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## Pediatric Cancers: Development and Treatment Methods

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## Pediatric Cancers: Development and Treatment Methods

## Abstract

Pediatric cancers are cancers that develop in kids and adolescents ages 0-19. Pediatric cancers usually develop in three ways: through inherited gene mutations, parental exposure to toxins, and acquired gene mutations. While cancer can affect children and adults alike, treatment becomes more difficult for children due to their physical predevelopment stages. Therefore, it is important to discuss all methods of treatment when dealing with a particular pediatric cancer in order to choose the most effective method.

## Keywords

Pediatric Cancer, Cancer, Cancer Treatment

## Disciplines

Diseases | Life Sciences | Medicine and Health Sciences

## Comments

Written for FYS 155-2: Cancer in Society: A War Against Immortality and presented at the 2019 Celebration of Academic First-Year Engagement Symposium.



# **Overview**

- Cancer is known to be a disease that requires multiple mutations to develop over a long period of time
- However, this mechanism of cancer does not hold true when discussing pediatric cancers
- Due to this phenomenon, researchers have discovered the primary factors that lead to the develop of cancer in children, as well as successful treatment methods suitable for young patients

# Background

- Pediatric cancers are generally characterized as cancers that are present in children ages 0-15, but this characterization can also hold true for adolescents ages 15-19
- Pediatric cancers are very rare, but when they do arise in children, the disease impacts them more than it would in adults, due to the beginning stages of physical development
- Similar to adults, cancer can arise in children in a myriad amount of ways, but there are three focal causes that are the most prevalent

# **Pediatric Cancer Development**

# **Inherited Gene Mutations**

- Affected parent transfers germ cell mutation, which becomes present in the child's genome
- Not all mutations cause cancer, but the child is definitely at risk

# Parental Exposure to Toxins

- Higher instance of parental exposure to toxins leads to higher risk of mutation development in child
- Example: Mother that smokes may weaken child's lungs

# **Acquired Gene Mutations**

- Proto-oncogenes can mutate into oncogenes
- Top three most common gene mutations: ETV6-RUNX1, Hyperdiploid, and MLL rearrangements

# **Pediatric Cancers: Development and Treatment Methods**

# MaKayla Walker

# First Year Seminar: Cancer in Society, Gettysburg College, Gettysburg, PA



# Leukemias

- Most are acute lymphocytic or acute myeloid leukemias
- Chronic leukemias are very rare in children
- Arises due to the acquired mutations of the ETV6-RUNX1 gene
- The ETV6-RUNX1 gene is a transcription factor, which means it binds to particular DNA sequences and prompts for DNA synthesis to occur
- A mutation in the ETV6-RUNX1 gene leads to uncontrolled synthesis of DNA, which leads to the over-proliferation of mutated cells in the bone marrow

# **Central Nervous System** Cancers

- Develops when cells in the brain or spinal cord overproliferate
- Affects patients' thought process and movement
- Challenging to treat because tissues surrounding affected area are crucial to the body's functioning
- Some inherited diseases, such as Turcot Syndrome and Nevoid Basal Cell Carcinoma Syndrome, increase child's risk of developing central nervous system cancers

# **Treatment Methods** Surgery

- Helps to identify type of cancer and how far it has spread
- If the cancer has not spread, affected tissue can be removed
- Can help to relieve discomfort and other symptoms caused by cancer
- Can help to prevent cancer from reoccurring

## Chemotherapy

- Kills cancer cells that have metastasized to different parts of the body
- Goals are to ease symptoms, control metastasis, and ultimately cure the cancer

# **Radiation Therapy**

- Radiation makes small breaks in DNA within cells, which triggers cancer cell apoptosis
- Radiation uses high energy particles to kill or damage cancer cells
- Goals of radiation therapy are to shrink or cure early stage cancer, treat symptoms, and treat cancer that has returned

# **Issues/Limitations**

- Chemotherapy and/or radiation therapy can cause learning issues
- Chemotherapy and/or radiation therapy targeted at the head or neck can cause mouth sores, sensitive gums, tooth decay, and other physical effects
- Therapy may harm the body's production of red blood cells, which can cause patients to become anemic



- effective
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# Summary

• Like cancers in adults, pediatric cancers can develop in children similarly, in which proto-oncogenes mutate and transform into oncogenes

Pediatric cancers are rare, but when they do occur, a particular method of treatment must be selected in order to prevent metastasis as well as reoccurrence

Extra precautions must be taken when treating children with cancer, for it is important not to harm certain areas of the body that are vital to a child's physical development

# Conclusions

• It is important to keep track of family history of cancer and other related diseases, for inherited gene mutations can be passed on and can affect children of later generations

Keeping children in a clean and safe environment will limit increased exposure to particular toxins, which can also decrease their risk of developing cancer

Chemotherapy and radiation therapy are the most invasive forms of treatment, but they are also the most

# **Works Cited**

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## Acknowledgments