

[OPINION] Cancer – How We Did Ourselves In

In the introductory article, cancer was presented as an insidious genetic disease, a disease of old age, and an integrated part of evolution that turned rogue. It is brought about by the accumulation of genetic abnormalities over time that confers growth advantages to a cell over its surrounding tissue.

This very trait and characteristic of evolution, the survival instinct, is etched permanently in all living things at the genetic level and carried down the generations even today. Most cell mutations are harmless and provide environmental adaptability for the host, but those that grow too fast and too furious harbour destructive tendencies. This is the essence of cancer. Nothing has changed.

Neither did evolution. Information from the outside world continues to be translated and processed by living cells. It has not stopped. Except our line of sight now is not 530 million years. From the Hunter-Gatherer Era to the Agrarian Society to the Industrial Revolution and today's Digital Explosion Epoch, it merely spans about 5,000 years.

Perhaps for this reason, evolutionary forces causing environmental changes that disrupt lifestyles adequately to cause DNA mutations are not acute enough to warrant morphology which is now almost inconspicuous.

Genetic aberrations or DNA damage that cause cell mutation are driven by hereditary, replicative, and environmental factors. These factors may operate singularly or in tandem to cause multiple mutations at an accelerated pace. Keep reading to find out the main factors that predispose one to cancer.



Tanning Troubles

Cats love sunbathing and so do humans who share 90% of their DNA with cats. Having strong sunlight all year round is a perk of living along the equator, but this could be less than desirable for those with fair skin and feline instincts. The rule of sun worship limits exposure to half the duration for a particular skin type to burn and that should provide all the good feeling and sunshine vitamin needed.

Failing to abide elicits the dire consequence of having one's DNA damaged by UVA in the sun rays which can cause skin discolouration and possibly both precancerous and cancerous skin lesions.

Indoor tanning is no exception, and perhaps more deadly than sun exposure. Tanning beds emit mainly UVA which promotes the development of two common skin cancer types — squamous cell carcinoma and basal cell carcinoma. Indoor tanning before age 20 increases the risk of developing melanoma by almost 50%, the risk increasing with each use. Having said that golfers are also at an increased risk of melanoma and non-melanoma skin cancers due to cumulative UV exposure.

Frequent flyers may be exposed to even greater risks without realising it. At a common cruising altitude of about 10,000 meters, UV radiation doubles the intensity at sea level, and when UV gets reflected off surrounding clouds, the entire cabin becomes filled with ambient UV light turning it into a flying solarium. And that's not counting being exposed to cosmic ionising radiation.



Sinister Status Symbol

Tobacco smoking was a status symbol in its heyday. For man, it symbolises modernity, strength, youth, and excitement; evoking individuality and a sense of eccentricity. Smoking for women symbolises rebellious independence, glamour, seduction, and sexual allure that represents a challenge to social norms and advocacy for equal rights. For children, smoking provides a fleeting moment of adulthood. Collective smoking propels individuals into transient camaraderie.

Such ego trips introduce into the body with each inhalation some 4,800 toxins including some 70 identified carcinogens, raising the risk of various cancers. Life expectancy for smokers is at least ten years shorter than for non-smokers, but this setback may be reversed if the habit is abandoned before age 40, and even for older smokers, the risk of stomach, mouth, throat, lung, or oesophageal cancer is halved five years after smoking cessation.

Whilst non-addictive, involuntary smoking carries the same cancer risk as smoking by choice. This is because second-hand smoke is no less lethal. As such, there is no defined safe level of exposure. Passive smoking does not arise from breathing in the exhalation of active smokers alone.

Chemicals from cigarette smoke that remain in furniture, wallpaper, carpets, or anything fabric can subtly permeate the surrounding when a non-smoker could unwittingly inhale the toxins so emitted.

Smokeless tobacco, often as an alternative to cigarette smoking, is just as harmful to health. Besides higher nicotine content, oral tobacco contains at least 28 chemical carcinogens that promote mouth, stomach, oesophageal cancer, and more.

Active and passive smokers are well advised to avoid consuming any ACE or Vitamin A (beta-carotene) and Vitamin E (alpha-tocopherol) anti-oxidant combos.



Sleepless Sojourns

Although the connection between sleep and cancer is still unclear, studies have indicated a positive correlation between poor sleep and elevated cancer risk.

Sleep duration is something that at times “less could be more”. A 2022 article in Cancer Epidemiology observed that sleeping more than 10 hours daily elevates the risk of developing many cancers, including colon, liver, breast, and lung cancer in both genders. On the contrary,

short sleep durations of less than 6 hours are specifically associated with a higher risk of colon polyps and stomach cancer.

The International Agency for Research into Cancer (WHO) has classified night shift work as category 2A (probable carcinogen). Nurses, cabin crew, and people working overnight or graveyard shifts who suffer circadian rhythm disorders may have a higher rate of hormone-dependent cancers, like breast and prostate cancer. Anyone experiencing long-term sleep cycle disruption shares this peril of increased cancer risk.

Circadian rhythms, help regulate cell proliferation and apoptosis, as well as DNA repair during sleep. Circadian rhythm is powered by melatonin, a hormone produced by the pineal gland, and studies have suggested that people with displaced or disrupted circadian rhythms display low levels of melatonin or its metabolites. Melatonin, besides having a broad range of immuno-enhancing actions, is now recognised for its oncostatic properties that interfere with tumour growth during the initiation, progression, and metastasis phases.



Obesity – the Stealth Killer

Most people associate being overweight or obese with insulin resistance, but not cancer. Insulin resistance is when cell insulin receptors become less sensitive and compel increased insulin secretion by the pancreas resulting in elevated serum insulin levels. As a growth factor, high insulin levels trigger rapid cell proliferation, reduce apoptosis, and can cause DNA regulator genes to spin out of control. That implies a greater opportunity for replicative errors and cancer development in the liver, pancreatic, kidney, breast, and more.

Another deleterious characteristic of obesity is sustained inflammation. Normal or acute inflammation is a defence mechanism for the short-term containment of pathogenic breaches in the body. Chronic inflammation, however, is a long-term disorder presented with lymphocytes and macrophages and the proliferation of blood vessels and connective tissue, a perfect microenvironment for tumour growth.

Sustained inflammation is considered a strong risk factor for developing many diseases including cancer. As a risk factor, obesity predisposes to a pro-inflammatory state via increased inflammatory mediators IL-6 and TNF- α , with TNF- α being overexpressed in the overweight, while IL-6 is linked to the obese that influences the liver to synthesise and secrete C-Reactive Protein, which is a marker of systemic inflammation.

Obesity is often related to inactive lifestyle and poor dietary habits.



Mocking Moderation

Advocates for alcohol suggest drinking a glass a day is beneficial for the heart and health. While the suggestion may have merit, much research has pointed out that regular consumption of alcohol may double the incidence of developing cancer including breast, liver, stomach, pancreatic, mouth, and oesophageal cancers in both genders.

Alcohol in the body is metabolised by the liver into acetaldehyde, a highly toxic substance and known carcinogen, which damages DNA and prevents repairing of the damage leading to cellular mutation and possibly cancer in due course.

Because the half-life of alcohol is about five hours, it takes about 25 hours for the body to completely clear the alcohol consumed. For the average metabolic rate of about 7g/hr for alcohol, The Centre for Disease Control and Prevention advises against drinking more than two alcoholic drinks a day or ten drinks a week to keep matters in check.

Moreover, the energy content in alcohol is high, with each gram of the spirit yielding 7 calories, just slightly less than a gram of fat which registers 9 calories. Thus, regular consumption of alcohol boosts unwarranted gain in weight and cholesterol, also risk factors for cancers.

It is fair to assume physical activity levels decline with the phase of human civilisation. People of today certainly move much less than their forefathers during the Hunter-Gatherer Era. Apart from

being trapped in a desk-bound job, many perpetuate a sedentary lifestyle into their leisure hours by indulging in computer gaming or being a “couch potato”.

Physically active individuals have lower rates of many cancers and improved cancer outcomes. The National Cancer Institute attempts to explain this nebulous relationship to include the effects of exercise in lowering serum levels of hormones (eg. oestrogen) and certain growth factors (eg. insulin), reducing inflammation, improving immunity, increasing the speed of food passing through the digestive system thereby reducing contact of the bowel lining with potential carcinogens and preventing obesity, which itself is a risk factor for many cancers.

Modern affluent society provides consumers with an excellent platform for choice and a stage for persuasive communication and influence. This is one reason for the quantum leap departure in lifestyles of the modern man relative to that of his forefathers.

Modern man, influenced by pervasive marketing, has developed a dangerous craving for processed food, particularly processed meat. Research, however, demonstrates that eating any processed meat increases the risk of both stomach and colorectal cancers. To preserve or enhance the flavour in processed meat through salting, curing, fermenting, or smoking, the main ingredients used are nitrates and nitrites, which can become N-nitroso chemicals (NOCs) when ingested and nitrosamines when heated.

Nitrosamines are strong carcinogens that may produce cancer in diverse organs and tissues including the lung, brain, liver, kidney, bladder, stomach, oesophagus, and nasal sinus. Eating processed meat also poses a greater risk of bowel cancer than eating red meat.

Heme iron, a precursor to haemoglobin, is naturally found in red meat. When ingested, heme iron catalyses the endogenous formation of cancer-causing N-nitroso chemicals. Similarly, when red meat is grilled, barbecued, or cooked at high temperatures, Heterocyclic amines (HCAs) and Polycyclic aromatic hydrocarbons (PAHs) are released and these mutagenic chemicals can damage cells in the bowel.

Adhere to the safe limit of 450 grams of red meat per week to avoid increasing the risk of colorectal cancer.

Eating pickled foods can be a double-edged sword. While it benefits gut health with probiotics, there's increasing reason to believe that pickled foods can increase the risk of nasopharyngeal carcinoma. Like processed meats, some pickled foods contain high nitrate and nitrite content, which react with proteins in the body to form nitrosamines. So, consume sauerkraut and kimchi in moderation.

Hideous Habits

People may at times be oblivious to detrimental yet apparently, innocuous habits that increase their likelihood of developing cancer.

Asians, especially, enjoy drinking soups piping hot for enhanced aroma. Yet there are others who start their day with hot stimulating coffee or tea for extra potency. Observational studies have shown that imbibing hot beverages above 60°C scald the tongue and irritate the oesophagus, and when repeatedly performed elevate the risk of oesophageal cancer. So be kind to one's tongue and throat.

Takeout containers serve a singular purpose – to allow cooked food to be ferried home from an eatery. Notwithstanding, to save washing crockery, some people reheat their takeout in the container it came with. Those who did so, unwittingly put themselves in harm's way because takeout containers are made of polystyrene, and the International Agency for Research on Cancer, has upgraded the warning for Styrene from possibly carcinogenic to probably carcinogenic for humans.

Microwaving food in a polystyrene container allows styrene to leach into the food and repeated exposure to this chemical increases the risk of cancers like leukemia, lymphoma, pancreatic, and oesophageal cancers. The safer option is to bring your food container or ensure that the disposables provided are made from polypropylene.

Filling up the tank is a regular activity for most car owners. However, it is crucial to note not to add more gasoline after the nozzle clicked off, an action that otherwise releases gasoline vapour and its carcinogens like benzene into the surrounding air. By forced filling just a little more gasoline, the risk of kidney and nose cancers is positively elevated even though benzene levels in the air could be as low as 0.5mg/m³.

For diesel-powered car owners, it is instructional to note that diesel exhaust is more carcinogenic than second-hand cigarette smoke, is conclusively linked to lung cancer, and may increase the risk for oesophageal cancer, stomach cancer, and more.

Vanquished by Viruses

Viral infection is just one step in the process of cancer development. Due to the complex genetic changes needed for cancer to develop, establishing a link between a virus and a certain cancer is difficult due to the long delay between infection and cancer development. While infection is

necessary for certain cancers to develop, a vast majority of infected individuals do not develop cancer. Oncoviruses can therefore be described as risk factors for certain cancers. Below is a list of cancer-causing viruses and their associated cancer types.

Virus Type	Cancer Caused
Epstein-Barr Virus	Burkitt's Lymphoma, Hodgkin's Disease, Nasopharyngeal Carcinoma
Hepatitis B	Hepatocellular Carcinoma
Hepatitis C	Hepatocellular Carcinoma
Human papillomavirus 16 and 18	Anal, Oropharyngeal, Cervical, Vulvar, Penile Carcinoma
Human immunodeficiency virus	Kaposi Sarcoma, Burkitt's lymphoma, head & neck cancers, anal cancer
Human T-cell Leukemia Virus 1	Adult T-cell Leukemia
Merkel cell polyomavirus	Merkel cell Carcinoma
Kaposi's Sarcoma herpesvirus	Kaposi's Sarcoma, primary effusion Lymphoma

Viruses promote the development of cancer in many ways. When infected cells are killed by the immune system as a defence against the disease, the increased cell turnover accelerates the mutation rate. Long-term persistent infection also induces chronic inflammation and increased production of oxidising agents used by killer cells resulting in oxidative stress which has the potential to cause accumulated mutations and remodel cellular pathways. Viruses may directly corrupt host DNA that deregulates cellular processes like cell cycle, DNA repair, apoptosis, etc. A long-weakened immune system is also unlikely to suppress the growth and mobilisation of cancer cells.

Vaccination and personal behavioural modifications are ways to reduce the incidence of viral infection. Besides viruses, the bacteria *Helicobacter pylori* has been associated with the development of stomach cancer.

We have provided a list of modifiable risk factors that one may avoid to minimise one's risk of developing cancer. This list is by no means exhaustive and is constantly evolving.

Conceptually, these risk factors can be controlled or substituted at the discretion of the individual, and therefore deemed “modifiable”. Risk factor is a numbers game and the more risk factors one amasses, the greater the probability of being afflicted with the disease.

Many risk factors are associated with lifestyle. But does that mean one shall always be disposed of choices? When life is kind, risk factors imply discretionary pleasures, but under life's less favourable conditions, these can be immutable occupational hazards.

I shall never forget a medical documentary film that, in part, covered the life of a high-rise construction worker in Hong Kong. A sole breadwinner, he was diagnosed with some skin malignancy but continued to toil in hot weather despite his condition to provide for the family. Not knowing how long he could support his family, he fed himself cheap processed food to save for the future. The summer solar rays intensified as the construction stabbed deeper into the sky and he quickly succumbed to the disease under aggravated conditions. In this case, even if he knew the risk factors he was encountering, he was unable to change the situation, given his position at the low end of the food chain.

Is it then relevant to ask cancer victims how they did themselves in? As physicians, we do not judge and would never ask. We focus on the treatment regime, a more important matter on hand.

In the next instalment of this topic, we shall share more about treatment options available in contemporary medicine settings before turning to discuss how patients may benefit from TCM interventions during these orthodox treatment regimes in our final discourse.

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