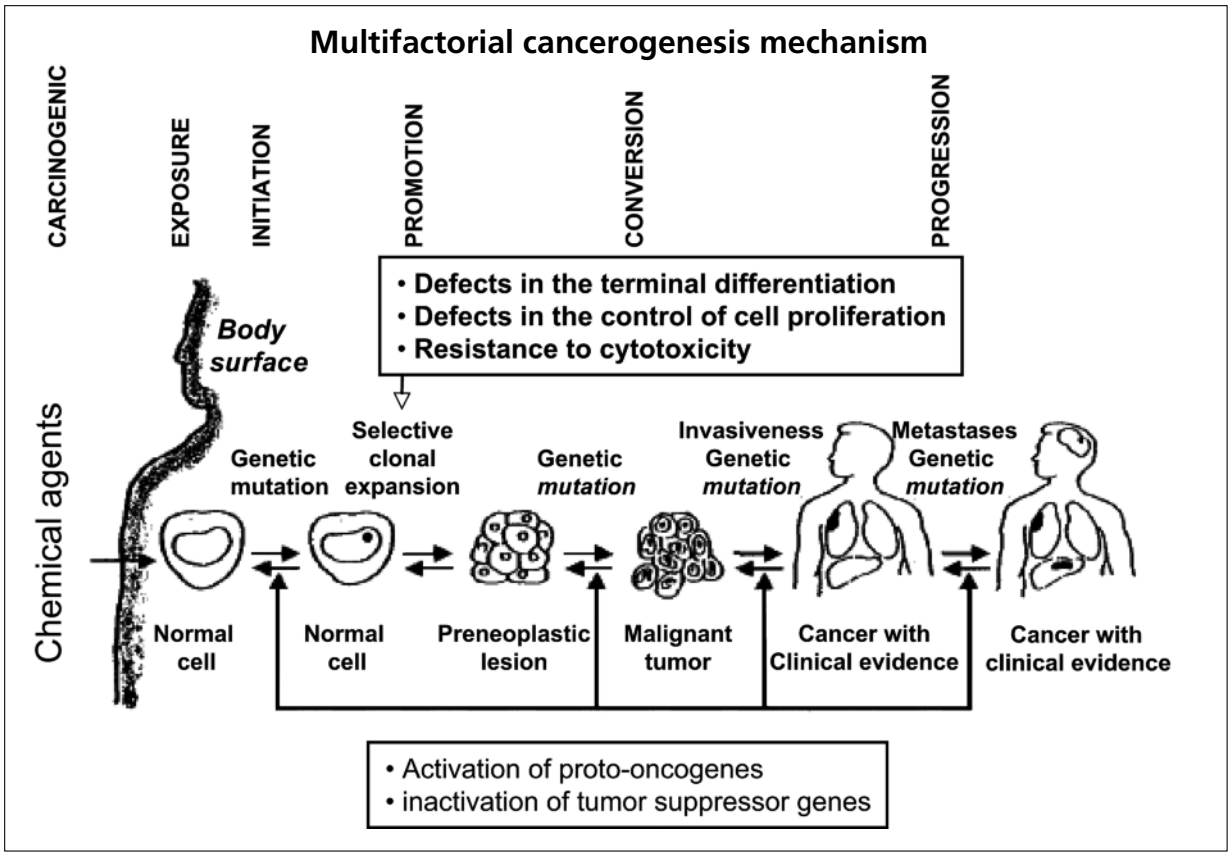

Figure 1. Cancerogenesis and mutagenesis.

One of consequences of food mutagens are Heterocyclic amines (HCAs) that are formed during the cooking of meat, by condensation of creatine with aminoacids. Studies have consistently shown that HCAs cause mutations in most test systems, including bacteria, rodents exposed in vivo, and cultured rodent and human cells. Moreover HCAs also caused sister chromatid exchange, micronucleus formation, and unscheduled DNA, synthesis, and most of HCAs induced DNA damage and chromosomal aberrations in vivo studies, in rodents, in vitro studies with human and rodent cell cultures[12].

When ingested by humans or administered orally to experimental animals, HCAs are readily absorbed and rapidly distributed. They are metabolized by both phase I (activation) and phase II (conjugation) enzymes and these processes are responsible of carcinogenesis and so this produce a high risk of cancer development (e.g., stomach, colo-rectal, breast and pancreas).

Hence, a good knowledge of nutrition, and the life-style are important tools to reduce the risk of cancer-related consumption of HCAs, adopting a well balanced diet and at same time to consume food with natural action against the mutagenesis process.

Furthermore, nutritionally related cancer have been ultimately developed from an imbalance of carcinogenesis and anticarcinogenesis process[11-15].

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