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.

Genetic Changes

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

- 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

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
General Information from MedlinePlus

- Diagnostic Tests
  https://medlineplus.gov/diagnostictests.html

- Drug Therapy
  https://medlineplus.gov/drugtherapy.html

- Genetic Counseling
  https://medlineplus.gov/geneticcounseling.html

- Palliative Care
  https://medlineplus.gov/palliativecare.html

- Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html

Additional Information & Resources

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/Lynchreviewarticleforfamiliesrev.pdf
• Genetic Science Learning Center, University of Utah
http://learn.genetics.utah.edu/content/disorders/multifactorial/
• MalaCards: lynch syndrome
http://www.malacards.org/card/lynch_syndrome
• My46 Trait Profile
https://www.my46.org/trait-document?trait=Lynch%20syndrome&type=profile
• Orphanet: Lynch syndrome
http://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

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/

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

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

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+AND+5Bdp%5D
OMIM

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

• LYNCH SYNDROME I
  http://omim.org/entry/120435

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