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# Familial Adenomatous Polyposis

[FAP, Adenomatous Polyposis Coli (APC). Includes: Attenuated Adenomatous Polyposis Coli (AAPC), Gardner Syndrome, Turcot Syndrome]

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## Summary

**Clinical characteristics.** FAP is a colon cancer predisposition syndrome in which hundreds to thousands of precancerous colonic polyps develop, beginning at a mean age of 16 years. Extracolonic manifestations are variably present.

**Diagnosis.** The diagnosis of FAP relies upon clinical findings. Genetic testing is available through the methods of linkage analysis and protein truncation testing of the APC gene (chromosomal locus 5q21-q22). The main role of DNA-based testing is in early diagnosis of at-risk children and adults for management reasons.

**Genetic counseling.** FAP is an autosomal dominant disorder. The offspring of an affected individual have a 50% risk of inheriting the altered APC gene. Prenatal testing is available.

## Diagnosis

The diagnosis of FAP usually relies upon clinical findings. Protein truncation testing of the APC gene (chromosomal locus 5q21-q22) is occasionally used in the diagnosis of atypical cases, but is primarily used for genetic counseling and presymptomatic testing of at-risk family members.

### Clinical Diagnosis

FAP is diagnosed clinically in an individual with the following:

- Greater than 100 colorectal adenomatous polyps OR
- Fewer than 100 adenomatous polyps and a relative with FAP

**Attenuated adenomatous polyposis coli (AAPC)** is considered in an individual who has colonic polyps and who belongs to a family in which colon cancer develops at an average age of 50 years in individuals with an average of 30 adenomatous polyps.

Variable features that may be helpful in establishing the clinical diagnosis of FAP or AAPC include: gastric fundic gland polyps, duodenal adenomatous polyps, osteomas, dental abnormalities, congenital hypertrophy of the retinal pigment epithelium (CHRPE), soft tissue tumors, and desmoid tumors.

In atypical or questionable cases, DNA-based testing may be helpful in establishing the diagnosis of FAP or AAPC.

### Molecular Genetic Testing

Two types of DNA-based tests are available clinically: protein truncation testing (PTT) and linkage analysis (see [Genetic Counseling](#)). The APC gene is large and is not conducive to DNA mutation analysis; however, most mutations in the APC gene cause premature truncation of the APC protein. A test based on this finding [[Powell 1993](#)] detects approximately 80% of truncated APC proteins; thus, this test is positive in about 80% of individuals with FAP.

**Table 1. Testing Used in the Molecular Diagnosis of FAP**

% of Patients	Genetic Mechanism	Test Type	Test Availability
~80%	Premature truncation of APC protein	Protein truncation testing	Clinical <b>GENETests</b>

For [genetic counseling](#), linkage testing can be considered in families with more than one affected family member.

## Clinical Description

In FAP, colorectal adenomatous polyps begin to appear at an average age of 16 years (range 7-36 years) [[Petersen 1991](#)]. They rapidly increase in number; typically hundreds to thousands of colonic adenomatous polyps are observed. Colon cancer is inevitable without colectomy. The average age of the diagnosis of colon cancer is 39 years. Seven percent of untreated patients with FAP will develop colon cancer by age 21 years, 87% by 45 years, and 93% by 50 years [[Bussey 1975](#)]. Penetrance of FAP in individuals with an APC disease-causing mutation is >90%. Although rare, asymptomatic individuals in their 50s have been reported [[Evans 1993](#)].

Other features of FAP that are variably present include: gastric fundic gland polyps, duodenal adenomatous polyps, osteomas, dental abnormalities (such as unerupted teeth, congenital absence of one or more teeth, supernumerary teeth, dentigerous cysts, and odontomas), congenital hypertrophy of the retinal pigment epithelium (CHRPE), soft tissue tumors (especially epidermoid cysts and fibromas), and desmoid tumors.

Gastric fundic gland polyps are hamartomatous lesions with little malignancy potential. Gastric adenomatous polyps also occur and are usually confined to the gastric antrum. Adenomatous polyps of the duodenal papilla are observed in at least 50% of patients. Duodenal polyps have a 4-12% lifetime risk of malignancy. Jejeunal and ileal adenomatous polyps are frequently observed in patients with FAP, but they rarely become malignant.

Extraintestinal growths, including osteomas and soft tissue tumors, occur in FAP, but are not specific to FAP.

Other cancers that occur with a higher incidence in individuals with FAP than in the general population include hepatoblastoma and cancer of the thyroid,

pancreas, adrenal glands, gallbladder, and CNS, especially medulloblastoma.

Approximately 10% of persons with FAP develop desmoid tumors [Gurbuz 1994, Clark 1996]. The risk of desmoid tumors in FAP is 852 times the risk in the general population [Gurbuz 1994]. Desmoid tumors are benign fibrous tissue tumors that are locally invasive but do not metastasize. They form predominantly within the abdomen or in the abdominal wall, but may also occur extra-abdominally. Desmoid tumors are best evaluated by CT scan [Clark 1996]. Abdominal desmoid tumors may occur spontaneously, but their development may be stimulated by abdominal surgery. Desmoid tumors may compress abdominal organs or complicate surgery. About 5% of patients with FAP experience morbidity and/or mortality from desmoid tumors.

Three phenotypes that previously were thought to be discrete clinical entities distinct from FAP are now recognized to be part of the spectrum of FAP. These are attenuated adenomatous polyposis coli (AAPC), which appears to be the same as the hereditary flat adenoma syndrome [Lynch 1992], Gardner syndrome, and Turcot syndrome.

**Attenuated adenomatous polyposis (AAPC)** is characterized by the presence of fewer colonic polyps (average of 30) than seen in classic FAP and a significant risk for colon cancer. Polyps tend to be found more proximally in the colon than in classic FAP. The average age of colon cancer diagnosis in individuals with AAPC is 50 to 55 years, which is 10-15 years later than that observed in FAP but younger than that of individuals in the general population with sporadic colon cancer [Spirio 1993, Giardiello 1997]. Upper gastrointestinal polyps and cancers may be seen in individuals with AAPC and, although the extra-intestinal manifestations of FAP may be present in individuals with AAPC, CHRPE lesions and desmoid tumors are rare.

**Gardner syndrome (GS)** is the association of colonic adenomatous polyposis, osteomas, and soft tissue tumors. Although GS was once thought to be a distinct clinical entity, it is now known that mutations in the *APC* gene give rise to both typical FAP and GS. Mutations in certain locations of the *APC* gene appear to favor the occurrence of extraintestinal manifestations that tend to run true in families.

**Turcot syndrome** is the association of FAP and CNS tumors, usually medulloblastoma. Two-thirds of persons with Turcot syndrome have a mutation in the *APC* gene, and one-third have mutations in one of the mismatch repair genes that cause hereditary non-polyposis colon cancer (HNPCC) [Hamilton 1995, Paraf 1997]. The CNS tumors in patients with HNPCC are usually glioblastoma multiforme.

## Genotype-Phenotype Correlations

Variation occurs between and within individuals and between and within families with identical mutations in the *APC* gene [Giardiello 1994]. Attempts have been made to identify genotype-phenotype correlations. The attenuated form of FAP (AAPC) is associated with mutations in the 5' part of the gene [Spirio 1993], exon 9 [van der Luijt 1995, Soravia 1998], and the distal 3' end of the gene [Friedl 1996, Van der Luijt 1996, Walon 1997]. Profuse polyposis (< 5000 polyps) has been reported with mutations in codons 1250-1464 [Nagase 1992]. The presence of CHRPE is associated with mutations between codons 463-1387 [Olschwang 1993]. Mutations between codons 1444-1578 lack CHRPE expression but appear to be associated with a higher incidence of desmoid tumors [Caspari 1995, Davies 1995].

Much effort has gone into making genotype-phenotype correlations and some have suggested basing management of FAP on these associations [Vasen 1996]. While not utilized routinely now, these correlations may become more integral in management decisions in the future.

## Prevalence

The prevalence of FAP reported from national registries is 2.29-3.2 per 100,000 people [Burn 1991, Järvinen 1992, Bülow 1996]. FAP historically accounted for about 0.5% of all colorectal cancers, although this figure is declining as more at-risk family members undergo successful treatment following early polyp detection and prophylactic colectomy.

## Differential Diagnosis

FAP may be distinguished from other inherited colon cancer conditions and other gastrointestinal polyposis syndromes by molecular genetic testing, histopathologic findings, and phenotypic characteristics. Conditions that must be considered in the differential diagnosis include the following:

- **Hereditary non-polyposis colon cancer (HNPCC):** autosomal dominant colon cancer with proximal colonic predominance; few colonic adenomas; other malignancies often include uterine, ovarian, gastric, small bowel, and urinary tract. To find information on laboratory testing for HNPCC, see [GENETests](#).
- **Turcot syndrome (TS):** CNS malignancies in addition to colonic polyposis; two-thirds of TS cases are caused by mutations in the *APC* gene, while one-third of TS cases arise from mutations of one of the mismatch repair genes known to be mutated in hereditary nonpolyposis colorectal cancer (HNPCC)
- **Peutz-Jeghers syndrome (PJS):** autosomal dominant, multiple, distinctive hamartomatous polyps of GI tract, most commonly occurring in the small bowel late in the second decade; mucocutaneous pigmentation of lips and buccal mucosa in the first decade; other malignancies include breast, pancreatic, cervical, ovarian (often benign), and testicular tumors. PJS is caused by mutations in the *STK11* gene.
- **Familial juvenile polyposis (JP):** autosomal dominant, ten or more juvenile polyps, found most often between four and 14 years, that occur anywhere in the GI tract but are most common in the colon. JP is caused by mutations in the *SMAD4* gene.
- **Cowden disease:** autosomal dominant, hamartomatous polyps, increased risk for breast and thyroid cancers, facial trichilemmomas. It is caused by mutations of the *PTEN* gene.
- **Ruvalcaba-Myhre-Smith syndrome (also called Bannayan-Zonana syndrome):** autosomal dominant, hamartomatous intestinal polyps, developmental delay, macrocephaly, and spotted pigmentation of glans penis. It is caused by mutations in the *PTEN* gene.
- **Hereditary mixed polyposis syndrome:** autosomal dominant, atypical juvenile polyps, polyps containing mixed histology or multiple polyps of more than one histologic type in an individual
- **Neurofibromatosis type 1:** autosomal dominant, café au lait macules, neurofibromas, may also exhibit multiple intestinal polypoid neurofibromas or ganglioneuromas in the small bowel, stomach, and colon
- **Cronkite-Canada syndrome:** acquired disease, generalized gastrointestinal hamartomatous polyposis, cutaneous hyperpigmentation, hair loss, and nail atrophy
- **Nodular lymphoid hyperplasia:** acquired, lymphoproliferative disorder resulting in hyperplastic lymphoid nodules in small bowel, stomach, and colon; may be associated with common variable immunodeficiency syndrome
- **Lymphomatous polyposis:** acquired, occurrence of primary extranodal lymphomas in the gastrointestinal tract, two types include multiple lymphomatous polyposis and Mediterranean-type lymphoma
- **Inflammatory polyposis:** acquired; nonneoplastic polyps associated with inflammatory bowel disease, most commonly ulcerative colitis
- **Hyperplastic polyposis (or metaplastic polyposis):** not known if inherited or acquired; multiple nonneoplastic hyperplastic polyps of the gastrointestinal tract
- **Sporadic colorectal tumors:** The majority of sporadic colorectal tumors have been shown to have a somatic mutation in the *APC* gene [Miyoshi 1992, Powell 1992, Smith 1993] that is believed to occur early in colorectal tumorigenesis [Fearon 1990].

## Management

### Recommendations for individuals suspected of having FAP:

- Personal medical history with particular attention to features of FAP (colon cancer, colon polyps, rectal bleeding, diarrhea, abdominal pain)
- Family history with particular attention to features of FAP
- Physical examination with particular attention to osteomas, dental abnormalities, epidermoid or sebaceous cysts, desmoid tumors
- Ophthalmologic evaluation for presence of CHRPEs
- Evaluation of the colon by sigmoidoscopy/colonoscopy
- Consideration of upper GI tract evaluation, including endoscopy and small bowel X-ray

**Recommendations for individuals known to have FAP and colonic polyps:**

- Colectomy. The timing of colectomy depends on the size and number of adenomatous polyps, although it usually should be accomplished within one to several years after adenomas emerge. The two types of colectomy are: total colectomy with mucosal proctectomy with ileo-anal pull through, and subtotal colectomy with ileorectal anastomosis. The latter is often used when the rectum is spared of polyps or when the individual has AAPC. If subtotal colectomy is performed, at least annual surveillance of the remaining rectum is recommended. If total colectomy with ileo-anal pull through is performed, biannual surveillance of the ileal pouch is recommended. For individuals with AAPC, colectomy is recommended, but it may be deferred until polyps are difficult to control.
- Endoscopic or surgical removal of duodenal adenomas if polyps exhibit villous change or severe dysplasia, exceed one centimeter, or cause symptoms
- Esophagogastroduodenoscopy (EGD) using a side viewing duodenoscope, beginning when colonic polyposis is detected or by age 25 years and repeated every one to three years
- Small bowel X-ray when duodenal adenomas are detected or before colectomy
- Attention to extra-intestinal growths, usually for cosmetic concerns, although symptomatic desmoid tumors require medical and/or surgical therapy
- Use of non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs, especially sulindac, have been shown to cause regression of adenomas in FAP and to improve the ease of polyp removal, especially in the remaining rectum of persons who have had a subtotal colectomy. NSAID use in patients before colectomy remains experimental.

**Recommendations for all persons at risk for FAP:**

Early recognition of FAP may allow for timely intervention and improved final outcome; thus, surveillance of asymptomatic at-risk children for early manifestations of FAP is appropriate. Use of DNA-based testing for early identification of at-risk family members (see [Genetic Counseling](#)) improves diagnostic certainty and reduces the need for costly screening procedures in those at-risk family members who have not inherited the disease-causing mutation.

**Recommendations for surveillance of persons who have inherited an APC disease-causing mutation OR persons at-risk for FAP who havenot undergone molecular genetic testing:**

- Sigmoidoscopy every one to two years beginning at age ten to 12 years
- Annual colonoscopy if colectomy is delayed more than a year after polyps emerge

**Recommendations for surveillance of persons at risk for AAPC:**

- Full colonoscopy every two to three years beginning at 18-20 years of age
- Annual colonoscopy if colectomy is delayed more than a year after polyps emerge

**Recommendations for surveillance of at-risk family members who havenot inherited the disease-causing mutation as determined by protein truncation testing or linkage analysis:**

- No routine colonic screening, OR some centers recommend baseline sigmoidoscopy at age 18 years to verify genetic test results

## Genetic Counseling

*Genetic counseling is the process of providing individuals and families with information on the nature, inheritance, and implications of genetic disorders to help them make informed medical and personal decisions. The following section deals with genetic risk assessment and the use of family history and genetic testing to clarify genetic status for family members. This section is not meant to address all personal or cultural issues that individuals may face or to substitute for consultation with a genetics professional. To find a genetics or prenatal diagnosis clinic, see [GENETests](#). —ED.*

## Mode of Inheritance

FAP is inherited in an autosomal dominant manner.

## Risk to Family Members

**Parents of a proband.** Approximately 75-80% of individuals with FAP have an affected parent; therefore, it is always appropriate to evaluate the parents of an affected individual for manifestation of FAP. Approximately 20-25% of individuals with FAP have the altered gene as the result of a new gene mutation [[Bisgaard 1994](#)].

**Sibs of a proband.** If neither parent of an individual with FAP meets the clinical diagnostic criteria for FAP, the risk to the sibs of an affected individual of having FAP is low.

**Offspring of a proband.** Affected individuals have a 50% chance of transmitting the mutant gene to each child.

## Related Genetic Counseling Issues

Consideration of DNA-based testing of young at-risk family members is appropriate for surveillance (see [Management](#)). As colon screening begins as early as age ten, testing is generally offered to children aged eight and older. Testing may be performed earlier if it alters medical management of the child. Parents often want to know the genetic status of their children prior to initiating screening in order to avoid unnecessary procedures in a child who has not inherited the altered gene. Special consideration should be given to education of the children and their parents prior to genetic testing. A plan should be established for the manner in which results are to be given to the parents and their children.

**Testing at-risk asymptomatic adults and children.** DNA-based testing used in early identification of at-risk family members may either be PTT or linkage testing.

**PTT** can be used with certainty to clarify the genetic status of at-risk family members when a clinically diagnosed relative has undergone protein truncation testing and is known to have a truncated APC protein. Those at-risk family members with a truncated APC protein will develop FAP and those who have normal PTT results will not develop FAP. The use of PTT for determining the genetic status of at-risk relatives when the clinically diagnosed relative is not available for testing is problematic and test results need to be interpreted with caution. A positive test result in the at-risk family member indicates the presence of an APC disease-causing mutation in the at-risk family member and indicates that PTT can be used to assess the genetic status of other at-risk family members. In contrast, a negative PTT result in the at-risk family member does not eliminate the possibility that an APC disease-causing mutation is present in the at-risk family member. The genetic status of such individuals cannot be determined and they need to follow the recommendations for surveillance for at-risk family members.

**Linkage analysis** can be considered in families with more than one affected family member who belong to different generations. Linkage studies are based upon an accurate clinical diagnosis of FAP in the affected family members and accurate understanding of genetic relationships in the family. Linkage analysis is dependent on the availability and willingness of family members to be tested. The markers used for FAP linkage analysis are highly informative and very tightly linked to the APC locus; thus, they can be used in more than 95% of FAP families with greater than 98% accuracy [[Petersen 1991](#), [Burt 1992](#)]. Linkage testing is not available to families in which there is a single affected individual, which often occurs when an individual has a new gene mutation and no offspring who are known to be affected.

**Other issues to consider.** It is recommended that physicians ordering APC testing and individuals considering undergoing testing understand the risks, benefits, and limitations of the testing prior to sending a sample to a laboratory. A recent study demonstrated that in almost 1/3 of cases assessed, the physician misinterpreted the protein truncation test results for FAP, and genetic counseling was provided and written informed consent was obtained in less than 20% of cases assessed [[Giardiello 1997](#)]. Referral to a genetic counselor and/or a center in which testing is routinely offered is recommended.

## Prenatal Testing

Prenatal testing of fetuses at 50% risk for FAP is clinically available either through PTT or linkage analysis. The same criteria for use of PTT or linkage analysis as discussed in [testing at-risk asymptomatic adults and children](#) apply to prenatal testing. It should be noted that detection of an *APC* mutation in a fetus at risk does not predict the time of onset or severity of the disease.

## Molecular Genetics

**Table 2. Molecular Genetics of FAP**

Gene	Locus	Product	Genomic Databases
<i>APC</i>	5q21-q22	Adenomatous polyposis coli protein	<a href="#">OMIM</a> <a href="#">HGMD</a> <a href="#">LocusLink</a> <a href="#">GeneCards</a> <a href="#">GDB</a> <a href="#">GenAtlas</a>

- **Gene symbol:** *APC*
- **Chromosomal locus:** 5q21-q22
- **Normal allelic variants:** The *APC* gene was identified and characterized in 1991 [[Croden 1991](#), [Joslyn 1991](#), [Kinzler 1991](#), [Nishisho 1991](#)]. The gene has been shown to be alternatively spliced in multiple coding and noncoding regions and the main transcript has 15 exons with 8532 base pairs that code for 2844 amino acids and result in a 311.8 kd protein. Exon 15 is large and comprises over three-quarters of the coding region of the gene.

- **Disease-causing allelic variants:** Over 450 germline mutations have been found in families with FAP [[Eccles 1996](#)]. Mutations almost always cause a premature truncation of the APC protein, usually through single amino acid substitutions or frameshifts. While mutations have been found scattered throughout the gene, they are predominantly located in the 592 end of the gene. The most common germline *APC* mutation is a 5-bp deletion that results in a frameshift mutation at codon 1309.

One mutation discovered in the *APC* gene at codon 1307 appears to create a hypermutable region that does not lead to classical FAP, but instead has been implicated in causing an increased risk of colon cancer in individuals of Ashkenazi Jewish descent [[Laken 1997](#)].

- **Normal gene product:** The APC protein has been localized to the nucleus and membrane/cytoskeleton in human epithelial cells [[Neufeld 1997](#)]. It has also been shown to homodimerize [[Joslyn 1993](#)] and bind to other proteins including GSK3b [[Rubinfeld 1996](#)],  $\beta$ -catenin [[Rubinfeld 1993](#), [Su 1993](#)],  $\beta$ -catenin [[Hülsken 1994](#), [Rubinfeld 1995](#)], tubulin [[Munemitsu 1994](#), [Smith 1994](#)], EB1 [[Su 1995](#)], and hDLG, a homolog of the *Drosophila* discs large tumor suppressor protein [[Matsumine 1996](#)]. Recent progress has been made in understanding the function of the APC protein product, which is a tumor suppressor. APC protein forms a complex with glycogen synthase kinase 3b (GSK-3b) [[Rubinfeld 1996](#)], which targets for degradation of  $\beta$ -catenin, a protein involved in both cell adhesion and intracellular signal transduction [[Korinek 1997](#), [Morin 1997](#), [Rubinfeld 1997](#), [Peifer 1997](#), [Nakamura 1997](#)]. The presence of normal APC protein appears to maintain normal apoptosis and may also decrease cell proliferation, probably through its regulation of  $\beta$ -catenin. This pathway is also involved with Wingless-Wnt signaling, which is involved in several known cell growth functions.

Other possible roles for the APC protein include regulation of cell migration up the colonic crypt and cell adhesion through association with E-cadherin and other functions related to association with microtubule bundles [[Näthke 1996](#), [Barth 1997](#)].

- **Abnormal gene product:** Mutations in the *APC* gene most often result in truncated protein products. Experiments have localized normal full length APC protein to the membrane/cytoskeleton and nuclear fractions of human epithelial cells, but demonstrated that colon cancer cells containing only mutant *APC* genes revealed no truncated APC protein in nuclear fractions [[Neufeld 1997](#)].

When the *APC* gene is mutated and abnormal protein is present, high levels of free cytosolic  $\beta$ -catenin result. Free  $\beta$ -catenin migrates to the nucleus, binds to a transcription factor Tcf-4 or Lef-1 (T cell factor-lymphoid enhancer factor) and may activate gene expression. The specific genes targeted are not yet known, but may include those increasing proliferation or decreasing apoptosis. As APC may be important in cell migration, abnormal APC protein may disrupt normal cellular positioning in the colonic crypt.

## Resources

GeneClinics provides information about selected national organizations and resources for the benefit of the reader. GeneClinics is not responsible for information provided by other organizations. —ED.

- **Colon Cancer Alliance**  
175 Ninth Avenue  
New York, NY 10011  
**Phone:** 212-627-7451  
**Fax:** 425-940-6147  
**Email:** [kelly@ccalliance.org](mailto:kelly@ccalliance.org)  
[www.ccalliance.org](http://www.ccalliance.org)
- **Colorectal Cancer Network**  
PO Box 182  
Kensington, MD 20895-0182  
**Phone:** 301-879-1500  
**Fax:** 301-942-7145  
**Email:** [semicolonclub@yahoo.com](mailto:semicolonclub@yahoo.com)  
[www.colorectal-cancer.net](http://www.colorectal-cancer.net)
- **Genetics of Colorectal Cancer (PDQ)**  
*CancerNet - A service of the National Cancer Institute*  
[cancernet.nci.nih.gov](http://cancernet.nci.nih.gov)
- **Hereditary Colon Cancer Association (HCCA)**  
3601 N 4th Ave, Suite 201  
Sioux Falls, SD 57104  
**Phone:** 800-264-6783; 605-373-2067  
**Fax:** 605-336-6699  
**Email:** [hcca@dtnet.com](mailto:hcca@dtnet.com)  
[www.hereditarycc.org](http://www.hereditarycc.org)
- **IMPACC (Intestinal Multiple Polyposis and Colorectal Cancer)**  
PO Box 11  
Conyngham, PA 18219  
**Email:** [impacc@epix.net](mailto:impacc@epix.net)

- **The Johns Hopkins Hereditary Colorectal Cancer Website**  
[www.hopkins-coloncancer.org](http://www.hopkins-coloncancer.org)
- **United Ostomy Association, Inc**  
19772 MacArthur Blvd Suite 200  
Irvine, California 92612-2405  
**Phone:** 714-660-8624; 1-800-826-0826  
**Fax:** 714-660-9262
- **APC gene database of germline and somatic mutations**  
[perso.curie.fr/Thierry.Soussi/APC.html](http://perso.curie.fr/Thierry.Soussi/APC.html)
- **American Cancer Society**  
[www.cancer.org/index.html](http://www.cancer.org/index.html)
- **Registries for inherited colon cancer syndromes**  
[www.fascrs.org/ascrs-cancer-reg.html](http://www.fascrs.org/ascrs-cancer-reg.html)

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### Statements and Guidelines Regarding Genetic Testing

- American Society of Clinical Oncology [statement](#) on genetic testing for cancer susceptibility
- American Society of Human Genetics and American College of Medical Genetics (1995) [Points to consider](#): ethical, legal, and psychosocial implications of genetic testing in children and adolescents.
- American Society of Human Genetics and American College of Medical Genetics (2000) [Joint statement](#): genetic testing for colon cancers. (*Acrobat reader required*)

### Articles on Familial Adenomatous Polyposis [MEDLINE](#)

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