Class Preparation
Before class, students will be expected to review the online lecture, study guide and referenced literature.

Readings (required)

Readings (optional)


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Colorectal Cancer
Colorectal cancer (CRC) is cancer of the colon and rectum. It is one of the leading cancers to cause mortality and 40% of those who develop colorectal cancer will die of the disease. The majority of colorectal cancers are thought to arise from malignant transformation of an adenomatous polyp, villous adenoma, or serrated polyp; however, through regular screening, precancerous polyps can be found to catch it in the earliest stages. While approximately 75% of all cases occur in those with no known predisposing factors, there are numerous risk factors that contribute to the chances of developing colorectal cancer that have been identified. The largest contributors to increasing risk relate to family history, age, body weight, physical fitness, and diet. Current statistics shows that 20% of patients have seen cases in family history, 90% of cases occur in those over the age of 50 years, those with a BMI greater than 40 have a 45% higher risk, and physical activity of at least 4 hours per week cuts risk in half.

Dietary Effects on the Risk of CRC
A direct correlation between the development of colorectal cancer and diet has also been identified.

Recent studies of the DASH diet, which emphasizes low fat animal intake and higher intakes of whole grains, fruits and vegetables, found a 20% reduction in the relative risk of CRC among more than 130,000 cohort participants.

Saturated Fat and Animal Fat
Another proposed pathway is that saturated fats modify bile acid metabolism and alter gut flora composition toward a pro-oncogenic colon microenvironment. There is strong evidence that less animal fat in the diet is associated with lower rates of colon cancer.

Fiber
Higher consumption of dietary fibers is associated with a decreased risk of CRC. It is theorized that this is due mainly to fiber’s action in reducing secondary bile acid concentration in the gut. In contrast, insoluble fiber, which is well known to increase stool bulk and reduce transit time, may result in the dilution of toxin concentrations and the duration of potential carcinogen exposure to the colonic mucosa. Beneficial forms of whole grain fiber include rye breads, whole grain breads, oatmeal, whole grain cereals, high fiber cereals, brown rice, and porridge.

Folate and B6
Folate and B6 consumers similarly decrease their risk of CRC, as folate and B6 both contribute to the methylation of DNA. The methylation of DNA has the effect of suppressing tumorigenesis and reduced cell proliferation as well as ameliorating oxidative stress and reducing angiogenesis. A few excellent sources of folate and B6 include leafy greens, beans, whole grains, and colorful vegetables.

Calcium and Vitamin D
Those with elevated calcium and vitamin D intake were also seen to have a lower risk of colorectal cancer and fewer adenomas in an array of studies. Calcium ultimately effects cell proliferation, differentiation, and apoptosis. Additionally, it binds and alter the structure of bile acids, decreasing the acid’s lytic and therefore cytotoxic capability. Sources of calcium include milk, yogurt, cheese, soybeans, broccoli, and almonds.
Refined Starches
Starches and sucrose may also play a role with the involvement of bioactive IGF-1 and insulin receptors. Studies have shown that those consuming the most refined carbohydrates (sucrose, refined starches) have two fold risk of developing colorectal cancers.

Summary of Recommendations

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<th>Table 2. Dietary Exposures and Their Impact on Colorectal Cancer Risk by Direction, Level of Evidence, and Magnitude of the Effect</th>
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<td>Dietary Exposure</td>
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<td>Red and processed meat</td>
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<td>Supplemental calcium</td>
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<td>Excessive alcohol</td>
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Prostate Cancer
Prostate cancer forms in the tissues of the prostate gland, which is located in the male reproductive system. It is heterogeneous and contains sub-populations of cells that have increased tumorigenic potential compared to surrounding cells. It is the most common non-skin malignancy in men. Eventually 1 in 6 men will be diagnosed and 1 out of those 30 will die of the disease. Most cases progress slowly and never present during the patient’s lifetime. A major factor that has been acknowledged points toward the diet of a patient, which is related to body mass. A patient is 55% more likely to die of prostate cancer if his BMI ranges from 30-35. Obesity related diseases like type 2 diabetes double the risk for developing prostate cancer. Another top model for the development of carcinoma includes chronic inflammation from sources such as bacteria, viruses, and hormonal changes. Chronic inflammation stimulates cell division, which allows for more opportunity for genetic error.

Dietary Effects on the Risk of Prostate Cancer
Mediterranean diet studies have revealed its protective effect for lycopene, selenium, vitamin E, pulses and high plasma 1,25-dihydroxyvitamin D levels. However, some Japanese studies have demonstrated a negative association with soybean products, isoflavones, and long-chain polyunsaturated fatty acids such as eicosapentaenic acid (EPA) and docohexanoic acid (DHA) from fatty fish.

Saturated and Monounsaturated Fats
Diets high in both saturated and monounsaturated animal fat have been associated with a higher risk of prostate cancer. Some reports reveal the essential omega 3 fatty Alpha Linolenic Acid (ALA) is also linked to its development due to the oxidizing effects after the application of heat. However, the benefits of omega-3 fatty acids far outweigh any potential risk. There have been a number of mechanisms for dietary fats having an effect upon the development of prostate cancer. These include fat interactions with insulin IGF-1, free radical damage and fatty acid metabolism. ALA can be found primarily in seeds, nuts, and some whole grains. While easy to incorporate into the diet, they should be consumed in moderation.
Meat
Prostate cancer development has also been correlated with meat intake. The consumption of highly processed foods of any sort, such as hot dogs, refined grains, vegetables oils, and soft drinks, should be left out of the diet as much as possible. People taking part in a general non-meat diet tended to have a lower incidence of prostate cancer across the board.

Lycopene
In the 1990's lycopene, a carotenoid antioxidant in bright red foods, was linked to reduced risk of prostate cancer. The theory behind this is that it interferes with IGF-1, IL-6, oxidation and androgen signaling. Although currently there is a lack of evidence to show lycopene’s effectiveness, it is still recommended to daily consume whole bright-colored fruits and vegetables.

Summary of Recommendations
Overall recommendations to protect against the development of prostate cancers is to eat a wide variety of fruits and vegetables every day while reducing the consumption of red and processed meats. Increasing the consumption of fatty fish also contributes to decreasing risk factors.

Pancreatic Cancer
Pancreatic cancer forms in the tissues of the pancreas. In comparison to other cancers, the incidence of pancreatic cancer is much lower; however, due to its inaccessible location, diagnosis is much more difficult. It is a disease predominantly of older individuals and a positive family history for pancreatic cancer is often seen. Risk factors include chronic pancreatitis, hereditary pancreatitis, family history of pancreatic cancer, prolonged tobacco use or smoking, a BMI over 35, and heavy alcohol use.

Dietary Effects on the Risk of Pancreatic Cancer
As numerous digestive tract tumors have a correlation of diet and disease, so has pancreatic cancer. There is data that shows that a multitude of dietary items can either increase or decrease the risk of pancreatic cancer.

Flavonoids
Quercetin is a flavonoid that exhibits strong antioxidant properties in the presence of high intracellular glutathione (GSH). It has been associated with preventing cancerous growth by interfering with transcription of growth factors and inducing apoptosis in cancerous cells. Quercetin can be found in a multitude of fruit and vegetable sources. This includes, but is not limited to kale, apples, broccoli, cauliflower, turnips, buckwheat tea, green tea, sweet potatoes, dill, and red wine.

Genistein, a flavonoid found predominantly in soybeans, fava beans, and legumes, has been correlated with inducing apoptosis in cancer cells and interfering with extracellular migration and cancerous cell growth. It enhances the effectiveness of chemotherapeutic drugs, including gemcitabine, erlotinib, and cisplatin. Besides the foods mentioned before, Genistein can also be found in prairie turnip, lupin, and coffee.
Vitamins
Vitamins play a large role in the inhibition of pancreatic carcinogenesis and metastasis. A few examples of vital vitamins include vitamin D, vitamin E, and folate. The active form of vitamin D binds to VDRs produced by pancreatic cells and induces differentiation and apoptosis and reduces invasiveness, proliferation, angiogenesis, and metastasis. In addition to sunlight (UV rays), dietary sources of vitamin D include liver, mushrooms, eggs, and fatty fish such as salmon, tuna, eel, and mackerel.

Vitamin E, which is commonly found in nuts and greens, facilitates the inactivation of kinase AKt via phosphatase PHLPp1. The stimulated cell death is associated with inhibiting cancer cell growth and enhancing the effectiveness of the chemotherapeutic drug, gemcitabine. Dietary sources of vitamin E include wheat germ oil, almonds, sunflower seeds, spinach, peanuts, broccoli, and hazelnuts.

Protein
Studies on the role of dietary proteins and pancreatic cancer have distinguished between the effects of animal-based protein and plant-based proteins. Diets with exclusively plant-based proteins were found to prevent pancreatic cancer by inhibiting cancer cell growth by down-regulating mTOR activity and decreases PSA and IGF-1 levels. Contrarily, diets high in fat and animal-based protein were correlated with a greater risk of developing pancreatic cancer due to natural regression of early lesions and interference with repair mechanisms. Plant based sources of protein include quinoa, buckwheat, hempseed, chia, soy, beans, and peanuts.

Summary of Recommendations
Diet has a large impact on the risk of developing pancreatic cancer. Making small dietary changes can have a positive lasting effect. Simply put, decrease the intake of animal fat and protein, increase plant based protein consumption, and increase intake of vegetables and fruit.