Lynch syndrome

Lynch syndrome, often called hereditary nonpolyposis colorectal cancer (HNPCC), is an inherited disorder that increases the risk of many types of cancer, particularly cancers of the colon (large intestine) and rectum, which are collectively referred to as colorectal cancer. People with Lynch syndrome also have an increased risk of cancers of the stomach, small intestine, liver, gallbladder ducts, upper urinary tract, brain, and skin. Additionally, women with this disorder have a high risk of cancer of the ovaries and lining of the uterus (the endometrium). People with Lynch syndrome may occasionally have noncancerous (benign) growths (polyps) in the colon, called colon polyps. In individuals with this disorder, colon polyps occur earlier but not in greater numbers than they do in the general population.

Frequency

In the United States, about 140,000 new cases of colorectal cancer are diagnosed each year. Approximately 3 to 5 percent of these cancers are caused by Lynch syndrome.

Causes

Variations in the \textit{MLH1}, \textit{MSH2}, \textit{MSH6}, \textit{PMS2}, or \textit{EPCAM} gene increase the risk of developing Lynch syndrome.

The \textit{MLH1}, \textit{MSH2}, \textit{MSH6}, and \textit{PMS2} genes are involved in the repair of errors that occur when DNA is copied in preparation for cell division (a process called DNA replication). Mutations in any of these genes prevent the proper repair of DNA replication errors. As the abnormal cells continue to divide, the accumulated errors can lead to uncontrolled cell growth and possibly cancer.

Mutations in the \textit{EPCAM} gene also lead to impaired DNA repair, although the gene is not itself involved in this process. The \textit{EPCAM} gene lies next to the \textit{MSH2} gene on chromosome 2; certain \textit{EPCAM} gene mutations cause the \textit{MSH2} gene to be turned off (inactivated), interrupting DNA repair and leading to accumulated DNA errors.

Although mutations in these genes predispose individuals to cancer, not all people who carry these mutations develop cancerous tumors.

Inheritance Pattern

Lynch syndrome cancer risk is inherited in an autosomal dominant pattern, which means one inherited copy of the altered gene in each cell is sufficient to increase cancer risk. It is important to note that people inherit an increased risk of cancer, not the disease itself. Not all people who inherit mutations in these genes will develop cancer.
Other Names for This Condition

- cancer family syndrome
- familial nonpolyposis colon cancer
- hereditary nonpolyposis colorectal cancer
- hereditary nonpolyposis colorectal neoplasms
- HNPCC

Diagnosis & Management

Genetic Testing Information

- What is genetic testing?
  https://primer/testing/genetictesting

- Genetic Testing Registry: Hereditary nonpolyposis colorectal cancer type 3

- Genetic Testing Registry: Hereditary nonpolyposis colorectal cancer type 4

- Genetic Testing Registry: Hereditary nonpolyposis colorectal cancer type 5

- Genetic Testing Registry: Hereditary nonpolyposis colorectal cancer type 8

- Genetic Testing Registry: Lynch syndrome

- Genetic Testing Registry: Lynch syndrome I

- Genetic Testing Registry: Lynch syndrome II

Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22hereditary+nonpolyposis+colorectal+cancer%22+OR+%22colorectal+neoplasms%2C+hereditary+nonpolyposis%22

Other Diagnosis and Management Resources

- GeneReview: Lynch Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1211

- Genomics Education Programme (UK)
  https://www.genomicseducation.hee.nhs.uk/resources/genetic-conditions-factsheets/item/81-lynch-syndrome/
• MedlinePlus Encyclopedia: Colon Cancer
  https://medlineplus.gov/ency/article/000262.htm

• National Cancer Institute: Genetic Testing for Hereditary Cancer Syndromes

**Additional Information & Resources**

**Health Information from MedlinePlus**

• Encyclopedia: Colon Cancer
  https://medlineplus.gov/ency/article/000262.htm

• Health Topic: Cancer--Living with Cancer
  https://medlineplus.gov/cancerlivingwithcancer.html

• Health Topic: Colorectal Cancer
  https://medlineplus.gov/colorectalcancer.html

**Genetic and Rare Diseases Information Center**

• Lynch syndrome

**Additional NIH Resources**

• National Cancer Institute: Colorectal Cancer
  https://www.cancer.gov/types/colorectal

• National Cancer Institute: Genetics of Colorectal Cancer
  https://www.cancer.gov/types/colorectal/hp/colorectal-genetics-pdq

• National Human Genome Research Institute: Learning About Colon Cancer
  https://www.genome.gov/10000466/

**Educational Resources**

• American Cancer Society: Colon and Rectum Cancer

• CDC: Colorectal (Colon) Cancer
  https://www.cdc.gov/cancer/colorectal/

• Dr. Terrilea Burnett, University of Hawaii Cancer Center: Lynch Syndrome: An Explanation for Families
  https://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/30728/Lynchreviewwartyarticleforfamiliesrev.pdf

• Genetic Science Learning Center, University of Utah
  https://learn.genetics.utah.edu/content/disorders/multifactorial/
• MalaCards: lynch syndrome  
http://www.malacards.org/card/lynch_syndrome

• Orphanet: Lynch syndrome  
https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=144

• Stanford Cancer Center  
https://stanfordhealthcare.org/medical-conditions/cancer/lynch-syndrome.html

• Your Genome from Wellcome Genome Campus: What is Hereditary Non-Polyposis Colorectal Cancer?  
https://www.yourgenome.org/facts/what-is-hereditary-non-polyposis-colorectal-cancer

Patient Support and Advocacy Resources

• Colon Cancer Alliance  
https://www.ccalliance.org/

• Colon Cancer Alliance for Research and Education for Lynch Syndrome  
http://fightlynch.org/

• Colorectal Cancer Coalition  
https://fightcolorectalcancer.org

• Lynch Syndrome International  
https://lynchcancers.com/

Clinical Information from GeneReviews

• Lynch Syndrome  
https://www.ncbi.nlm.nih.gov/books/NBK1211

Scientific Articles on PubMed

• PubMed  
https://www.ncbi.nlm.nih.gov/pubmed?term=%28lynch+syndrome%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+360+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

• COLORECTAL CANCER  
http://omim.org/entry/114500

• LYNCH SYNDROME I  
http://omim.org/entry/120435
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/14585257

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16341812

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12667026

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15872200

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20301390

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21309036

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17312306

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/19098912

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/14518071

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15938070
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12621137

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/23572416
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4235668/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16136382

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/22892529
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3533316/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15660526

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/14970275
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2933058/

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