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Editorial

What Is the Main Cause of Cancer?

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Tobacco use, most people would say. Smoking tobacco increases the risk of developing many types of cancer and is responsible for approximately one-third of all cancer deaths. The association between tobacco use and lung cancer is well known; lung cancer occurs about 20 times more often in heavy smokers than in nonsmokers [1]. However, many lung cancers are diagnosed in never smokers [2], and most smokers do not develop lung cancer [3,4].

Aging, many epidemiologists would probably say. According to SEER cancer statistics review, 1975-2012, cancer incidence increases dramatically with age [5]. The risk of being diagnosed with cancer is 1 in 128 in people under 30 years old, 1 in 10 in people between 30 and 60, and 1 in 3 in people over 60. The rise is more pronounced for the most common cancers. Breast, colon, lung and prostate cancers are over 150 times, 180 times, 600 times and 2,800 times more frequently diagnosed in people over 60 years old than in people under 30. However, cancer incidence decreases late in life for most cancers; men in their 80s have approximately half the risk of developing prostate cancer than men in their 70s. In addition, the risk of some cancers does not correlate well with age; brain cancer and leukemia are more frequently diagnosed in the first decade of life than in one of the following three decades [5].

The self-renewal capacity of the body tissues, some researchers might say. Tissues with a high self-renewal capacity give rise to cancer almost a million times more often than tissues without this capacity. The incidence of breast, prostate or lung cancer is approximately seven cases per 100 people [5], whereas the incidence of heart cancer is 34 cases per 100 million people [6]. Lung cancer in nonsmokers is about 10,000 times more common than heart cancer in smokers [5,6]. However, some tissues with similar self-renewal capacities have different cancer risks [7].

The accumulation of mutations in oncogenes and tumor suppressor genes, many cancer researchers would conclude [8-10]. However, other cancer researchers would present evidence challenging this theory, e.g., sequencing studies showing zero genetic mutations in human tumor samples, and human studies linking non-mutagenic agents with increased cancer risks [11-16]. It has repeatedly been shown that the risk of developing cancer is increased by a variety of non-mutagenic factors, including hormone therapy (several cancer types) [17-19], drinking very hot beverages (esophageal cancer) [20-22], shift work that involves circadian disruption (breast cancer) [23-25], and exposure to non-ionizing electromagnetic fields (childhood leukemia) [26-31]. Carcinogenesis experiments in laboratory rodents have also shown that non-mutagenic factors can have a major impact on cancer incidence. Implanting foreign bodies of different materials under the skin of rodents leads to the formation of tumors; the shape of the implanted material, but not the composition, determines tumorigenesis [11,32-34]. For example, all mice implanted with Millipore filters with a pore size of 0.025 micrometers developed tumors, whereas none of the animals implanted with filters with pore sizes equal or higher than 0.22 micrometers developed any malignancy [32]. There is also consistent evidence that interruption of nerve connections alters cancer incidence and tumor growth. For example, the early phases of prostate tumor development are prevented by surgical interruption of the sympathetic nervous system [35]. Denervation of the stomach also suppresses gastric tumorigenesis [36].

It is known that cancer is ultimately caused by an uncontrolled cell proliferation that threatens life. The uncontrolled cell division of some cells leads to the accumulation of abnormal cell populations that threaten life by interfering with vital body functions [16]. However, despite decades of research, the main biological cause of such an uncontrolled proliferation remains to be elucidated. Not having the answer to the question raised in this Editorial is a major barrier to reducing the

burden of the disease [37]. To be widely accepted, the answer should explain the striking differences in cancer risk by age and among tissues. It should also explain why non-mutagenic agents increase the risk of developing the disease. *Cancer Research-Open Journal* welcomes submissions addressing this key question.

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