



# Colon Cancer – A Review

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COLORECTAL CANCER (CRC) is the United States' third most leading cause of death. Colorectal (colon) cancer are abnormal growths that turn into cancer in the colon or rectum ("What is Colorectal Cancer?"). There are a few different treatments for colon cancer including chemotherapy and precision medicine. While chemotherapy is a very effective

form of treatment, precision medicine has a different approach.

Precision medicine is a different way of helping a patient overcome a type of cancer with treatments specific to their genetic mutations or cells. It slows down the growth of cancerous cells. One type of precision medicine that is changing the medical

industry is biomarker testing. Biomarker testing analyzes the genetics behind the tumor and it gives the patient an idea of what types of treatments will work best ("The Future of Colorectal Cancer Care Is Precision Medicine").

Specifically in CRC, most precision medicines target the epidermal growth factor receptor

(EGFR) pathway which is the area of the colon where the cancer spreads most rapidly. Two other areas of cancer mutations are in the RAS and BRAF genes. Another notable type of precision medicine for CRC is the use of immune checkpoint inhibitor therapy.

An article from *BMC Cancer* included a specific study where the doctors created a precision medicine treatment for stage 4 colon cancer (metastatic CRC). The treatment involved a series of cell lines and PDXs (patient-derived xenografts). Cell lines are cultures of cells that are created from one cell therefore consisting of cells with the same genetic makeup. PDX is the model of the patient's tumor that is implanted into a mouse that is either immunodeficient or humanized. The doctors started off by using the cell lines to perform drug screens to identify the potential targets and the matching PDXs were used to corroborate them. After these findings, the doctors analyzed the response the patient's cells had to the standard care agents and the targeted therapies. For the different PDXs, *ponatinib* and *trametinib* were found to be the most effective among the targeted therapies. The results from this study prove to doctors that precision medicine is the best way to treat any stage of colorectal cancer (Altunel and Roghani).

*“Despite the fact that colorectal cancer is rare among adolescents and young adults, pediatric colorectal tumors are on the rise.”*

The immune checkpoint inhibitor therapy, also called immunotherapy, is used for those with advanced colon cancer. The checkpoints are proteins that need to be turned on or off in order to start the immune response (“Immunotherapy for Colorectal Cancer”). The checkpoint inhibitors are used for those patients that test positive for certain gene mutations. Some of these drugs help to treat patients whose cancers cannot be removed by surgery. Two drugs, *Pembrolizumab* (*Keytruda*) and *Ipilimumab* (*Yervoy*), help improve the immune system response. But these drugs can also have side effects that can be dangerous to the patient's overall treatment. Those include infusion reactions and autoimmune reactions. Infusion reactions are similar to allergic reactions that cause fevers, rashes, itchiness, wheezing and trouble breathing. Autoimmune reactions, however, are more detrimental to the body's major organs – lungs, liver, intestines, skin, kidney etc (“Immunotherapy for Colorectal Cancer”).

Another type of precision medicine is genomic testing. Genomic testing tests for specific genetic

mutations or the proteins that are produced and the results help to directly attack the colon cancer cells. Because precision medicine, as a whole, is still developing, genomic testing will only be an option if the oncologist recommends it. The process of genomic testing consists of a biopsy that will isolate and extract the cancer cells. Then, those cancer cells will be scanned for any abnormalities that tell the doctor how the tumor functions. Lastly, those newfound abnormalities will be analyzed in order to determine if there is a treatment for it (“Advanced Genomic Testing: How It Works and Benefits”).

Although there are benefits, there are also drawbacks with using precision medicine. Since precision medicine is fairly new in the medicine field, access to certain research is limited to only the doctors and scientists working on it. Precision medicine treatments are only happening on a trial basis at bigger cancer treatment centers.

Additionally, precision medicine has been known to be biased and excluding women in their studies (“The Downside of Precision Medicine”). Precision medicine doctors assume those who seek this kind of treatment are “uncommonly tech savvy, highly health literate, self-directed, information seeking, English fluent, health focused, and well insured; according to bioethicist Mark Rothstein” (“The Downside of Precision Medicine”). But that usually is not the case as those who want personalized treatments are on the opposite side of the health spectrum.

Despite the fact that colorectal cancer is rare among adolescents and young adults, pediatric colorectal tumors are on the rise. Screening programs benefit older adults, in contrast to this trend. Incidence of distal colon and rectal tumors is rising most rapidly; rectal tumors are most prevalent among children and young adults.

A number of genetic syndromes are associated with colorectal cancer in young patients, but most cases occur sporadic in adolescents and young adults. Several factors make clear the biological dissimilarity, such as the preponderance of high-grade and mucinous tumors, but the oncogenesis is still not fully understood. This calls for more “precision medicine”-based innovations to understand the biological differences in the prevalence of this disease among children and teens.

The following is a tribute to “Jayden Oakes”, who died in July 2021 at the age of 13 after a courageous battle with colon cancer. Walking with a smile and always being adventurous, he was always an adventurous spirit. It is for this reason that I continue to raise awareness of this awful disease: to educate, support, and help those affected, including patients and caregivers. There is a serious

rise in the rate of colon cancer. It now affects and takes away our youth: early teens, teenagers, and adults in their 30s and 40s... This is not just an old age disease!

The purpose of this article is to emphasize the cutting-edge research being done by experts in medicine and healthcare concerning “colon cancer,” and to demonstrate my commitment to helping fight the epidemic of disorders affecting young adults. [IoPM](#)

#### Acknowledgement

A heartfelt thank you to my mentor, Dr. Kamala Maddali, who embodies empathy in her work and emphasizes that change is what we all seek.

#### References

- “What Is Colorectal Cancer?” Centers for Disease Control and Prevention, [www.cdc.gov/cancer/colorectal/basic\\_info/what-is-colorectal-cancer.htm](http://www.cdc.gov/cancer/colorectal/basic_info/what-is-colorectal-cancer.htm). Accessed 24 June 2021.
- “The Future of Colorectal Cancer Care Is Precision Medicine.” CISION PR Newswire, [www.prnewswire.com/news-releases/the-future-of-colorectal-cancer-care-is-precision-medicine-301083924.html](http://www.prnewswire.com/news-releases/the-future-of-colorectal-cancer-care-is-precision-medicine-301083924.html). Accessed 24 June 2021.
- “Precision or Personalized Medicine.” American Cancer Society, [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/precision-medicine.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/precision-medicine.html). Accessed 9 Aug. 2021.
- “The Downside of Precision Medicine.” *Genome Web*, 1 Mar. 2018, [www.genomeweb.com/scan/downside-precision-medicine#\\_YTN9oijYrrc](http://www.genomeweb.com/scan/downside-precision-medicine#_YTN9oijYrrc). Accessed 9 Aug. 2021.
- “Advanced Genomic Testing: How It Works and Benefits.” Cancer Treatment Centers of America, [www.cancercenter.com/treatment-options/precision-medicine/advanced-genomic-testing](http://www.cancercenter.com/treatment-options/precision-medicine/advanced-genomic-testing). Accessed 9 Aug. 2021.
- “Immunotherapy for Colorectal Cancer.” American Cancer Society, [www.cancer.org/cancer/colon-rectal-cancer/treating/immunotherapy.html](http://www.cancer.org/cancer/colon-rectal-cancer/treating/immunotherapy.html). Accessed 9 Aug. 2021.
- Altunel, Erdem, and Roham S. Roghani. “Development of a Precision Medicine Pipeline to Identify Personalized Treatments for Colorectal Cancer.” *BMC Cancer*, 24 June 2020, [bmcancer.biomedcentral.com/articles/10.1186/s12885-020-07090-y#citeas](https://doi.org/10.1186/s12885-020-07090-y#citeas). Accessed 9 Aug. 2021.