Although the mechanisms of action for all cancer types are not fully known, best practice recommends promoting a healthy lifestyle while avoiding certain substances. Based on environmental science, the precautionary principle is a guideline that suggests that preventive action should be taken when the effects of a substance are unknown or disputed. Oncology nurses and maternal child healthcare professionals can improve cancer prevention through efforts during pregnancy, childhood, adolescence, and adulthood. This article reviews the application of the precautionary principle during critical periods of growth and development and provides recommendations that may prevent epigenetic changes and reduce the risk for cancer.

AT A GLANCE

- The precautionary principle can be applied in practice to reduce individuals' risk for developing cancer throughout their lifetime.
- Continuing education on epigenetics, as well as providing recommendations for health and lifestyle changes during growth and development, can help to prevent cancer.
- Education on assessments for genetic, nutritional, and environmental risk factors can improve oncology nurses' ability to advocate for patients.

KEYWORDS
precautionary principle; prevention; epigenetics; genes; environment; carcinogens

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Precautionary Principle

Cancer prevention efforts during critical periods of growth and development

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According to Mariotto, Yabroff, Shao, Feuer, and Brown (2011), the total cost of cancer treatments in the United States will increase by 2% each year, from $125 billion in 2010 to $174 billion in 2020. The cost of cancer care can be decreased significantly through lifestyle changes that promote prevention. Preventing disease also ensures that individuals and families can avoid the potential suffering, long-term complications, and financial burdens associated with a cancer diagnosis (Johnson, 2016). Improving cancer prevention during pregnancy and childhood is particularly advantageous because incidence in infant and adolescent cancer continues to rise (National Cancer Institute, 2015). Oncology nurses are in the best position to assist families during critical periods of growth and development to maximize health promoting behaviors while also reducing risk factors for long-term health.

Background

The precautionary principle emphasizes cancer prevention during critical periods of growth and development and addresses the role that the environment, nutrition, epigenetics, and genetic risk factors play in individual and generational health (Holman & Buchanan, 2016; Nilsson et al., 2012; Skinner et al., 2013; Skinner, Manikkam, & Guerrero-Bosagna, 2011; Tiffon, 2018). In addition, the precautionary principle posits that implementing preventive measures is recommended when there is a high risk to human health, even despite a lack of definitive evidence (Cohen & Jefferies, 2019).

Genetic Mutations

Implementing the precautionary principle requires an understanding of how tumors can develop from their own microenvironment of multiple signaling pathways, between cancerous cells and the environment, or within existing tumors that grow and mutate (Grivennikov, Greten, & Karin, 2010; Kumar, Abbas, & Aster, 2015). Genetic mutations can affect the four regulatory genes in the body: tumor suppressor genes, DNA repair genes, proto-oncogenes, and apoptosis genes (Hanahan & Weinberg, 2011; Kumar et al., 2015; Weeden & Asselin-Labat, 2018). These initial mutations, often referred to as driver mutations, and epigenetic modifications can contribute to the transformation of a malignant cell locally or can cause cells to metastasize over time and become pathologically diverse (Weeden & Asselin-Labat, 2018).

Genetic mutations can also occur through the inheritance of defective genes, such as germline mutations, or through a multifactorial transformation of genes (i.e., somatic genetics that occur during one's lifetime) that are then passed onto future daughter cells and mutate into a malignant stem cell (Kanchi et al., 2014; Kumar et al., 2015; Weeden & Asselin-Labat, 2018). An example of transgenerational inheritance is the discovery of genetic mutations in blood samples of