**Nutrition and Cancer**

**Smoking**

**Radiation**

**Environmental Risks**

**Nutrition and Cancer**

Studies show that 20-60% of cancer deaths are related to diet, thus, human nutrition is considered a preventive factor and an adjunct treatment to different types of cancers at almost all stages.

**Fruits and vegetables:**

There are many reasons behind the support of a diet rich in fruits and cruciferous, dark-green vegetables that help reduce cancer risk. Indoles and isothiocyanates, vitamins A, C, E, beta-carotene and fiber found in the cruciferous vegetables (cabbage family including cabbage, broccoli, Brussels, sprouts...), are known anti-cancer components. In addition; dark green leafy vegetables are high in chlorophyll, antioxidants and other anticarcinogenic compounds. Greens with bitter flavor such as dandelion and chicory showed to stimulate liver detoxification. Also, Alliums family (onions, garlic, chives...) has been reported to contain anticarcinogenic sulfur compounds like allicin that help in the prevention and/or the reduction of the severity of different cancer diseases. Orange and yellow colored fruits like apricots, peaches and all berries were also shown to possess anticancer properties due to their high content of alpha- and beta-carotenes, lycopene and vitamin C. Similarly, citrus fruits (oranges, lemon, and grapefruit) and more importantly their peel contain the substance D-limonene that acts as a free radical scavenger and cancer cell killer.

Legumes have similar anticancerous effects due to their richness in isoflavones and flavonoid compounds that are commonly found in different types of beans and peas especially soybeans. Genistein is a member of the flavonoids family that has a molecular resemblance with the human hormone -estrogen- ; hence, it blocks the potent effect of endogenous estrogen which is a factor in hormone-dependent breast cancers. Another prevention factor associated with genistein has been its role in inhibiting unregulated angiogenesis and/or proliferation of tumor cells.

**Fiber:**

Studies have shown that dietary fiber and its metabolic products contribute to the reduction of several types of cancers and more importantly, the colorectal cancer, by mediating biological and genetic factors involved in the carcinogenesis process.
**Vitamins and Minerals:**

One of the most abundant vitamins in orange colored fruits and vegetables is vitamin C; it reduces the formation of harmful nitrosamines in the intestinal tract which are potent factors in stomach and esophageal cancers. When lung cancer patients were administered high doses of vitamin C (antioxidant) prior, during and after radiation and chemotherapy, their bodies showed increased tumor destruction results and longer life span. Similarly, vitamin A and beta-carotene (the most important oxidant carotenoid and the precursor of vitamin A) enhance T-cell mitogenesis and strengthen antibodies’ response against tumor development among lung cancer patients. Also, high lycopene intake through tomato-rich diets was associated with a reduction in prostate cancer in a prospective cohort study. Vitamin E, in its active form in the body as α-tocopherol, is the major antioxidant in lipid tissue that acts as a scavenger of free radicals and enhancer of immune system. Vitamin E supplementation lowered the risk of stomach, esophagus, and prostate cancers, yet it showed no significant effect on other types of cancer in the colon and lung.

**Dietary Fat:**

Results of recent researches indicate lower cancer incidences among populations with lower fat intakes especially colon, rectum, and prostate cancers that are associated with saturated fats. “It is known that diets high in polyunsaturated fat (linoleic acid and other omega-6 PUFAs), relative to diets high in saturated fat, are more immunosuppressive and better promoters of tumor genesis (growth of tumors). On the contrary, diets rich in omega-3 fatty acids and monounsaturated fatty acids, oleic acids in specific which are found in olive oil, exhibit protective effect against cancer formation. Moreover, in more developed researches, a unique fatty acid class called conjugated dienoic derivative of linoleic acid (CLA) showed a significant anticancirogenic effect. CLA’s are produced by microbes in the rumen of cows and beef and dairy products act as their primary sources.

**Obesity and cancer**

As a result of the change in lifestyles, many dietary habits with high energy, saturated fat and cholesterol have multiplied in the latest three decades. This kind of diet along with insufficient physical activity has led to an increasing number of overweight populations worldwide. Besides the fact that obesity has a clear association with cardiovascular diseases and type 2 diabetes, some studies affirm that it plays a significant role in increasing the risk of various types of cancers. By taking the BMI (Body mass index) as an indicator of obesity, researches have studied the correlation between cancer occurrence among overweight and a control group, the findings showed that there is a positive relationship between the two variables.
Breast cancer risk is increased when dietary fat raises hormone levels, colorectal cancer risk is increased with the increasing secretion of primary bile acids that convert to other cytotoxic bile acids. Other cancers such as Non-Hodgkin’s lymphoma, prostate, esophagus, gall bladder, liver and pancreas also showed a positive association.  

Obesity is highly dependent on other interactive factors such as heredity and lifestyle, which makes the conclusion more debatable and better considered at the individual level.

**Effect of radiation**

The Ionizing Radiation and UV (Ultraviolet) are the only radiations that are proven to cause human cancer after a long exposure. Skin cancers and skin melanomas are enhanced after a long exposure to these daily radiations. Nowadays the exposure is becoming more threatening since the ozone layer holes are wider due to the significant increase in pollution. Many studies from patients receiving radiotherapy, certain occupational groups such as uranium miners, as well as atomic bomb survivors presented evidence that high-dose IR causes cancer. Like all forms of cancer treatment, radiation therapy can have several side effects ranging from temporary or permanent loss of hair and change in skin color in the area being treated, skin irritation and tiredness. Other side effects are largely dependant on the area of the body that is treated, but especially bone marrow and thyroid gland.

**Link between Tobacco and Cancer:**

It clearly established now that there is a causative relationship between tobacco and cancer. Initially, we used epidemiological surveys of cancer patients and their smoking history and demonstrated that lung cancer for example is associated with smoking. 87% of all lung cancers are caused by smoking; this link was also established for cancers of the mouth, throat, esophagus, bladder, pancreas, cervix and suspected for other cancers. It is estimated that one third of cancers are caused by smoking.

Nowadays, we have scientific evidence that smoking causes cancer. We know that there are over 4000 chemicals in the smoke and tar of cigarettes, and more than 40 of those chemicals are carcinogenic. This means that these chemicals cause transformations in the normal animal cells into cancerous cells in laboratory experiments. We also know that in humans, the inhaled smoke of cigarettes causes genetic DNA changes in the normal cells of the bronchi and lungs that lead to cancer formation. The more you smoke, and the longer you smoke, the more irritation and carcinogenic stimulation of normal cells occur and more chances of getting cancer.
Smoking not only harms smokers, but also the people who live with them or who work with them, which is called passive smoking. Smoking notably hurts pregnant women and their unborn child.

**Worldwide tobacco use:**

While there is some decrease noted in developed countries, smoking is still rising in developing countries at a rate of 3.4% per year at least, where lack of regulations and insistent advertising prevail.29

**Smoking and Cancer in Lebanon:**

In Lebanon, 85% of patients with lung cancer are smokers. We have many patients who are in their forties and have lung cancer. 40.5% of adults smoke; 46% of males and 35% of females, and this number is the highest among all Arab countries. 45% of students smoke, out of which 16% are less than 15 years old. (WHO estimates 2002a)

**Preventing Cancer:**

Many people ask their physicians or health professionals: “What can we do to prevent cancer?” The true and simple answer is to stop smoking, which prevents all smoking-related cancers and the risk of developing other diseases.

**Smoking advertising in Lebanon:**

Cigarette advertising in Lebanon is unfortunately very strong and uses lies to propagate smoking among young people, women and teenagers. Advertising presents smoking as a good adventurous habit and that is a big lie!

We need to have regulations to stop advertising around the country. Cigarette advertisements should not be allowed near schools, tops of buildings, grocery stores, shops, pizzerias, children and teenagers recreation areas, sporting clubs, popular streets and highways, cinemas and theaters, and television. Cigarette packs should have a clear disclosure statement of the amount of addictive nicotine and harmful tar in it, along with a clear legible large warning that smoking causes dangerous diseases.

Politicians, religious leaders, teachers and other public figures should not be allowed to smoke in public nor in television interviews.

Parents also have an important role to play: They should stop offering cigarettes to their guests in their homes, and refrain from sending their children to grocery stores to buy them cigarettes. These are very bad habits that give the illusion to children and teenagers think that smoking is an acceptable social habit.

Some regulations, if well implemented, can significantly decrease the marketing of that harmful product. Selling cigarettes for people below 21 years of age should be identified as
illegal. Competitions such as lowering prices among brands should be banned. Farmers should be assisted to switch to other products.

These issues have been addressed by AUB doctors and other doctors in Lebanon in newspapers and magazine interviews, radio and television programs, public lectures, and lectures in schools and universities.

We plan to continue our public campaigns, in cooperation with the Lebanese Order of Physicians and Scientific Societies. This information needs to be repeated to reach all regions and all age groups Repetition and scientific information will convince people that smoking is dangerous to their health and causes cancer. Once they are convinced, they will strive to stop for good.

Cancer and the Environment

Many occupational and environmental hazards cause cancer (Table 1). People are exposed to these hazards at work, home, or in the general environment. Some of these hazards are inhaled while others are ingested, absorbed through the skin, or simply penetrate the body (e.g., gamma radiation).

Table 1. Selected list of definite human carcinogens (32-34)

<table>
<thead>
<tr>
<th></th>
<th>Industrial activity</th>
<th>Exposed population</th>
<th>Cancer site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aflatoxins</td>
<td>Farming (grains, peanuts)</td>
<td>Farmers, Consumers</td>
<td>Liver</td>
</tr>
<tr>
<td>Arsenic compounds</td>
<td>Metal industries, Glass production, Pesticides</td>
<td>Workers</td>
<td>Lung, Skin, Liver (?)</td>
</tr>
<tr>
<td>Asbestos</td>
<td>Mining, Manufacturing of asbestos-containing material (e.g., asbestos-cement pipes, auto brake shoes), Construction and demolition, Ship building</td>
<td>Miners, Industrial workers, Construction workers, Auto mechanics, General community (if fibers are loose)</td>
<td>Lung, Pleura, Peritoneum, Gastrointestinal tract(?)</td>
</tr>
</tbody>
</table>
In addition to these human carcinogens, there is a long list of hazards where the evidence is not as strong. For these, there is either weak evidence among humans but strong evidence among animals (probable carcinogens) or weak evidence for both humans and animals (possible carcinogens), according to the classification of the International Agency for Research on Cancer (IARC).

Overall, occupational and environmental exposures contribute 2% to 8% of all cancers. Environmental exposure is more strongly associated with specific cancers, especially lung and bladder cancer. Table 2 lists examples of cancers that have been associated with specific environmental hazards.

Table 2. List of cancers that have been associated with exposure to environmental hazards (adapted from references 32-34)

<table>
<thead>
<tr>
<th>Cancer site</th>
<th>Environmental/ occupational hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>Cigarette smoking, Arsenic (inorganic), Asbestos, Chloromethyl ether, Chromium, Nickel, Polycyclic aromatic hydrocarbons, Radon, Coal tar</td>
</tr>
<tr>
<td>Leukemia</td>
<td>Ionizing radiation (all types of leukemia except CLL), Benzene (AML), Alkylating antineoplastic agents</td>
</tr>
<tr>
<td>Liver</td>
<td>Mono vinyl chloride, Thorotrast (thorium dioxide), Arsenic</td>
</tr>
<tr>
<td>Bladder</td>
<td>Aniline dyes, Aromatic dyes, Cigarette smoking</td>
</tr>
<tr>
<td>Skin</td>
<td>Arsenic, Ionizing radiation, Polycyclic aromatic hydrocarbons, UV radiation</td>
</tr>
<tr>
<td>Nasal cavity and</td>
<td>Wood dust, Nickel, Chromium, Cutting oil, Shoe manufacturing, Coal</td>
</tr>
</tbody>
</table>
It is worth noting that the association between environmental exposure and cancer is often difficult to establish. There are two main reasons for this difficulty:

1) Cancer is characterized by a long latency period. Cancer is clinically diagnosed years after exposure to a certain hazard. This is the case with mesothelioma (cancer of the pleura of the lung) for example, which is caused by asbestos but usually diagnosed 30-40 years after exposure to this carcinogenic fiber.

2) People are exposed to multiple chemical, physical, and biological hazards over the span of their life, which complicates the possibility of linking cancer to a single exposure.

3) Environmental exposure interacts with other lifestyle factors (e.g., smoking, nutrition) also associated with cancer.

Prevention in many cases follows the “precautionary principle”. This means that exposure to any chemical or other hazard that is suspected of being carcinogenic should be limited or eliminated if alternative technology or material exists.