

## **COLORECTAL CANCER**

### **PREVENTABLE, TREATABLE, BEATABLE!**

#### COMMUNITY RESOURCES

Northern Indiana Cancer Research Consortium  
615 N. Michigan Street  
South Bend, IN 46601  
574-284-7370 or 800-284-7370  
[www.nicrc.org](http://www.nicrc.org)

Women Task Force  
707 Cedar St., Suite 222  
South Bend, IN 46617  
(574) 472-6095  
[www.womenstaskforce.org](http://www.womenstaskforce.org)

United Health Services  
Riverbend Cancer Services  
711 E. Colfax Ave.  
South Bend, IN  
574-234-3136  
[www.riverbendcancer.org](http://www.riverbendcancer.org)

#### NATIONAL RESOURCES

American Cancer Society  
[www.cancer.org](http://www.cancer.org)

Cancer Research Foundation of America  
[www.preventcancer.org/colorectal.htm](http://www.preventcancer.org/colorectal.htm)

StopWatch  
[www.coloncancerprevention.org](http://www.coloncancerprevention.org)

National Comprehensive Cancer Network  
[www.nccn.org](http://www.nccn.org)

Center for Disease Control  
[www.cdc.gov/cancer](http://www.cdc.gov/cancer)

The National Colorectal Cancer Action Center  
[www.cdc.gov/cancer/screeforlife](http://www.cdc.gov/cancer/screeforlife)

American Society of Colon and Rectal Surgeons  
[www.fascrs.org](http://www.fascrs.org)

Foundation for Digestive Health and Nutrition  
[www.fdh.org](http://www.fdh.org)

American Gastroenterological Association  
[www.gastro.org](http://www.gastro.org)

National Cancer Institute  
[www.nci.nih.gov](http://www.nci.nih.gov)

## **WHAT IS COLORECTAL CANCER**

Colorectal cancer is cancer of the colon (the large intestine) and the rectum. Colorectal cancer may begin as non-cancerous polyps, which are like grape-like growths on the lining of the colon and rectum. For reasons that are not fully understood these polyps may become cancerous. Because this change may take a long time, there is time to find the growths and remove them before they can cause trouble. Taken out early, these growths can be removed and you may live a long and healthy life

The key is early detection.

### **How Serious are Colon And Rectal Cancers?**

Nearly 57,000 people are expected to die from colorectal cancers in 2002. Only lung cancer is responsible for more cancer deaths. This occurs despite the fact that colorectal cancer is almost always a preventable or curable disease when proper screening is used.

### **Survival Rates**

Survival rates for colorectal cancer have been rising in recent years. The five-year survival rate for patients undergoing colon cancer surgery is as high as 90% for cancer that has not spread to the lymph nodes. When cancer has spread to lymph nodes, survival rates drop to 65% and below. Because many cancers are detected at later stages, the overall survival rate is currently about 60%. Women tend to fare better than men; in 1998, death rates were approximately 40% higher among men. African-Americans also tend to have lower survival rates. According to one study, these higher mortality rates in African Americans and also other minorities are largely due to less access to optimal health care, including appropriate surgical care and aggressive treatments.

### **Factors in Treatment Success**

In most cases age is not a factor in treatment success; good survival rates are achieved in the elderly as well as in young people. Chances for survival are less in stage II cancers if the intestine is obstructed or perforated. If cancer has spread to lymph nodes (Stage III), the outlook is better if three or fewer lymph nodes are involved. It is important to note that treatment can prolong life even when cancer has spread.

## **WHAT IS THE ROLE OF DIET IN COLON AND RECTAL CANCERS?**

Previous research suggested that diets low in fruits and vegetables and high in meats pose a risk for colon cancer, and that those rich in fruits and vegetables are protective against many cancers.

### **Plant Chemicals (Phytochemicals) Found in Fruits and Vegetables**

There has been a prevailing belief from a number of studies that high intake of fruits and vegetables can lower the risk for colorectal cancer. For example, early results in 2000 of the European Prospective Investigation into Cancer and Nutrition (EPIC) have suggested that such a diet is protective. This is the largest study ever conducted on the role of diet in the development of cancer. A 2000 study by Harvard researchers, however, concluded that eating such foods had little or no effect on colorectal cancer rates. It should be noted that it is nearly impossible to do controlled studies on dietary factors, since people eating habits can rarely be made consistent. Dietary studies also use a variety of different approaches to obtain results that make comparisons very difficult.

Phytochemicals. Many studies have demonstrated the cancer-fighting effects of plant chemicals called phytochemicals. Fruits and vegetables that contain phytochemicals can often be identified by colors:

- Dark green (broccoli, spinach, kale, collard greens, mustard greens). These specific vegetables contain chemicals called isothiocyanates, which have been associated with a lower risk for cancer in general.
- Red (red pepper, tomatoes, watermelon, raspberries, pink grapefruit). Lycopene is a chemical found in these foods that may have strong cancer-protective properties. Cooking tomatoes appears to increase their benefits.
- Yellow-orange (carrots, pumpkin, sweet potatoes, oranges, tangerines). The colors in these foods are due to carotenoids, which have been associated with health protection, although may not have much effect on colon cancer itself.
- Blue-black (Many berries). Dark berries appear to have potent chemicals that may be protective against cancer. In one animal study, extracts from black raspberries reduced colon cancer tumors in rats.

Organosulfurs are important food chemicals that are part of the allium family and there have been studies reporting health benefits from foods containing them. These compounds are found in garlic, leeks, onions, chives, scallions, and shallots. A review of 300 studies concluded that people who eat raw or cooked garlic regularly experience about two-thirds the risk of colorectal cancer as people who eat little or none. Another analysis, however, found the available evidence about garlic to be inconclusive. Garlic supplements, in any case, do not appear to be protective.

## **Fiber**

A number of studies had reported protection from fiber in vegetables and fruits. Research now suggests, however, that the benefits observed in high-fiber diets were probable due to the fact that such diets were usually also low in fat. Two studies reported no difference in the development of colorectal polyps with high or low intake of fiber. In any case, fiber, which is only found in plant products, may be beneficial for the heart and have other health advantages.

## **Fats and Oils**

**Saturated Fats and Trans-fatty Oils.** Some studies had found an association between colon cancer and consumption of saturated fats (found primarily in animal fats). The association is not altogether clear, however, and more recent evidence has not supported a strong link. Some experts suggest that the real hazard is iron from red meat, which is often high in saturated fats and may have confused study results [ see below ].

Of further interest, however, is a 2001 study that reported a possible link between colon cancer and trans fatty acids, which are partially hydrogenated oils found in stick margarine, fried foods and commercial baked goods. The association is supported by known chemical effects of these manufactured fats, and more research is warranted.

**Olive Oil.** Certain oils may be beneficial. Olive oil, for example, may be protective, according to animal and human population studies. Some evidence suggests that it reduces levels of deoxycholic acid, an acid found in bile that has tumor-promoting properties.

**Plant Sterols.** Some reports suggested that plant sterols, heart-healthy fats found in grains, nuts, some fruits and vegetables, might help prevent colon cancer, but a 2001 study in the Netherlands concluded that a high intake of plant sterols conferred no such benefits.

## **Meat**

Some evidence suggests that red meat raises the risk for colon cancer. Red meat contains dietary iron, which has been associated with a higher risk for colon cancer. In fact, early results in 2000 from the largest study on diet and cancer to date have supported previous studies linking red meat with intestinal tumors. (

High-temperature cooking (grilling, broiling, or pan frying) has been specifically associated with increased risk for colon polyps and colon cancer. Over-cooking meat increases the amount of carcinogens called heterocyclic amines, which has been associated with cancerous changes.

### **Dairy Products and Calcium**

Milk, Lactose, and Probiotics. In a Finish 2001 population study, adults who drank the most milk had the lowest risk for colon cancer. Milk not only contains calcium but also other compounds, such as lactose, that may help protect against colon cancer. Yogurt specifically has been associated with a lower risk for colon cancer if it contains live active bacterial cultures, such as *Lactobacillus acidophilus*, that are called probiotics. These "friendly bacteria" appear to protect the colon from cancerous changes. (Acidophilus and other probiotic capsules are also available in health food stores.) Results are mixed on other fermented milk products, such as buttermilk and cheese, which in one study were associated with a higher risk. The reasons for this were not clear.

Calcium. Calcium, which is found in dairy products, is also associated with colon cancer protection. Most studies show a possible protective effect from either high-calcium diets or calcium supplements. The protective effect has been observed as early as one year after calcium supplementation began. A large 2002 study concluded that daily intake of about 700 mg, from food or supplements, reduces the risk of colon cancer, but intake beyond this level does not add any further protection. Calcium supplements may even offset certain effects of dietary iron, found in red meat and other foods, that may increase the risk for colon cancer. More work in this area is needed, however.

### **Total Calories and Sugar**

Obesity has been associated with colon cancer. In some studies of people under 67 years old, the amounts of fat and protein were less important than the total number of calories consumed: the higher the energy intake, the greater the risk for developing colon cancer. In older adults, high calorie intake did not make any significant difference. Other studies have indicated that excessive sugar-intake may increase the risk for colon cancer.

### **Coffee and Tea**

Studies conducted in a number of countries have found that drinking four or more cups of coffee a day is associated with a lower risk for colorectal cancer. Green tea may have beneficial properties, but more research is needed in both of these areas.

### **Vitamin and Mineral Supplements**

Folate and B Vitamins. There is evidence that the B vitamin folate (called folic acid) is protective. Both folate and vitamin B12 convert the amino acid homocysteine to methionine, a chemical that protects certain genes that help prevent cells from becoming malignant. Folate is found in beans, citrus fruits, and green vegetables, but benefits seem

higher when taking supplements. The protective effect appears to be greatest for people who are genetically predisposed to colorectal cancer.

**Antioxidant Supplements.** Antioxidants are chemicals that help eliminate harmful particles called oxygen-free radicals that have been associated with cancerous changes. Some studies have associated supplements of the antioxidants selenium and vitamins A, C, D, and E with lower colon cancer risk, but most studies have found no protective effect.

## **WHAT ARE NON-DIETARY MEASURES FOR PREVENTING COLON AND RECTAL CANCERS?**

### **Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)**

Nonsteroidal anti-inflammatory drugs (NSAIDs) are very common agents available over-the-counter and by prescription that are used to relieve pain. They have specific actions against prostaglandins and the enzymes called cyclooxygenases (COX 1, COX 2, or both), which have with colon cancer risk [ *see Cyclooxygenases and Prostaglandins above*].

- *Over-the-Counter NSAIDs.* Over the counter NSAIDs include aspirin, ibuprofen (Motrin, Advil, Nuprin, Rufen), and naproxen (Aleve). A number of studies have report that taking these agents at doses similar to those commonly taken to relieve arthritis pain is associated with a lower rate of colorectal cancer by up to 40% over the long term. Even low doses, such as a baby aspirin (81 mg) a day, may confer protection. However, long-term use of these NSAIDs increases the risk for gastrointestinal bleeding and they are not recommended yet to prevent colorectal cancer. At this time, taking them to prevent cancer is not as effective as screening procedures to catch cancer at an early, and curable, stage [ *see How Are Colon and Rectal Cancers Diagnosed? below*].
- *Prescription NSAIDs for Prevention of Hereditary Cancers.* Some studies report that the potent prescription NSAIDs indomethacin and sulindac can cause regression of polyps and stave off colon cancer for several years in people with FAP. A 2002 study in children and young adults with FAP who were given sulindac for four years, however, did not show any reduction in new polyp formation. More research is needed to determine if NSAIDs have preventive value in high-risk individuals.
- *COX-2 Inhibitors.* Selective COX-2 inhibitors, such as celecoxib (Celebrex) and rofecoxib (Vioxx), are newer enzymes that only block the enzyme cyclooxygenase-2 (COX-2), which has been specifically linked to colon cancer. Both are being investigated for possible protection against colon cancer. Early studies indicate that celecoxib may help prevent new growth and retard the growth of existing polyps. Experts hope, then, COX-2 inhibitors may prevent

colon cancer without posing as high a danger of bleeding and ulcers as standard NSAIDs. Celecoxib has now been approved for patients with familial adenomatous polyposis (FAP), although low doses (100 mg) do not appear to have much effect in these patients.

In some studies, combining NSAIDs with the cholesterol-lowering drugs known as statins (for example, lovastatin, pravastatin, simvastatin) significantly lowered the rate of colon cancer compared to taking NSAIDs alone. Experts are hoping that such combinations may allow lower NSAIDs dosages, thereby reducing the risk for side effects, but further study is required.

*Complications.* It is important to note that NSAIDs, even in low doses, can cause gastrointestinal bleeding and ulcers in some people. In fact, studies estimate NSAID-related deaths in the United States at 10,000 to 20,000 per year, and NSAID-related hospitalizations at 100,000 per year. COX-2 inhibitors may have fewer of these side effects, although long-term studies are still needed.

### **Exercise**

Studies have indicated that regular, even moderate, exercise (30-minute daily jog or 60-minute daily walk) reduces the risk of colon cancer. Regular activity may be the most important lifestyle component in decreasing colon cancer risk. Strenuous activity adds only slight or no additional benefit.

### **Estrogen in Women**

*Hormone Replacement Therapy (HRT).* Some studies show that estrogen replacement therapy, with or without progesterone, is associated with a reduced risk of colon cancer. Estrogen's benefits may be due to its role in modulating an enzyme called 17HSD that protects against cell proliferation. Older women who are at risk for colon cancer might discuss hormone replacement therapy with their physicians. HRT carries specific risks and benefits that can affect individual choices.

*Oral Contraceptives.* Use of oral contraceptives may reduce women's risk of colon cancer. Duration of use does not seem to be associated with decreased risk, but protection appears stronger for women who have used oral contraceptives more recently.

### **Ursodiol**

Ursodiol is a drug sometimes used to treat gallstones or a rare inflammation of the bile ducts associated with ulcerative colitis. It helps reduce deoxycholic acid levels, a bile acid that has tumor-promoting properties. Studies now suggest it may prevent colon cancer in persons at high risk. More research is needed.

## **RISK FACTORS**

Family or personal history of benign colon or rectal polyps.

Family or personal history of colorectal cancer.

Personal history of inflammatory bowel disease, ovarian, endometrial or breast cancer.

Excess intake of alcohol

Excess intake of red meat

Tobacco use

## **SIGNS AND SYMPTOMS**

Bleeding from the rectum

A change in bowel movement pattern that continues over time.

General discomfort in the abdomen (frequent gas pains, cramping pain, feeling of bloating or fullness)

Vomiting

Constant fatigue

Chronic constipation

## **HOW ARE COLON AND RECTAL CANCERS DIAGNOSED?**

Colon and rectal cancers are diagnosed using the screening tests discussed below. These tests can detect precancerous polyps and colorectal cancers at stages early enough for complete removal and cure. Unfortunately, only 30% to 40% of adults over 50 years old (mostly in the upper socioeconomic group) have regular screening tests that could detect a cancer early enough for curative treatment. A survey reported that many people are not screened because they are too embarrassed and revealed that they would rather lose months off their life than face these tests. Those who had already had the tests were willing to have them again if they saved one additional day of their lives. There is some debate about what is the best screening modality. However almost all experts agree that not enough people are screened and that if these tests were adopted with the same regularity as other screening tests, such as Pap smears, they would save many lives. It is especially important that anyone at increased risk or with symptoms, such as rectal bleeding, undergo testing.

### **GENERAL SCREENING GUIDELINES**

Individuals should discuss with their physician the risks and benefits of all screening procedures. Some controversy exists over how often people without risk factors for cancer should be screened and which detection method should be used for them.

#### **Guidelines for Adults Age 50 and Over with Average Risk**

The following are the most recent expert screening guidelines for people at age 50 and over who have no symptoms and no family history of colon cancer (or possibly also no family history of benign polyps):

- A fecal occult blood test (FOBT) every year and a flexible sigmoidoscopy every five years. A follow-up colonoscopy should be done if any questionable results, such as precancerous polyps, are found.
- Many medical experts are now recommending a colonoscopy every 10 years, replacing sigmoidoscopy at that interval. This option is increasingly being covered by Medicare and other insurers.

*Choosing between Colonoscopy and Sigmoidoscopy.* The choice between the use of colonoscopy and sigmoidoscopy for routine screening for older adults with average risk is, in fact, an area of intense debate. The issues are as follows:

- Sigmoidoscopy is less costly, less invasive, quicker, and safer than colonoscopy, but it allows inspection only of the left side of the colon. Some studies have suggested that sigmoidoscopy is likely to miss polyps in as many as 20% to 30% of patients who have the procedure, even when combined with FOBT. They also may be more likely to miss cancers in older people, who, some evidence suggests, are more likely to have right-sided cancer. Nevertheless, a 2002 British study reported that sigmoidoscopy is still effective for detecting many cancers, and patients tolerate it very well.
- Colonoscopy is more sensitive than any other current screening methods for detecting colon cancer but it is costly. If the goal is to maximally reduce the number of cancer cases regardless of cost, colonoscopy would be the preferred approach. A landmark 1993 study reported an approximate 90% reduction in colorectal cancers in patients with precancerous polyps who were regularly screened with colonoscopy and who had all colonic polyps removed. And, no deaths were reported from cancers that were detected during screening. Colonoscopy, however, has a higher rate of complications and cost than sigmoidoscopy. (It has a rate of perforation of two per 1,000 procedures versus one per 10,000 for sigmoidoscopy.)

### **Guidelines for Increased-Risk Groups**

Groups at increased risk include the following:

- Men of African descent (particularly from sub-Saharan Africa).
- Anyone with first-degree relatives diagnosed with colon cancer younger than 60.

Such individuals should consider beginning the standard screening regimen with a colonoscopy every five years beginning at age 40 or ten years before the youngest case in the family (whichever is earlier).

### **Guidelines for High-Risk Groups**

Screening, particularly with colonoscopy, in high-risk populations can save lives.

The following guidelines may be specifically useful for high-risk groups.

- People known to have the mutated hereditary nonpolyposis colorectal cancer (HNPCC) gene (like MSH-2 or MLH-1) or who have a family history of HNPCC. Colonoscopy every one to three years beginning at age 20 to 25. (Regular screening for other cancers such as uterine cancer, is also reasonable.)
- People known to have the familial adenomatous polyposis (FAP) gene or who have a family history of FAP. Annual sigmoidoscopy beginning at 18 or whenever an individual with FAP has been identified. (Most cancers in FAP show up in the lower colon.) Colonoscopy every two years beginning at age 10. Genetic testing is now recommended for family members of people with known FAP.
- People with predisposing intestinal problems such as widespread and active ulcerative colitis or Crohn's disease. Annual screening with colonoscopy with biopsies of suspicious areas.

### **Guidelines for Follow-Up after Detection of Precancerous Polyps**

Patients who have had a previous examination in which polyps were detected (and removed) should have a repeat colonoscopy one to three years later, depending on the size, number, and type of polyps removed.

### **Digital Rectal Examination (DRE)**

The digital rectal examination is used to detect tumors in the rectum, lower intestine, and prostate gland. The doctor inserts a lubricated-gloved finger into the patient's rectum and feels for lumps or other abnormalities. The exam is quick and painless but embarrassing for some. The DRE will only detect a minority of cancers and is not at all useful as a sole screening test.

### **Fecal Occult Blood Test (FOBT)**

Blood in bowel movements is not always visible, in which case it is called occult blood. Fecal occult blood tests (FOBTs) are used to detect this hidden blood. The most common FOBT method is called the guaiac-based test. The patient is asked to supply up to six stool specimens in a specially prepared package. A small quantity of feces is smeared on specially treated paper, which reacts to hydrogen peroxide. If blood is present, the paper turns blue.

*Accuracy.* FOBTs can miss more than 75% of advanced cancers and many experts believe they are too inaccurate to be relied on, not only in missing cancers but also in reporting many false positive results, which lead to invasive and expensive tests that detect no cancers. Large studies, however, have indicated that this simple test, performed annually, does indeed save lives and may reduce the risk of dying from colon cancer by 15% to 33%. The following may affect its results:

- The levels of iron in the blood can affect results. Patients should not take iron supplements or eat red meats several days before the test.
- Certain raw fruits and vegetables, including cauliflower, horseradish, radishes, melons, and turnips, that contain the chemical peroxidase can cause a positive test reaction even if no blood is present.
- Aspirin and other NSAIDs can cause minor bleeding and should not be taken for a week before the test.
- Vitamin C and foods rich in this vitamin may cause a false *negative* reaction and should be avoided a few days before the test.
- Bleeding from other causes, such as menstruation, hemorrhoids, gingivitis, or urinary infections, can produce blood in the stools and affect results.

Even if none of these conditions is present, a test that shows hidden (occult) blood does not necessarily mean that cancer is present. About 20% to 30% of people with occult blood have noncancerous polyps or other conditions, such as gastritis, and only 5% to 10% actually have cancer. Any abnormal result, however, requires further testing, such as colonoscopy [ *see below* ].

*Lack of Compliance.* Compliance is a major problem. Patients are asked to perform the tests at home and send the test cards to the laboratory; only 35% to 50% of patients actually follow through. Occult-blood tests that give results at home are available but are extremely inaccurate. In one large study, these tests failed to detect advanced cancer in about 62% of cases, although they may detect some early cancers.

### **Visualizing the Colon: Colonoscopy, Sigmoidoscopy, and Barium Enema**

If a digital rectal exam (DRE) or fecal occult blood test (FOBT) shows signs of trouble, several methods to visualize the colon are available. They include colonoscopy, sigmoidoscopy, and double-contrast barium enema. They have the following similarities and differences:

- Sigmoidoscopy can only view the rectum and the left side of the colon, while colonoscopy and barium enemas allow a view of the entire large intestine.

- Both flexible sigmoidoscopy and colonoscopy involve snaking a fiber optic tube through regions of the rectum and colon to view the walls of the intestine. The tube contains a tiny camera that transmits the image to a video screen. The use of an ultrasound (sound wave) scanner is proving to enhance viewing quality. Barium enemas simply use x-rays.
- During either sigmoidoscopy or colonoscopy, the physician is able to remove polyps or other abnormalities revealed by these procedures with surgical instruments inserted through the tube. It is not possible to remove polyps with a barium enema, which is not invasive.

*Sigmoidoscopy.* Sigmoidoscopy examines the rectum and the lower two feet of the colon. It cannot, however, detect the roughly half of cancers that occur in the right colon. Right-sided cancers are more common in older people.

- The procedure employs a flexible fiberoptic tube (it is thus referred to as *flexible* sigmoidoscopy) that contains a tiny camera and surgical instruments.
- It lasts about 10 minutes and may be mildly uncomfortable, but it is not painful and is generally very safe. In one study, 70% of patients reported that the procedure was far less unpleasant than they had expected.

This procedure has been found to reduce the risk of fatal cancers in the rectal and sigmoid area by 60%. If polyps are detected, a colonoscopy is then used.

*Colonoscopy.* Colonoscopy is the most accurate testing method and can reduce cancer incidence by up to 90%. It is clearly indicated for anyone with an increased risk for colorectal cancer, including those with a personal or family history of the disease. As with sigmoidoscopy, a colonoscopy uses a flexible tube but it is snaked through the entire large intestine.

- For about a day before the procedure the patient eats nothing and drinks a laxative solution that cleans out the colon. The taste of the solution is unpleasant, although it has improved in recent years.
- The procedure typically uses a sedative that produces a "twilight" sleep and often makes the procedure more comfortable than sigmoidoscopy.
- Air may be introduced into the intestine to widen it and allow the tube to navigate curves. A colonoscopy avoids the risk of radiation associated with a barium enema [ *see below* ], but it is important to note that even a colonoscopy does not detect all cancers.

Complications are rare, but include the following:

- Hyponatremia. Hyponatremia is a low concentration of sodium in the blood. The complication may be caused by the effects of bowel cleaning before the procedure

that can result in water retention and reductions in sodium. When severe, it can cause temporary neurological symptoms, such as confusion, lethargy, unsteadiness, and slurred speech. Researchers suggest that sodium concentrations be measured in patients who develop such symptoms after colonoscopy.

- Bowel perforation (very low risk, about two cases per 1,000 procedures).

*Barium Enema.* The double-contrast barium enema, which uses an x-ray image, is the less expensive alternative for viewing the entire colon. It is not as accurate as colonoscopy [ *see above* ], and if any polyps or abnormalities are revealed on x-ray, a colonoscopy is then required to remove suspicious tissue, so it is now recommended much less often than in the past.

## **Genetic Screening**

Genetic screening for familial adenomatous polyposis (FAP) and hereditary nonpolyposis colon cancer (HNPCC) is now available and may be recommended for high-risk patients. The test for FAP detects a mutation in the APC (adenomatous polyposis coli) in up to 90% of people who carry it. Testing for HNPCC mutation is somewhat more complex.

*Stool DNA Testing.* A promising technique for colorectal cancer screening is the detection of altered DNA in cancer cells that have shed from the colon and are excreted in the stool. Such tests may prove to detect both inherited and noninherited genetic mutations. This may become a widely used tool in the future; however, larger clinical studies are needed.

## **Experimental Screening and Diagnostic Methods**

*Virtual Colonoscopy.* A promising experimental technique called virtual colonoscopy allows three-dimensional imaging of the colon without using invasive instruments. As with standard colonoscopy, the patient takes a laxative first to clear out the intestine. The procedure itself involves pumping air into the colon and scanning the intestine using computed tomography (CT). It is very safe and takes only 10 minutes. The procedure is similar in accuracy to conventional colonoscopy for detection of larger polyps (6 mm or more in diameter) and is also potentially less expensive. Colonoscopy is required, however, if suspicious areas are found, which may occur frequently with the CT procedure, since it erroneously identifies a high number of nonexistent polyps.

*Magnetic Resonance Colonography (MRC).* Magnetic resonance colonography (MRC) is another non-invasive technique for visualizing the colon. The patient receives an enema containing a contrast agent, then magnetic resonance images are taken. MRC is fast, comfortable, and less invasive than colonoscopy. Currently, however, there is a poor detection rate for flat tumors and for polyp tumors less than 10 mm in diameter.

*Encapsulated Video Camera.* Researchers have developed a video camera that is small enough to be swallowed. It works its way through the digestive tract, beaming data to a

receiver worn on the patient's waist, and is excreted in eight to 72 hours. The camera was not designed to replace standard visualization procedures and is currently being used to assess problems in the hard-to-reach small intestine. More testing is needed to determine whether it has value in colon cancer screening as well.

## **RESEARCH PROTOCOLS:**

In our local community specialists in Colon and Rectal Surgery in the NICRC are teaming with research scientists at the University of Notre Dame to link human cancer tissue with basic animal model research in the fight against this common and deadly disease.

Several clinical trials in the prevention and treatment of colorectal carcinoma are available in our community and can be found by contacting the Northern Indiana Cancer Research Consortium. (See community resources)