



Gut Motility: In Health and Irritable Bowel Syndrome

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What are the normal movements of the digestive tract?

The digestive tract is a continuous tube from the mouth and esophagus (gullet) through to the rectum and anus. Each region of the gut carries out a number of special tasks. These different tasks are needed for the break-down and digestion of food. We now have a clear understanding of what happens to the food we eat as it passes through each part of the digestive tract.

The esophagus, stomach, small intestine (small bowel), and large intestine are the main regions of the digestive tract. Gut motility is the term given to the stretching and contractions of the muscle in the wall of the stomach and bowel. These movements enable the food to progress along the digestive tract while, at the same time, ensuring the absorption of the important nutrients. New techniques of measuring these movements of the gut have enabled us to recognize the normal patterns of contraction in each of the regions.

The types of contraction in the gut differ depending on the region and the type of food which has been eaten. Some contractions cause onward movement of the food, others cause mixing and grinding. At some points along the digestive tract, e.g., between the small and large bowel, are specialized muscles called sphincters: these act to close off the portions of the gut on either side of them, thus preventing the onward passage of food when appropriate. They also help prevent food material from being moved back along the digestive tract in the wrong direction.

The stomach is large enough to temporarily store the food eaten at each meal. Solid food is gradually broken down by powerful muscle contractions in the lower end of the stomach. This muscular activity produces small food particles suitable to enter the small bowel, where processes of nutrient absorption begin. Different types of food empty from the stomach at different rates; e.g., fatty foods take longer to leave the stomach than other foods. Beverages are handled differently by the stomach, emptying more quickly into the small bowel and not requiring break-down into smaller particles. Normally, most of an average-sized meal has left the stomach after about 2 hours.

In the small bowel, the muscular contractions occur irregularly, varying in strength and type. Here also, the different nutrients in food affect the type of contractions generated. After an average sized meal, the contractions continue for several hours, mixing the food and moving it along the bowel. These types of contractions last until most of the meal residues enter the large bowel. Different foods travel at different rates along the small bowel; e.g., foods high in fat travel more slowly than fiber-rich foods. After most of the food has left the small bowel, a different pattern of contractions appears. Bursts of powerful contraction, occurring about every 90 minutes during fasting and particularly at night, progress slowly down the bowel. These bursts clear residual food and secretions from the upper bowel, and thus act as a “housekeeper” in the bowel.

In the large bowel (colon), water and salts are absorbed from the food residues and further mixing of the residues occurs. The patterns of bowel contraction in the colon are not as well understood as those in the small intestine. It is known, however, that eating a meal stimulates contractions in the colon—the larger the meal the greater is the response. Stretching of the rectum by feces produces relaxation of the muscles of the anus and surrounding structures. The rectal contents can then be discharged voluntarily.

Intestinal gas is made up of carbon dioxide, hydrogen and a number of other gases. It is produced largely from fermentation of undigested food residues by bacteria in the colon. The more dietary fiber that is consumed, the more gas is produced. Fiber also increases the bulk of the stool by increasing the amount of water held in the stool. The greater the stool bulk, the shorter is the time taken for the stool to move through the colon (transit time). On an average diet, foods normally take up to three days to pass through the colon. During sleep, there is a large drop in the number of contractions in both the small and large intestine, compared to that during the daytime.

Gut Motility in Irritable Bowel Syndrome

Disorders affecting the motility of the digestive tract may be self-limiting, occurring only for a brief period as in acute infection of the digestive tract causing diarrhea. They can also be more longstanding and persistent as in irritable bowel

syndrome (IBS). IBS is associated with a variety of symptoms, particularly abdominal pain and an irregular bowel habit.

The precise causes of IBS are unknown; it is likely that there are a number of factors which result in similar types of symptoms because there are a limited number of ways in which the bowel can respond. An important finding has been that in some cases the bowel itself is abnormally sensitive to stretching and to contractions, or to the passage of food and gas along the bowel. This may result in abdominal discomfort or pain, and/or a feeling of bloating. The oversensitivity of the bowel to stretching may also lead to disordered and inappropriate bowel muscular activity, resulting in an erratic bowel habit.

In the majority of patients, the underlying trigger factor that has produced this excessive sensitivity cannot be determined. In some patients, however, IBS symptoms can be precipitated by an attack of food poisoning or gastroenteritis. At the time of infection subtle damage to the nerves lining the bowel wall may occur. Symptoms in this post-infective IBS usually improve gradually over time.

As discussed above, alterations in the normal patterns of stomach and bowel motility are thought to cause many of the symptoms of IBS. This altered gut motility can be brought out by things such as eating, stress, emotional upsets, or even factors such as the menstrual cycle.

Uncoordinated or abnormally high pressure contractions may cause excessive distention or stretching of the bowel wall directly, or may produce other effects such as the trapping of pockets of gas which then distend the bowel—each of these effects may give rise to abdominal pain or discomfort.

Impairment of propulsive activity, or conversely an excessive number of contractions, may lead to abnormal movement of food residue through the gut. Delayed transit of food results in a range of symptoms from nausea and vomiting to abdominal pain and/or constipation, depending on the region affected. Delayed emptying from the stomach can cause loss of appetite, nausea, inability to eat a normal meal, vomiting, belching, and bloating.

Accelerated transit through the small and large bowel may result in abdominal pain and also diarrhea. Stools of small or “normal” volume, but passed more frequently, may result from the combined effects of rapid small bowel transit, abnormal motility of the colon, and abnormal sensitivity of the rectum to stretching or distention. Small, hard, pellet-like stools may result from colonic and/or small bowel motility abnormalities, and these stools are more difficult to expel from the rectum than “normal” stools.

A feeling of incomplete emptying after opening the bowels may result from the frequent entry of loose stool into

the rectum, or from the retention of fecal pellets in an overly sensitive rectum.

Mental stress can be associated with the onset and exacerbation of IBS symptoms in some patients. Normally, stress can affect the patterns of contraction in the small and large bowel and also the rate of stomach emptying. This can occur because of the extensive connections between the brain and the nervous system in the bowel wall. It is believed that IBS patients may be more susceptible to altered motility of the bowel when normal stressors act on an oversensitive bowel.

Rates of transit through the digestive tract are also affected by the level of female hormones, therefore symptoms may become worse at certain times of the menstrual cycle in those with an oversensitive bowel.

There are currently available a range of different methods of treating the symptoms of IBS that can lead to substantial improvement in many cases. Further research into gut motility, however, will increase our understanding of IBS and related disorders. Better understanding will undoubtedly lead to new treatments for the distressing symptoms of these disorders.

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