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DIET AND THE AGING DIGESTIVE TRACT

Food enters the mouth and exits at the anus. Digestion starts as soon as food enters the mouth and ends when it exits at the anus.

Each part of the digestive tract has a specific function. These include:

- Processing of food
- Digestion of food
- Absorption of nutrients
- Utilization of nutrients
- Excretion of waste

In normal, healthy digestion food moves along the digestive tract and each of these functions occur in sequence and in the correct location.

When things go wrong

Distressing symptoms result when any of these functions is upset.

This can occur more frequently as a person ages. As a person grows older several things happen:

- The body slows down
- Secretions such as saliva and "digestive juices" decrease
- Injuries heal more slowly
- Dryness, soreness and pain in the mouth discourage eating
- Exercise decreases
- Fluid intake changes
- Movement of food through the digestive system is disturbed

Let us look at each part of the digestive tract as food moves through, and see how things can go wrong, and what we can do about it.

THE MOUTH

The main function of the mouth is the physical breakdown of food by chewing. This grinds the food into smaller and smaller particles that can be more easily digested. Saliva provides fluid as a lubricant, which helps the physical breakdown process.

In addition, saliva contains an enzyme (amylase) which starts the process of starch digestion.

Problems:

Tissue injury in the mouth is not uncommon. This may be caused by a number of things, such as tooth and gum problems which increase as a person ages. Ill-fitting dentures which constantly rub the mouth tissues is another frequent problem in older people.

In addition, decreased saliva can lead to a dry mouth. The reduction in the protection usually provided by the saliva, and a decrease in lubrication can lead to increased infection in oral tissues. Irritation can cause unpleasant soreness, which is often referred to as burning mouth syndrome. Canker sores also seem to occur more often

Solutions:

It is important that the tooth and gum problems and adjustment of dentures should be addressed by regular visits to the dentist.

A sodium bicarbonate (baking soda) mouthwash may help to soothe the irritated tissues. A baking soda toothpaste may be less irritating than ones that contain many preservatives and artificial colours and flavourings that can make an existing inflammation worse.

Acid foods such as tomatoes, citrus fruits, sour candies should be avoided as long as there is soreness in the mouth. The use of sour candy when the tissues heal, however, may help in increasing the flow of saliva.

Often cooking raw foods such as tomatoes, vegetables and fruits, will reduce their effect on sore tissues. Cracking nuts, and chewing raw seeds may cause damage to the delicate oral tissues and should be avoided. Irritating foods such as hot spices (cayenne, tabasco, jalapeno peppers, etc) should not be eaten while soreness in the mouth persists.

Beverages such as water, dilute fruit juices, and coffee and tea in moderation, should be increased, and should be taken throughout the day to ensure adequate moisture within the mouth.

THE OESOPHAGUS

Food passes from the mouth to the stomach through a tube called the oesophagus.

Problems in the oesophagus:

"Throat tightening" or a "lump in the throat" can impede movement of the food from the mouth into the oesophagus. A number of things can cause this sensation, the most common of which is stress and anxiety. A decrease in the amount of saliva produced will cause a dry mouth, which may make swallowing food difficult. This also may contribute to a fear of choking on the dry food, which may further impede swallowing.

A post-nasal drip from a cold or respiratory allergy can produce an unpleasant sensation at the back of the throat. Increased mucus secretions due to a cold or allergy can also produce similar unpleasant sensations and even nausea.

If a person experiences reflux from the stomach, the acidity of the contents often causes burning (heartburn) in the oesophagus. This seems to be more common as a person ages.

Solutions:

Increase the length of time that food is chewed. This will allow more saliva to mix with the food, and will ensure that the food is ground into small particles before it is swallowed. Because a sore mouth, teeth or gums usually leads to as little chewing as possible, the causes of these problems should be addressed by regular visits to the dentist.

Fluid intake should be increased. Water should be taken with all meals. Alcohol can be dehydrating, and is best taken as a cocktail or aperitif before meals or as a liqueur afterwards.

To reduce stress, tension and anxiety, meals should be taken in a calm, serene environment. Play calming music on the stereo. Refuse to discuss tension-producing topics during meal-times and avoid all arguments until at least an hour after a meal.

Food should be eaten slowly, in small portions and chewed well. Changing the texture of food sometimes helps considerably. Pureed food is often tolerated better than whole foods. Soups especially can be pureed; changing a "chunky" soup into a creamed soup by processing in a blender will not change its nutritional content, but may well reduce the irritating effect of the food, making it easier to swallow, and more available for digestive enzymes.

THE STOMACH

Acid in the stomach is very important because it starts the process of digestion of proteins (meat, poultry, fish, eggs, milk proteins). Hydrochloric acid weakens the linkages between molecules, making protein (peptide) bonds more accessible to digestive enzymes when the food moves down into the small intestine.

Stomach acid is also very important in killing any microorganisms that enter with the food, so preventing bacteria and viruses from causing disease in the digestive tract.

A churning action of muscles surrounding the stomach makes sure that the food is formed into a smooth paste, and that all surfaces are well coated with acid.

From the stomach food is allowed into the upper part of the small intestine, called the duodenum, through the pyloric sphincter. The circular muscle of the pyloric sphincter regulates the flow of the food paste into the duodenum a little at a time.

Problems in the stomach:

Too little acid can have two effects:

Microorganisms are not killed efficiently, and some that might cause disease are allowed into the small intestine

The linkages between the protein molecules are not adequately hydrolysed (weakened), and protein digestion in the small intestine may not be complete as a result

Too much acid can lead to heartburn, and sometimes reflux.

Burping can be caused by a number of factors, such as swallowing air with food, which rises back up through the oesophagus. Antacids may also cause burping because they neutralize stomach acid, and in doing so release carbon dioxide as a gas, which rises up through the oesophagus into the mouth. Carbonated beverages (soda pop) contain carbon dioxide, and when swallowed, the gas is released and rises up into the mouth.

Solutions:

Food should be eaten slowly and chewed well. If chewing is a problem, food should be pureed as much as possible.

No talking while putting food into the mouth, chewing and swallowing. Talk between mouthfuls of food.

Drink slowly. Do not drink carbonated beverages or alcohol with meals.

Antacids (Tums, Rolaids, etc) should be taken only for heartburn. They should not be taken daily as a source of calcium. There are a number of calcium pills and liquids on the market that are specifically designed as a supplemental source of calcium and are more appropriate than antacids for this purpose.

If heartburn and reflux is a problem irritating foods and beverages such as spices, high fat foods, and foods high in sugar should be avoided or decreased.

THE SMALL INTESTINE

Food paste passes from the stomach into the small intestine in small squirts. The small intestine is about 20 feet long. With all the folds at the surface, the small intestine has an enormous surface area (as large as two tennis courts). This allows adequate digestion and absorption of nutrients as food passes along its whole length and across the enormous surface area. Food is propelled along by rhythmic contractions of the muscles lining the intestine (peristalsis). Churning of the contents allows food to mix with digestive juices and enzymes.

Secretions in the small intestine change the acid of the stomach to alkaline, which allows the digestive enzymes to function properly. The enzymes come in from the pancreas to digest starches, proteins and fats.

Before fats can be adequately digested by lipase enzymes, they are required to be broken down into small droplets. This is accomplished by bile which comes in from the gall bladder.

Sugars such as sucrose (table sugar and syrup), lactose (milk sugar), and maltose (derived from starches) are digested by enzymes produced in cells lining the small intestine, called brush border cells.

When the food is digested, nutrients are released as small particles or molecules. When they are small enough, the nutrient molecules are carried through the lining of the small intestine into blood by a variety of transport mechanisms. The nutrients are then carried to the organs that need them.

When nutrients are present in excess, they are stored as fat until they are required by the body. If certain nutrients are not needed by the body, and are not stored for future use, they are broken down and excreted through the kidneys.

Undigested food is not absorbed through the lining of the small intestine. It passes into the large bowel - the caecum and colon - where millions of bacteria are waiting to digest the food materials that cannot be digested by human enzymes, or were not digested for other reasons.

Problems in the small intestine:

If food passes through the intestines too quickly (for example in chronic and severe diarrhoea), inadequate digestion takes place. This means that there is a reduction in the amount of nutrients absorbed into the body, and the person will tend to lose weight.

In addition, the undigested food will pass through into the large bowel where it will provide a substrate for microbial action.

If insufficient bile is present, there may be inadequate breakdown of fats, because the lipase enzymes that digest them cannot gain access to the molecules when the fat droplets are too large. This may result in reduced fat absorption, and fat moves out of the body in the faeces, which usually float because fat is lighter than water.

Damage to the brush border cells lining the small intestine, or natural decay, means that many sugars are not adequately digested. The most common sugar to be inefficiently digested because of lack of the appropriate enzyme is lactose. This results in lactose intolerance. Occasionally, intolerance of sucrose (table sugar, syrup, high sugar desserts) can produce the same symptoms as lactose intolerance. In both cases, undigested sugar passes into the large bowel, where it is fermented by microorganisms, resulting in diarrhoea, gas, bloating, and pain.

Solutions:

Dietary measures to promote digestion and absorption in the small intestine and to reduce the amount of undigested food material passing into the large bowel need to be followed.

Moderate amounts of all nutrients, none in excess, should be included in the diet. A moderate fat diet is fine when digestion is normal. A low fat diet is more suitable when severe or chronic diarrhoea is a problem, because rapid transit of the food through the small intestine means that the lipase enzymes have insufficient time to act, and a lot of fat is undigested.

Lactose intolerance

When lactose intolerance is a problem, lactose-free dairy products should be consumed. It is not necessary to avoid all milk and milk products, since the protein in the milk is adequately digested and absorbed. Lactase-treated milks and lactose-free products (most fermented cheeses) are suitable.

If desired, Lactaid drops can be added to food prior to consumption. Lactaid requires 24 hours to break down the lactose in the food, so it should not be consumed earlier than 24 hours after adding Lactaid. Some people find that they can consume lactose-containing foods without problems if they take Lactaid pills prior to eating.

Intolerance of other sugars

To reduce the amount of sucrose and other disaccharide sugars from fruits, vegetables and other plant sources, complex carbohydrates in the whole foods rather than processed sugars and free starches should be eaten. For example, whole wheat bread rather than white bread, brown rice instead of white rice, whole fruits and vegetables rather than juices and desserts with added sugars and syrups.

The monosaccharide (single) sugars do not require digestion. The molecules are small enough to be absorbed. When a person is having problems with disaccharides, substituting single sugars such as fructose (fruit sugar) and honey, in place of table sugar and syrups, often solves the problem.

THE LARGE BOWEL

Undigested food passes into the caecum and colon where millions of microorganisms, especially bacteria, live at all times. They digest foods that humans are unable to do because we lack the right enzymes. The bacteria make extra nutrients from the undigested foods, which are then absorbed into the body. These nutrients include some essential vitamins such as vitamin K (used in blood clotting) and some of the B vitamins. Some of the bacterial products (short chain fatty acids) may afford protection from certain types of cancer.

Water and electrolytes are extracted from the food and reabsorbed back into the body to maintain balance. The residue is passed as faeces. The consistency of the faeces is determined by the amount of water extracted from the residue, and the types of undigested material contained in it, such as water-retaining fibre and dietary fats.

Insoluble fibre and resistant starch

A lot of plant material, including certain types of starch, is not digestible by human enzymes, and passes into the colon unchanged. There are a few ways in which the amount of starch that is digested and absorbed in the small intestine, and the amount that passes undigested into the large bowel can be reduced. For example:

Eat runner beans, green beans instead of green peas and beans with hard outer skins (e.g. broad beans)

Lentils and split peas are more readily digested than navy beans, kidney beans, white beans, and others with indigestible outer skins

Free starches should be eaten **hot** - cold starch crystallizes and is more difficult to digest

- Eat only **hot, freshly-cooked**:

- pasta
- white rice (no sushi!)
- boiled, baked, mashed potatoes

Eat only **very ripe** bananas. 89% of the starch in a banana passes undigested into the colon; only about 10% is actually digested and absorbed in the small intestine

If bloating, gas, pain are frequent problems, cook **all** fruits and vegetables, including bananas and salad vegetables

Nuts and seeds are more efficiently digested when ground into flours or pastes with the consistency of smooth peanut butter.

Problems in the large bowel:

Constipation:

When food sits for too long in the colon bacterial fermentation may proceed too far and produces excessive quantities of gas, which causes bloating, and sometimes smelly products. Too much water is extracted from the faeces which become very hard. The hard stool might cause small tears in the anus - fissures - which bleed. In addition, haemorrhoids are irritated, become painful and sometimes bleed

Flatulence

An important result of microbial fermentation is the production of several different types of gases. Gas distends the abdomen and causes bloating. Bloating causes pressure, which results in pain, which is sometimes described as "cramping".

Inadequate digestion of proteins provides a "proteolytic substrate" which is fermented in the process called "putrefaction", which is quite malodorous (smelly).

Diarrhoea:

When food passes through the digestive tract too quickly, nutrients are not absorbed completely. If insufficient reabsorption of water and electrolytes occurs in the large bowel, dehydration can result. In addition, bacteria do not have time to break down the undigested food in the large bowel, and do not make the short chain fatty acids that are thought to provide protection from certain types of cancer.

Solutions:

Constipation:

Eat sufficient fibre to stimulate of movement of food through the digestive tract. Rice bran, oat bran, psyllium, tend to be less "irritating" than bran from wheat or rye.

A good supply of fruits, vegetables, and complex carbohydrates should be eaten every day. If the raw form is irritating, the foods should be cooked and pureed. Cooking and pureeing do not change the fibre.

Drink plenty of water.

Increase exercise. Even gentle walking promotes movement of the food through the digestive tract, and keeps all organ functions healthy.

Diarrhoea:

Drink adequate amounts of water and other fluids. Diarrhea it is necessary to increase quantity still further to counterbalance the excessive amount of fluid lost in the faeces. Pureed food is often better digested and absorbed than a liquid diet. Liquids pass through the small intestine too quickly, reducing the time in which food is in contact with enzymes, and therefore decreasing the amount of nutrition available.

Promote absorption in the small intestine and reduce the residue passing into the large bowel:

- Increase non-irritating (soluble) fibre to provide "bulk". Psyllium is a good source of such fibre.

- Decrease irritating fibre such as wheat bran, and similar grains such as rye and whole corn

- Reduce disaccharide sugars, especially lactose and sucrose.

- Increase honey, glucose and fructose (monosaccharides) {This directive is not suitable for a diabetic diet}

- Eat all starchy foods such as pasta, white rice, and potatoes, hot and freshly cooked.

Flatulence (wind)

- Aim for maximum digestion and absorption of nutrients in the small intestine, by following the solutions for diarrhea, above.

- Reduce the undigested residue passing into the colon, by following the same directives.

- Address the causes of constipation as above - the longer the food remains in the colon, the greater the degree of fermentation, and the more gas is produced

- Ensure adequate stomach acid to start the process of protein breakdown. Don't take antacids unless absolutely necessary.

- Increase complex carbohydrates (whole grains, cooked and pureed fruits and vegetables) to increase the "sweet substrate".

- Acidophilus milk or tablets is sometimes suggested to encourage "saccharolytic" bacteria and reduce the "putrefactive" types. This only works well after the putrefactive bacteria have been killed off, e.g. after a course of oral antibiotics

THE BALANCED DIET

The most important thing to keep in mind at all times: good health depends on supplying the body with all the nutrients it needs. In spite of food restrictions, it is possible to eat a balanced diet that includes foods from all essential food groups in the proportions necessary to achieve and maintain optimum health.

Your best source of information in achieving the diet best suited for your needs is a registered dietician. Contact your local hospital, your GP, or obtain information about health care clinics in your area to find a dietician to help you.