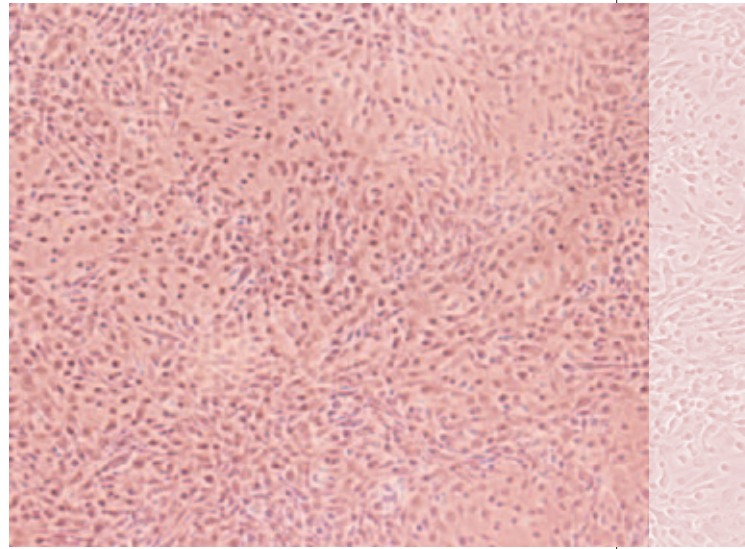


SECTION 9 OTHER CANCERS

A summary of epidemiologic studies of red meat or processed meat intake and head and neck cancers, endocrine cancers, thyroid cancer, skin cancer, brain and central nervous system cancer.

HEAD AND NECK CANCERS

Head and neck cancers include malignancies located in the nasal cavity, sinuses, lips/mouth, salivary gland, throat, and larynx. Collectively, cancers of the mouth, pharynx, and larynx are the seventh most commonly diagnosed cancers worldwide, while nasopharyngeal cancer is very rare, ranking as the 23rd most common malignancy worldwide (WCRF/AICR 2007). Malignancies from this group are more likely to be diagnosed among men than women. Tobacco, including smokeless tobacco, and alcohol intake are important risk factors for several types of head and neck cancers. The highest rates of nasopharyngeal cancer are found in Southeast Asia, and intake of Cantonese-style salted fish may increase the risk of this malignancy.

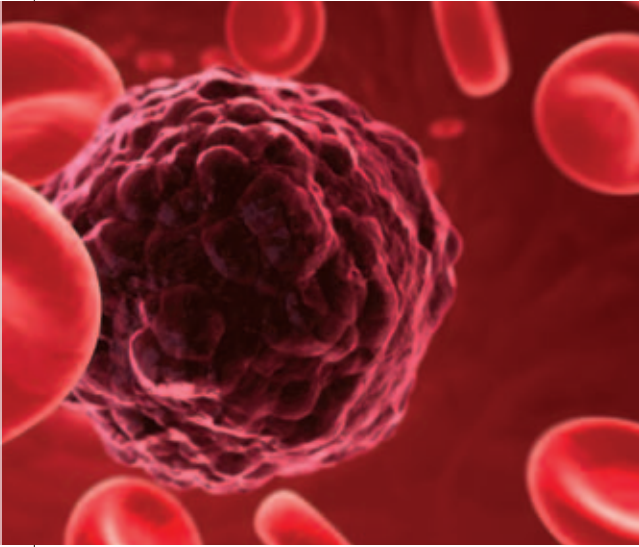


Cancer cells

Few epidemiologic studies have evaluated the potential role of meat intake on risk of this group of malignancies. Indeed, in the WCRF/AICR report on diet and cancer, no conclusions for red or processed meat intake were made because of limited data (WCRF/AICR 2007). In an analysis of the NIH-AARP cohort, non-significant associations for oral cavity/pharyngeal cancer were reported among persons in the highest intake categories for red meat (RR = 1.03) and processed meat (RR = 1.17) (Cross et al. 2007). Associations were slightly stronger in magnitude, albeit not statistically significant, between red meat (RR = 1.43) and processed meat (RR = 1.33) and laryngeal cancer (Cross et al. 2007).

Tavani et al. (2000), in a case-control study conducted in Italy, reported a non-significant 10% decreased risk of oral cavity, pharyngeal, and esophageal cancer (grouped as one outcome), and a marginally significant 30% decreased risk of laryngeal cancer among persons in the high red meat intake category. Overall, the epidemiologic data between red meat or processed meat intake and the head and neck malignancies are insufficient to evaluate an independent association.

Few epidemiologic studies have evaluated the association between meat intake and head and neck malignancies.



Cancer cell

ENDOCRINE CANCERS

Thyroid Cancer

The thyroid gland, an organ located at the base of the throat, produces hormones that assist in controlling some important physiological functions, such as heart rate, blood pressure, body temperature, and weight. Cancer of the thyroid is relatively uncommon, accounting for approximately 37,000 incident cases in the United States in 2008, with most cases diagnosed among women (Jemal et al. 2008). Ionizing radiation is the most well-established risk factor for thyroid cancer, while most causes of this malignancy remain relatively obscure (Ron and Schneider 2006). Iodine is a possible risk factor for thyroid cancer; however, more studies are needed to determine whether too much or too little iodine in the diet increases or decreases certain thyroid cancer sub-types. Indeed, several studies have evaluated fish consumption as a surrogate measure for iodine intake, although results have not been consistent.

There is little epidemiologic data pertaining to red/processed meat and thyroid cancer. In a cohort analysis of more than 275 thyroid cancer cases, non-significant decreased risks of 21%, 21%, and 8% were observed in the third, fourth, and fifth red meat intake quintiles (Cross et al. 2007). Similar associations were observed for processed meat consumption; decreased risks ranging between 7% and 29% were reported in the non-referent quintiles of intake. In a case-control study conducted in Italy, a marginally significant increased risk of thyroid cancer was reported among high consumers of red meat (OR = 1.5, 95% CI: 1.0-2.1) (Tavani et al. 2000).

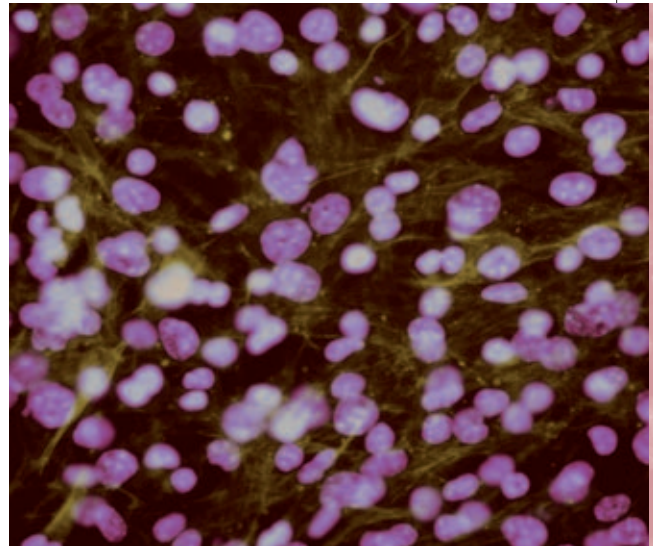
The available epidemiologic evidence between red meat or processed meat intake and thyroid cancer is limited. On the basis of the inverse associations from the large prospective cohort study, red or processed meat consumption does not appear to increase the risk of thyroid cancer.

SKIN CANCER

The skin is the largest organ in the human body, and is a fundamental component of the defense mechanisms to keep infections and microorganisms from entering internal organ systems. The skin also serves to regulate body temperature, retain water, excrete wastes, and synthesize vitamin D from the sun. The three primary types of skin cancer are melanoma, basal cell carcinoma, and squamous cell carcinoma. From a clinical and epidemiologic perspective, basal cell and squamous cell carcinomas are considered to be 'non-melanoma' skin cancers. They are the most common types of skin cancer, with more than one million cases diagnosed annually in the United States (Miller and Weistock 1994). However, since non-melanoma skin cancers are generally slow-growing cancers that can be easily located on the epidermis layer, they are usually very treatable. On the contrary, melanoma is diagnosed less frequently and has a considerably higher case-fatality rate. For the year 2008, it was estimated that more than 62,000 people in the United States would be diagnosed with melanoma skin cancer and that more than 8,000 people would die from the disease (Jemal et al. 2008).

The strongest and most established risk factor for skin cancer is direct exposure to ultraviolet (UV) radiation from the sun. Risk for skin cancer increases with age, and persons with a family history of skin cancer, particularly melanoma, have an increased risk of developing this malignancy.

No dietary factors have been consistently associated with skin cancer, and few epidemiologic studies have investigated the relationship between red or processed meat intake and skin cancer. In a cohort study of approximately 500,000 people aged 50-71 years, Cross et al. (2007) evaluated the association between red meat and processed meat and melanoma among more than 1,500 cases. Reduced risks of melanoma were observed in all red meat and processed meat intake categories. In fact, a statistically significant 18% decreased risk was reported among the persons in the highest processed meat intake category (RR = 0.82, 95% CI: 0.71-0.96) and a statistically significant 19% decreased risk was reported among persons in the lowest processed meat category (RR = 0.81, 95% CI: 0.70-0.94.).



Cells of skin

Liver intake and ham intake was associated with non-significant decreased risks of melanoma in a case-control study conducted in Italy (Naldi et al. 2004). The influence of processed meat on basal cell carcinoma risk was evaluated in the EPIC-Norfolk nested case-control study, but no significant effect was observed (RR = 1.06, 95% CI: 0.84-1.13) (Davies et al. 2002). A non-significant 7% decreased risk was observed among persons who consumed meat/meat dishes; however, the authors did not describe the specific type of meat that was included in that exposure category (Davies et al. 2002). A positive association between a dietary pattern high in meat and fat was significantly associated with the development of squamous cell carcinoma, compared to a dietary pattern high in vegetables and fruit (RR = 1.83, 95% CI: 1.00-3.37), and the association was stronger for persons with a history of skin cancer (RR = 3.77, 95% CI: 1.65-8.63) (Ibibebe et al. 2007). However, this study did not specifically evaluate red or processed meat as an intake category, and the meat and fat dietary pattern group also included butter, eggs, and alcohol among other items.

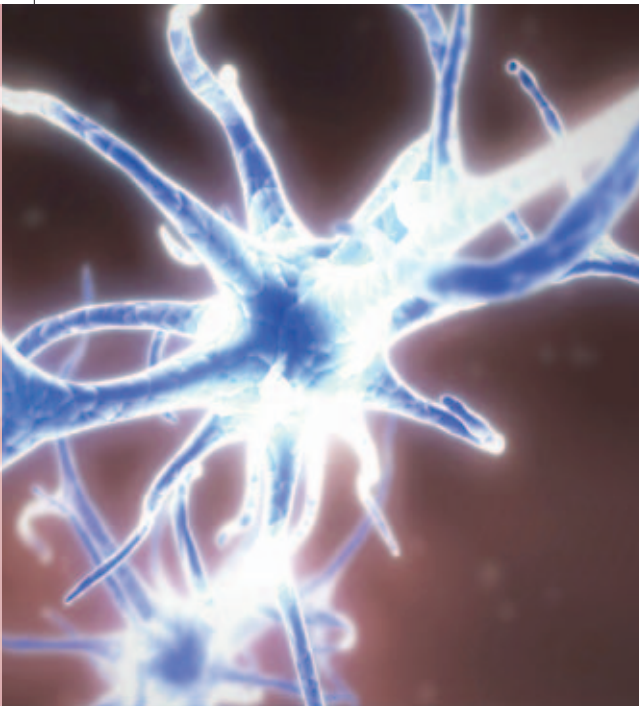
The epidemiologic research on red meat or processed meat intake and skin cancer is limited, although no positive association is indicated based on the available data.

BRAIN AND CENTRAL NERVOUS SYSTEM CANCERS

The human brain is the foundation of the central nervous system and it is responsible for controlling the physical, biological, and emotional functions of the body and mind. Malignancies of the nervous system are rare and account for only 2% of all cancers. Although it is largely known that diet is associated with mental function, very few epidemiologic studies have evaluated the influence of diet on the etiology of malignancies in

the nervous system (Society for Neuroscience). In fact, in the WCRF/AICR report, it was stated that the narrative review did not produce any findings and that it is unlikely that any further investigation is warranted (WCRF/AICR 2007).

Recently, one cohort study and one case-control study were published that evaluated the relationship between meat consumption and brain cancer. In an analysis of the National Institutes of Health and the American Association for Retired Persons (NIH-AARP) cohort, non-significant inverse associations between consumption of red and processed meat were reported (Cross et al. 2007). No significant elevations in risk were found in a case-control study conducted in eight Canadian provinces (Hu et al. 2008). Although limited by few studies, the available epidemiologic evidence does not support a causal association between red or processed meat intake and brain cancer.



Neuron cells