Introduction
Colorectal cancer is cancer that occurs in the colon and rectum. Sometimes it is called colon cancer, for short. The colon is also known as the large intestine or large bowel. The rectum is the passageway that connects the colon to the anus.

[Picture Credit: Anatomy Colon]

Colorectal Cancer
Cancers of the colon and rectum (colorectal cancer) start when the process of the normal replacement of lining cells goes awry. Mistakes in mucosal cell division occur frequently. For reasons that are poorly understood, sometimes mistakes occur that escape our editing systems. When this occurs, these cells begin to divide independently of the normal checks and balances that control growth. As these abnormal cells grow and divide, they can lead to growths within the colon called polyps. Polyps vary in type, but many are precancerous tumours that grow slowly over the course of years and do not spread. As polyps grow, additional genetic mutations further destabilize the cells and can make the cells more bizarre. When these precancerous tumours change direction (growing through the tube rather than into the middle of it) and invade other layers of the large intestine (such as the submucosa or muscular layer), the precancerous polyp has become cancerous. In most cases this process is slow, taking at least 8 to 10 years to develop from those early aberrant cells to a frank cancer.

**BACKGROUND:** Many epidemiological studies have shown that vitamin D deficiency is associated with various types of human cancers. The biological action of vitamin D and its metabolites is mediated by the transcription factor vitamin D receptor (VDR). The VDR gene is highly expressed in the colon and is involved in many biological functions. The aim of the current study was to assess the relationship between serum vitamin D metabolite and calcium levels with VDR polymorphisms in normal and colorectal cancer (CRC) patients.

**METHODS:** Fifty Saudi CRC patients and fifty controls were enrolled in the study. The levels of total vitamin D, \(25(OH)D_3\), and calcium were measured in serum.

**RESULTS:** The homozygous genotype (aa) of the Apal VDR polymorphism (rs7975232) was found to correlate with total serum vitamin D levels of CRC patients, while the heterozygous (Tt) TaqI VDR polymorphism (rs731236) was associated with serum calcium levels. In contrast, the BsmI and FokI VDR polymorphisms (rs1544410 and rs2228570, resp.) did not affect the serum levels of total vitamin D, \(25\)-hydroxyvitamin D, and calcium.

**CONCLUSION:** Appropriate vitamin D levels were shown to be important in preventing the onset of CRC.

Incidence of Colorectal Cancer in South Africa

According to the National Cancer Registry, the following cases of colorectal cancer were histologically diagnosed during 2014 (the most recent formal statistics available for South Africa):

<table>
<thead>
<tr>
<th>Group - Males 2014</th>
<th>Actual No of Cases</th>
<th>Estimated Lifetime Risk</th>
<th>Percentage of All Cancers</th>
</tr>
</thead>
<tbody>
<tr>
<td>All males</td>
<td>1944</td>
<td>1:79</td>
<td>5,28%</td>
</tr>
<tr>
<td>Asian males</td>
<td>152</td>
<td>1:39</td>
<td>16,30%</td>
</tr>
<tr>
<td>Black males</td>
<td>485</td>
<td>1:239</td>
<td>4,38%</td>
</tr>
<tr>
<td>Coloured males</td>
<td>289</td>
<td>1:48</td>
<td>6,87%</td>
</tr>
<tr>
<td>White males</td>
<td>1017</td>
<td>1:32</td>
<td>4,94%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group - Females 2014</th>
<th>Actual No of Cases</th>
<th>Estimated Lifetime Risk</th>
<th>Percentage of All Cancers</th>
</tr>
</thead>
<tbody>
<tr>
<td>All females</td>
<td>1 620</td>
<td>1:134</td>
<td>4,29%</td>
</tr>
<tr>
<td>Asian females</td>
<td>88</td>
<td>1:91</td>
<td>7,40%</td>
</tr>
<tr>
<td>Black females</td>
<td>465</td>
<td>1:342</td>
<td>2,89%</td>
</tr>
<tr>
<td>Coloured females</td>
<td>232</td>
<td>1:79</td>
<td>5,67%</td>
</tr>
<tr>
<td>White females</td>
<td>835</td>
<td>1:49</td>
<td>5,09%</td>
</tr>
</tbody>
</table>

The frequency of histologically diagnosed cases of colorectal cancer in South Africa for 2014 was as follows (National Cancer Registry, 2014):

<table>
<thead>
<tr>
<th>Group - Males 2014</th>
<th>0 – 19 Years</th>
<th>20 – 29 Years</th>
<th>30 – 39 Years</th>
<th>40 – 49 Years</th>
<th>50 – 59 Years</th>
<th>60 – 69 Years</th>
<th>70 – 79 Years</th>
<th>80+ Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>All males</td>
<td>2</td>
<td>36</td>
<td>89</td>
<td>198</td>
<td>418</td>
<td>570</td>
<td>436</td>
<td>175</td>
</tr>
<tr>
<td>Asian males</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>17</td>
<td>37</td>
<td>50</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Black males</td>
<td>1</td>
<td>18</td>
<td>47</td>
<td>87</td>
<td>129</td>
<td>118</td>
<td>52</td>
<td>19</td>
</tr>
<tr>
<td>Coloured males</td>
<td>1</td>
<td>8</td>
<td>7</td>
<td>26</td>
<td>65</td>
<td>83</td>
<td>66</td>
<td>30</td>
</tr>
<tr>
<td>White males</td>
<td>0</td>
<td>6</td>
<td>28</td>
<td>63</td>
<td>183</td>
<td>314</td>
<td>287</td>
<td>115</td>
</tr>
</tbody>
</table>

Researched and Authored by Prof Michael C Herbst
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September 2019
Signs and Symptoms of Colorectal Cancer
Sign and Symptoms of colorectal cancer may include:

- A change in bowel habits, including diarrhoea or constipation or a change in the consistency of stools
- Rectal bleeding or blood in stools
- Persistent abdominal discomfort, such as cramps, gas or pain
- A feeling that the bowel does not empty completely
- Weakness or fatigue
- Unexplained weight loss

Many people with colorectal cancer experience no symptoms in the early stages of the disease. When appearing, symptoms will likely vary, depending on the cancer’s size and location in the large intestine.

Risk Factors for Colorectal Cancer
Risk factors for colorectal cancer may include:

- Advancing age - national and international data indicate that the risk of developing colorectal cancer increases with advancing age. Most cases of colorectal cancer occur in people aged 50 or older.
- Family or personal history
  - A family history of inherited colorectal cancer syndromes, such as familial adenomatous polyposis (FAP) or hereditary non-polyposis colorectal cancer (HNPCC or Lynch syndrome)
  - A strong family history of colorectal cancer or polyps. This usually means first-degree relatives (parent, sibling, or child) who developed these conditions younger than age 60
  - A personal history of colorectal cancer or polyps
  - A personal history of chronic inflammatory bowel disease (for example, ulcerative colitis or Crohn’s disease)

(Botma, et al., 2012).

“Colorectal cancer is a multifactorial disease and a leading cause of cancer-related deaths worldwide. Inflammation is a driver across multiple stages in the development of colorectal cancer.
The inflammasome is a cytosolic multiprotein complex of the innate immune system central to the regulation of inflammation, pyroptosis, and other cellular processes important for maintaining gut homeostasis. Studies using mouse models of colitis and colitis-associated colorectal cancer have highlighted diverse and sometimes contrasting roles of inflammasomes in maintaining a balance between intestinal barrier function and the gut microbiota. In addition, persistent and/or dysregulated stimulation of inflammasome sensors finetune inflammation and tumorigenesis in the intestine. This review highlights the emerging role of inflammasome signaling in colitis and colitis-associated colorectal cancer. We also review the key mechanisms by which inflammasome signaling modulate inflammation and tumor development. Finally, we speculate the importance of using more tightly regulated experimental approaches to examine the role of gut microbiota in colorectal cancer."

Lifestyle Factors that May Contribute to the Increased Risk for Colorectal Cancer:
Lifestyle factors that may contribute to the increased risk of colorectal cancer include:

- Lack of regular physical activity
- Being overweight including obesity
- Low fruit and vegetable intake
- A low-fibre and high-fat and high sugar diet
- Red meat consumption
- Consuming processed meats
- Alcohol consumption
- Tobacco use

Lifestyle Factors that Play an Important Role in Reducing the Risk for Colorectal Cancer
The following are of importance:

- Fibre – research suggests that fibre (found mostly in fruit, vegetables and whole grain products and cereals) is likely to reduce the risk for bowel cancer
- Fruit and vegetables – the large European Prospective Investigation into Cancer and Nutrition (EPIC) study has shown that people who eat a lot of fruit and vegetables have a lower risk for colorectal cancer
- Meat – eating a lot of red meat, particularly processed meat, increases one’s risk for colorectal cancer
- Fish – eating more fish high in Omega-3 lowers one’s risk for colorectal cancer
- Calcium – calcium rich diets may lower the risk of colorectal cancer
- Alcohol – alcohol has been classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC) and should be avoided to reduce the risk of colorectal cancer
- Tobacco - people who use tobacco products have an increased risk of colorectal cancer and cancer in general. Smoking is a well-known cause of lung cancer, but some of the cancer-causing substances in smoke dissolve into saliva and if swallowed, can cause digestive system cancers like colorectal cancer
- Processed meats (like sausages, luncheon meats inclusive of ham and even biltong) can increase the risk for colorectal cancer based on the use of nitrate and nitrates
• Cooking meats at very high temperatures (frying, broiling, or grilling) creates chemicals that increase cancer risk, namely Heterocyclic Amines (HCAs)
• Body weight – being overweight increases the risk of developing and dying from colorectal cancer. Obesity raises the risk of colorectal cancer in both men and women, but the link seems to be stronger in men
• Physical inactivity - increases the risk of developing colorectal cancer - increasing activity may help reduce the risk
• Radiation therapy for cancer - radiation therapy directed at the abdomen to treat previous cancers may increase the risk of colorectal cancer

Screening for Higher Risk Individuals
People with familial risk factors for colorectal cancer may need earlier (before age 50) or more frequent testing. Genetic testing in suspected familial cases may identify candidates for secondary prevention. Screening for high risk individuals is more likely to be done using colonoscopy.

Testing for occult blood in the stool (faeces)
When a health care provider tests stool with a faecal occult blood test they are often looking for the presence of microscopic occult blood in the faeces, which may be a sign of a growth, inflammation or bleeding in the digestive system.

Causes of Blood in Stool
Blood may appear in the stool in one or more of the following conditions:

• Benign (non-cancerous) or malignant (cancerous) growths or polyps of the colon
• Haemorrhoids (swollen blood vessels near the anus and lower rectum that can rupture, causing bleeding)
• Anal fissures (splits or cracks in the lining of the anal opening)
• Intestinal infections that cause inflammation
• Ulcers
• Ulcerative colitis
• Crohn's disease
• Diverticular disease, caused by outpouchings of the wall of the large intestine
• Abnormalities of the blood vessels in the large intestine

Gastrointestinal bleeding may be microscopic (invisible to the eye) or may be easily seen as red blood or black tar-like bowel movements, called melaena stools indicating digested blood.

A Faecal Occult Blood Test - The faecal occult blood test requires the collection of 3 small stool samples. Usually the samples are a bit of stool collected on the end of an applicator. The stool samples should be taken one day apart, because colorectal cancers may bleed from time to time, rather than consistently.

Preparation before a Faecal Occult Blood Test - The faecal occult blood test results are largely affected by how one prepares for the test, so it is important to follow the instructions carefully.

Stool samples should NOT be collected from individuals:
• with haemorrhoids
• during or within 3 days either side of a menstrual period

As certain foods can alter the test results, a special diet is often recommended for 48 to 72 hours before the test. The following foods should be avoided during that time:

• Beets
• Broccoli
• Spanspek (also cantaloupe, canteloupe, cantaloup, mushmelon, muskmelon, rockmelon, sweet melon, Persian melon)
• Carrots
• Cauliflower
• Cucumbers
• Fish
• Grapefruit
• Horseradish
• Mushrooms
• Poultry
• Radishes
• Red meat (especially ‘rare’ prepared)
• Turnips
• Vitamin C-enriched foods or beverages

Ding, D., Han, S., Zhang, H., He, Y. & Li, Y. 2019.
“Colorectal cancer is one of the top leading causes of cancer mortality worldwide, especially in China. However, most of the current treatments are invasive and can only be applied to very few cancers. The earlier a malignant tumor is diagnosed, the higher the patient's survival rate. In this study, we proposed a computational framework to identify highly-reliable and easily-detectable biomarkers capable of secreting into blood, urine and saliva by integrating transcriptomics and proteomics data at the system biology level. First, a large number of transcriptome data were processed to identify candidate biomarkers for colorectal cancer. Second, three classified models are constructed to predict biomarkers for colorectal cancer capable of secreting into blood, urine and saliva, which are effective disease diagnosis media to facilitate clinical screening. Then biological functions and molecular mechanisms of the candidate biomarkers of colorectal cancer are inferred utilizing multi-source biological knowledge and literature mining. Furthermore, the classification power of different combinations of candidate biomarkers is verified by machine learning models. In addition, the targeted drugs of the predicted biomarkers are further analyzed to provide assistance for clinical treatment of colorectal cancer. In this paper, our proposed computational model not only provides the effective candidate biomarkers ESM1, CTHRC1, AZGP1 for colorectal cancer capable of secreting into blood, urine and saliva, but also helps to understand the molecular mechanism of colorectal cancer. This computational framework can span the huge gap between transcriptome and proteomics, which can easily be applied to the biomarker research for other types of tumor.”
Stoma Care

Being diagnosed with cancer and having treatment takes time to come to terms with. It can also be difficult to cope with the physical effects of treatment. If a patient had a colostomy or ileostomy operation as part of treatment, the end of the bowel is brought out into an opening on the abdomen. The opening is referred to as a stoma. Some people have a temporary colostomy (an artificial opening into the colon) made during their treatment for bowel cancer. The colostomy may be closed a few months later when the bowel has fully healed.

Some people have a permanent colostomy or ileostomy (artificial opening into the ilium or small bowel). It can take a while to get used to dealing with a stoma. There is a lot of advice and support available in the form of a specially trained nurse referred to as a stoma nurse.

Basic Care of a Colostomy or Ileostomy

The colostomy bag is designed to stick onto the abdomen where it collects the faeces and flatus from the stoma. It is waterproof so one can wear it while showering or bathing. Most colostomy bags have several special features including a filter. This filter works by releasing wind so the bag does not inflate (which is called ‘ballooning’). The filter also has a deodorising action to make sure that there is no smell, which is one of the things that people worry about the most.

Emptying and Changing a Stoma Bag

It is good to establish a routine for changing a stoma bag. Keep this routine as simple as possible. As the stoma is more active at certain times of the day, like shortly after meals, bags should be changed at time when it is relatively inactive, like first thing in the morning.

Stoma bag needs to be changed regularly – usually between one and three times a day depending on the amount of faeces. If using a drainable bag, it is recommended to empty the bag before removing it. Then seal the bag inside a disposal bag and place in the dustbin. Do not flush it down the toilet, as it will cause a blockage.

Taking Care of the Skin Around the Stoma is very important

Adhesive plate - The adhesive plate must fit snugly around the stoma. If the hole in the adhesive plate is larger than the stoma, the skin will become exposed to the harmful effects of the faeces and become irritated. Also, if the adhesive plate is cut too small, it may cause damage to the stoma. Check regularly to ensure the adhesive plate has a snug fit around the stoma.
Watch out for irritants - Leakage on to the skin, excessive removal of the adhesive plate and harsh skin cleansers can all cause irritation of the skin.

Bleeding - It is common to experience a small amount of bleeding around the stoma when cleaning it – no cause of alarm. If bleeding comes from inside the stoma, a doctor is to be contacted immediately. (Coloplast).

Diagnosis of Colorectal Cancer
Diagnosis of Colorectal Cancer may include:

- Obtaining a history from the patient
- A Physical examination
- A digital rectal examination
- The patient may then be referred for further examination - if the diagnosis uncertain or if symptoms suggest colorectal cancer.

Possible further examination
Two tests may also be used to confirm a diagnosis of bowel cancer:

**Sigmoidoscopy** - a device called a sigmoidoscope is used, which is a thin, flexible tube attached to a small camera and light.

A sigmoidoscopy is not usually painful, but can feel uncomfortable; most people go home after the examination has been completed.

**Colonoscopy** – it is similar to a sigmoidoscopy except a longer tube, called a colonoscope, is used to examine the entire large bowel.

Staging of Colorectal Cancer
Cancer staging is the process of determining the extent to which a cancer has developed by spreading. It also
assists in planning of treatment.

**Where Colorectal Cancer May Spread To**
Should colorectal cancer spread in the body, it may spread as indicated in the table below:

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Main Sites of Metastasis (Spread)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladder</td>
<td>Bone, liver, lung</td>
</tr>
<tr>
<td>Breast</td>
<td>Bone, brain, liver, lung</td>
</tr>
<tr>
<td>Colon</td>
<td>Liver, lung</td>
</tr>
<tr>
<td>Colorectal</td>
<td>Liver, lung, peritoneum (lining of abdomen)</td>
</tr>
<tr>
<td>Lung</td>
<td>Adrenal gland, bone, brain, liver, other lung</td>
</tr>
<tr>
<td>Melanoma</td>
<td>Bone, brain, liver, lung, skin, muscle</td>
</tr>
<tr>
<td>Ovary</td>
<td>Liver, lung, peritoneum (lining of abdomen)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Liver lung, peritoneum (lining of abdomen)</td>
</tr>
<tr>
<td>Prostate</td>
<td>Adrenal gland, bone, liver, lung</td>
</tr>
</tbody>
</table>

(National Cancer Institute).

**Treatment for Colorectal Cancer**
Most people with early colorectal cancer may have surgery.

Surgery - In many people with early bowel cancer the surgeon is able to cut away all of the cancer without any further treatment required.

There are different types of surgery for colorectal cancer. Which type of surgery is best will depend on where the cancer is, its type and size, and whether it has spread (metastasised) or not. If the cancer is removed from the bowel lining it is called a local resection.

Radiotherapy - Radiotherapy is not often used to treat cancer of the large bowel. It might be used before or after surgery for rectal cancer. It may include:

- External beam radiation therapy – radiation therapy from an external source
- Internal radiation therapy (also known as brachytherapy) where radioactive material is put into the rectum, and positioned close to the tumour. It is left in place for a predetermined period of time.


**BACKGROUND AND PURPOSE:** To review the clinical outcomes following the use of stereotactic body radiotherapy (SBRT) in patients with metastatic colorectal cancer (mCRC) from a large academic institution.

**MATERIALS AND METHODS:** Patients with mCRC treated with extracranial SBRT between 2008 and 2016 were identified from an institutional database. Treatment indications were oligometastases, oligoprogression, and local control of dominant tumors. Endpoints included local progression (LP), overall survival (OS), progression-free survival (PFS), and cumulative incidence of starting or...
changing systemic therapy (SCST). Univariate and multivariable analyses (MVA) were performed to identify predictive factors.

**RESULTS:** One hundred and sixty-five patients (262 lesions treated) were included. The 2-year cumulative incidence of LP was 23.8%. Lower SBRT doses and tumor location in the liver were significant predictors of LP on MVA. Median OS was 49.3 months, 19.3 months, and 9.0 months for oligometastases, oligoprogresison, and local control of dominant tumors, respectively. Primary tumor not in situ, smaller tumors, fewer lines of previous systemic therapy, lower CEA, and oligometastases treatment indications were significant predictors of higher OS on MVA. For the entire cohort, median PFS was 9.9 months, while oligometastatic patients had a median PFS of 12.4 months. 2-year cumulative incidence of SCST was 41.7%.

**CONCLUSIONS:** Survival outcomes are favorable after SBRT for mCRC patients. A significant proportion of patients did not have a change in systemic therapy after SBRT. Higher doses are required to obtain the best local control. Efforts should be made to better optimize SBRT delivery for liver metastases given their higher local failure rate.

Chemotherapy - Chemotherapy uses anti-cancer (cytotoxic) drugs to destroy cancer cells. It works by disrupting the growth of cancer cells. As it circulates in the blood, it can reach cancer cells almost anywhere in the body and kill them. Chemotherapy may be given before surgery for rectal cancer. Chemotherapy may also given as a treatment for colorectal cancer that has spread (metastasised).

Biological Therapy - biological therapies are drugs that help the body to control the growth of cancer cells.

Immunotherapy - Current immunotherapies for colorectal cancer fall into several broad categories: checkpoint inhibitors and immune modulators, monoclonal antibodies, therapeutic vaccines, adoptive cell therapy, oncolytic virus therapy, adjuvant immunotherapies, and cytokines. Most of these therapies are still in early-phase clinical testing for colorectal cancer, but their successful use in other types of cancers suggests that they may ultimately prove useful for colorectal cancer as well.


**INTRODUCTION:** the aim of the study is to evaluate the effect of preoperative and postoperative oral nutritional therapy in the prevention of malnutrition and postsurgical complications in colorectal cancer. Patients and methods: patients who underwent oncological colorectal surgery between June 2014 and December 2015 are included. An evaluation of preoperative nutritional status is performed. Patients received IMPACT® (2/day) for 5-10 days previous surgery. In the postoperative period, patients received IMPACT®/24h from 3rd to 7th postoperative day. Patients with low rates of albumin (< 2.5) or postoperative ileus received parenteral nutrition. Data were analyzed with the statistical package SPSS 21.0.

**RESULTS:** two hundred and twenty colorectal cancer patients were included. Twenty-eight patients did not take the preoperative oral supplements. Following the intake of nutritional supplements, an improvement of prealbumin and transferrin was noticed. One hundred and twenty-one patients received oral nutrition and 41 received parenteral nutrition in the postoperative period. There were more postoperative complications among patients without preoperative nutritional supplements (50% vs 28.1%; p = 0.019), and hospital stay was higher 14.64 ± 11.86 vs 9.36 ± 5.5; p < 0.005).
There were more complications among patients without postoperative oral nutritional supplements (24% vs 18.2%; p < 0.005), with more wound infection (1.9% vs 0.8%) and leaks (1.9% vs 0.8%). They also had a higher average stay (9.15 4.6 vs 7.57 2.5 days; p = 0.021).

**CONCLUSION:** in our study, patients that received oral nutritional supplements prior and following colorectal surgery had a lower rate of complications and a shorter hospital stay.

**Treatment for Advanced Colorectal Cancer**
Advanced colorectal cancer means the cancer has spread to other parts of the body from where it started in the bowel (colon) or back passage (rectum). The cancer may be advanced when it is first diagnosed, or the cancer may recur some time after original treatment.

Chemotherapy and radiotherapy may be used to shrink a cancer and control symptoms. Surgery can be used in some situations to treat advanced colorectal cancer.

Specialised surgical treatments may be used to destroy bowel cancer that has spread to the liver (liver secondaries). These treatments may include hepatic artery chemoembolisation, radiofrequency ablation, cryotherapy, microwave ablation and laser therapy.

**About Clinical Trials**
Clinical trials are research studies that involve people. They are conducted under controlled conditions. Only about 10% of all drugs started in human clinical trials become an approved drug.

Clinical trials include:
- Trials to test effectiveness of new treatments
- Trials to test new ways of using current treatments
- Tests new interventions that may lower the risk of developing certain types of cancers
- Tests to find new ways of screening for cancer

The South African National Clinical Trials Register provides the public with updated information on clinical trials on human participants being conducted in South Africa. The Register provides information on the purpose of the clinical trial; who can participate, where the trial is located, and contact details.

For additional information, please visit: www.sanctr.gov.za/

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Anatomy Colon


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Coloplast
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Colonoscope

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Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]
Colostomy
http://www.google.co.za/search?q=colostomy+pic&hl=en&tbm=isch&sourc=univ&sa=X&ei=EegZUcTnI8qp0AXmulIDwBw&ved=0CCsQsAQ&biw=1821&bih=817

Colostomy Bag
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Fruit and Vegetables
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MedlinePlus

National Bowel Cancer Screening Programme

National Cancer Institute
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NHS, UK.

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