

Plants, herbs and spices as information-carriers for the stomach and the intestines

Healthy, strong digestion as the key to well-being

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It is estimated that at the present time up to 15 - 35% of adults suffer from functional gastrointestinal symptoms (dyspeptic syndrome, irritable stomach, irritable bowel syndrome IBS), whereby women seem to be affected twice as frequently as men. In an extended frame, upper abdominal symptoms involving the bile ducts, the liver and the pancreas are generally classified as dyspepsia (Table 1). Persistence of the symptoms for several weeks is defined as chronic dyspepsia. The various clinical symptoms can considerably impair the quality of life of those who are affected [1].

The actual causes of these widespread symptoms are still largely unexplained. Increased susceptibility, disorders of gastric relaxation, food intolerance and allergies are discussed as possible causes. Psychosomatic processes, however, seem to play a not insignificant role.

Functional dysregulations, such as reduced production of gastric juices, disorders of the formation and secretion of bile, reduction of pancreatic function and secretion, and colonisation of the intestines by pathological bacteria and fungi, can be recognised as underlying mechanisms.

Table 1: The symptomatology of dyspeptic disorders [1]

Frequent symptoms:

Abdominal pain, irregular defecation, flatulence

Alternating constipation and diarrhoea, changes in consistency of the stools, feeling of inadequate emptying of the bowels

Flatulence with paroxysmal pain.

Other symptoms:

Headache, cardiac pain, irregular pulse, rheumatic complaints, menstrual disorders, sleep disorders.

The aim of this present article is to investigate the causes of these widespread digestive disorders from the point of view of holistic medicine. Special attention is given to the function of the stomach and the small intestine.

Herbs and spices in particular can assume an important function in a symptom-oriented dietary programme. Starting with the sensory effects of herbs and spices, and passing on to the secondary components of the plants, there is a broad spectrum of control impulses for the functional support of the motoricity and secretory capacity of the stomach and the intestines. The bioactive substances contained in herbs and spices can be classified into a large number of bioactive compounds: carotenoids, phytosterols, saponins, glucosinolates, polyphenols, protease inhibitors, terpenes, phyto-oestrogens, sulphides, phytic acid [2].

As has been known in Europe since time immemorial, a herbal schnaps, as an aperitif or a digestive, has helped to settle many a stomach. Also in Asian cultures, through the use of herbs and spices, Ayurveda, Traditional Chinese Medicine or Tibetan Medicine have provided valuable nutritional control impulses. Already in the Middle Ages, there was a wealth of descriptions of the different effects of herbs and spices on the digestive system, many of which have long been forgotten (Table 2). We would now like to consider the question: How are the controlling effects of herbs and spices on the digestive function to be understood from the point of view of holistic medicine?

Table 2. Traditional descriptions of the digestive-physiological controlling functions of foodstuffs, herbs and spices (with examples):

- Astringents – the intestinal mucosa is coated with a protective film of tanning agents (blueberries, pomegranate seeds,)
- Bitters – bitter substances that stimulate the gastric secretion and increase the appetite and the absorption (ginger, lesser galangal, gentian, orange peel, lemon peel,)
- Cholagogics – increase the bile flow (cardamom, peppermint, pomegranate seeds,)
- Choleretics – increase the production of bile
- Cholekinetics – promote emptying of the gallbladder (turmeric, radish, artichoke,)
- Carminatives – sedative effect, they act especially against flatulence (cardamom, cinnamon, caraway fruit, fennel, aniseed,)
- Spasmolytics – anticonvulsive (coriander, sage, peppermint,)
- Stomachics – stimulate the appetite and the digestion, mainly covering the activities of the bitters and the carminatives
- Tonics – strengthen the digestion (pomegranate seeds)
- Substances promoting enzymatic activity (papaya).

From the Stone Age into the Information Age?

In the search for the causes of the widespread digestive problems it is helpful to consider the different aspects of modern diet in relation to digestion.

The history of the development of our modern diet perhaps shows us which factors are still missing today, in spite all the “modernity”.

Back in the times of the nomadic stone-age people, about 100,000 years ago, their diet was meagre, but extremely varied. They lived on fruit, leaves, root tubers and beans, and in rare instances a wild animal was killed. The average life expectancy was short and the infant mortality high. Then around 10,000 years ago many tribes became settled and started to cultivate cereals and breed domestic animals.

The industrial revolution of the past 150 years brought about perhaps the most radical change in human behaviour since the migrations of the first inhabitants about 100,000 years ago. The advances in housing and the improvements in sanitation and personal hygiene have doubled the average life expectancy of the population.

The main objective of the industrial supply of food was the mass production, under perfect, hygienic conditions, of all the principal foodstuffs. Initially the emphasis was placed on their energy content, in the form of calories. At the same time, the quality of the principal foods was neglected and their general amino-acid, fatty-acid and sugar content was highly valued.

When it was recognised that deficiency of the calorifically unimportant trace elements can lead to pathological symptoms, research was started into micronutrients, vitamins, minerals and trace elements, which resulted in recognition of their great importance for a balanced, healthy diet. Only gradually it came recognised that the content of essential nutrients in the principal foodstuffs is also of decisive significance. The best example of this are the carbohydrates, with which purified (refined) products such as sugar, white flour and polished rice cannot replace the effect of the roughage originally contained in these foods. Another example are the hydrogenated fats, which are not able to cover the unsaturated fatty acid requirement.

In the course of the last few years these factors have been recognised and improvements have been made, so that in this respect today’s diet can be described as balanced in regard to its calorie, vitamin and trace element content (provided the diet itself is balanced).

However, as we enter the “information age” what has emerged as a clear shortcoming is the fact that a perfect diet must also contain important information for the functioning of the digestion itself. The intestine is not simply a mobile tube into which food and liquid is poured from the top. The gastrointestinal tract is an **information-processing system** that identifies the food and tries to utilise it to optimal effect. If the important control impulses (which have to come from the food itself) are missing from the digestive apparatus the gastrointestinal regulation system cannot function correctly. Initially, minor irregularities creep in which gradually adversely affect the person’s well-being. If the digestion is incomplete, digestive disorders appear.

Thus the lack of informative material can lead to the following changes, for example:

- Slowing down of the digestive process
- Reduced secretion (often associated with latent dehydration)
- Poor biliary function

A good, strong digestion is the key to an overall sense of well-being. The above mentioned foods, with the emphasis on calories and vitamins, cannot solve these problems, or only partly.

As a positive digestion-promoting mixture, the classical “Se ‘bru 5” mixture (Padma Digestin) from Tibetan Medicine, which through its generally strengthening properties acts as a digestive tonic, should be presented here (Table 3, Fig. 1). From what has been passed down through Tibetan Medicine it is known that this mixture promotes the digestive process and permanently regulates the gastric, intestinal and hepatic functions.

But in order to develop these concepts further, we have to know more about the secretory and immunological functions of the digestive apparatus.

Table 3: Example of a herbal mixture to strengthen a healthy digestion (Se ‘bru 5, Padma Digestin)

Cardamom	<i>Cardamoni fructus</i>
Lesser galangal	<i>Galangae rhizoma</i>
Pomegranate seeds	<i>Punicae granati semen</i>
Long pepper	<i>Piperis longi fructus</i>
Cassia bark	<i>Cinnamomium cassia</i>



Fig. 1: Se ‘bru 5 (Padma Digestin), a classical herbal mixture from Tibetan Medicine for support of the digestion, with cardamom, lesser galangal, pomegranate seeds, long pepper and cassia bark (clockwise from the top centre)

The digestion as a secretory cascade

When we take food, this starts a finely tuned cascade of secretion of digestive juices. Besides their obvious function of breaking down and liquefying the food and making it able to pass easily through the digestive tract, the different digestive juices also have important enzymatic and immunological functions.

Every day a total of about 10 litres of fluid are mixed into the food with the saliva and the gastrointestinal secretions. This fluid contains mucus and enzymes, of which all but about 100 ml are absorbed in the small intestine and the colon. It is therefore of basic importance to drink ample amounts of good quality water (spring water with low mineral content and without added carbon dioxide, such as Lauretana mineral water, is recommended).

Digestion already begins in the mouth, with the saliva. About 1 to 1.5 litres of this secretion, which is formed in the salivary glands, are secreted into the oral cavity every day. The enzyme α -amylase that is contained in the saliva starts with the breakdown of complex carbohydrates. The production of saliva can be increased and the successive organs of the digestive tract stimulated, for example by strong spices, herbs and bitters (Table 4).

Table 4: Herbs and spices to increase the production of saliva

Strong spices (e.g. long pepper, lesser galangal, chilli, curry, paprika, mustard) in the presence of inflammatory diseases and fever, but dosed with caution

Function: Activation of pain- and heat-receptors
Stimulation of the secretions
Tonic effect (stimulation of peristalsis)

Bitters (contained especially in bark and roots)

To allow the expansion of its inner surface, the stomach lining is covered by a folded mucous membrane. The amount of the gastric secretion is about 1.5 litres per day, whereby mainly its hydrochloric acid (pH 1-1.5, in the fasting state) content and its pepsinogen content are of importance. The hydrochloric acid has a bactericidal action and the pepsinogen converts into pepsin, which breaks down proteins.

The gastric secretion is simulated by:

- the autonomic nervous system (food in the mouth)
- gastrin (as the food passes into the stomach)
- mental stimuli
- the bitter taste sensation
- the vagus nerve, which stimulates the production of pepsin and hydrochloric acid
- bitters (Table 5)

Table 5: Herbs and spices that contain bitters

Angelica root
Bag bean
Condurango bark
Gentian root
Lesser galangal
Ginger
Orange peel
Wormwood

The gastric chyme is mixed together by *peristaltic* contractions and after partial digestion the acid chyme is pressed, in portions, by a reflex action through the *pylorus* into the *duodenum*. The period that the food remains in the stomach is from 15 minutes to 5 hours and depends on various different factors (Table 6).

Table 6: Examples of the effect of the condition of the food on the gastric function

Emptying of the stomach is inhibited by
excessive filling
high fat concentration
solid consistency, large pieces
cold food and drinks

Secretion of gastric juices is stimulated by
beer and white wine
protein

Acid production is inhibited by
food rich in fat

The gastric function is promoted by
hot meals and drinks (just drinking warm water can help!)

The small intestine differs in length, from 3 to 7 metres, from individual to individual, and has diameter of 2.5 to 3 cm. The first section of the small intestine is the 20 to 30 cm long *duodenum*. The bile duct and the pancreatic duct open out here at a common point where the bile and the pancreatic secretion empty into the small intestine. Here too, herbs, spices and plants can be helpful (Table 7). In this way the necessary enzymes pass into the intestine in order to break down the food into its smallest components. Peristalsis and pendular movements mix the chyme together and transport it forward. It remains in the small intestine for about 8 hours.

Table 7: Herbs and spices with positive effects on the biliary activity

Turmeric
Pepper
Lesser galangal
Ginger
Caraway fruit
Marjoram
Rosemary
Thyme
Coriander
Chervil
Mint

About 2 to 5 g of gallic acids per day are produced from cholesterol in the liver and are excreted with the bile into the intestine. Gallic acids have an important function in the digestion of fat. The gallic acids are also taken up again exclusively in the terminal portion of the small intestine (*ileum*) and returned to the liver (so-called enterohepatic circulation). The body is thus very sparing with the gallic acids: only about 0.5 g per day are lost with the stools. The remaining gallic acids pass through the enterohepatic circulation several times a day.

Through the folds in the mucous membrane and the 1-mm high intestinal villi that rest upon it, the surface area of the mucous membrane of the small intestine is enlarged to 200 m². The intestine is supplied and the absorption takes place through a close-meshed network of capillaries and initially blind lymph vessels in the intestinal villi. Glands that are embedded between the villi (*crypts*) and the goblet cells seated on the villi secrete mucous secretions with a pH value of about 9, which neutralise the gastric acid. The components of the food are broken down in the small intestine by enzymes and the products of this breakdown, glucose, fructose, galactose, amino acids, short-chain fatty acids etc., are absorbed through blood vessels. The long-chain fatty acids, triglycerides and glycerol, on the other hand, are absorbed through lymph vessels. The enzymes are supplied by the *pancreas*, the *liver* and the gallbladder, as well as from the *crypts*. The breakdown of fats into very small fat droplets, by lipase, takes place only after prior emulsification of the fats with gallic acid.

The colon lies around the loops of the small intestine and is about 1.5 m long, with a diameter of 6 to 8 cm. Every day about 1.5 to 2 litres of watery small-intestine stool flows into the colon, from where about 90% of the water and electrolytes (calcium, magnesium and iron) are absorbed. In elderly patients, fluid deficiency is therefore mostly accompanied by constipation. Coli bacteria destroy indigestible components, especially food containing cellulose, which at the same time promotes the formation of intestinal gases. The time that the chyme or faeces remain in the colon is between 10 and 70 hours and differs from individual to individual.

The intestine: its often underestimated function as an immune organ

It is over the 200-300 m² inner surface of the intestine that the organism is most acutely exposed to its environment, especially because of the enormous colonisation with 10¹⁴ microorganisms. The physiological intestinal flora of an adult consists of about 400 different germs. The degree of colonisation in the digestive

tract increases progressively from the top downwards and reaches its highest concentration in the colon. In addition, there is the constant exposure to the different components of the food and their degradation products, parasitic and viral substances, toxins and enzymes.

Normally our organism is immunologically tolerant of the enormous variety and amounts of foreign antigenic substances with which it comes into contact every day, mainly through the intestines. If this tolerance fails, this leads to maladjustment and disease, such as infectious diseases or allergies to certain foods, for example.

Therefore the intestine is equipped with perhaps the largest immune system of our body (Table 8), which can function independently of the systemic immune system. For example, normally secretory IgA antibodies against the bacteria in the colon are formed, so that about 90% of the serum antibodies are directed against intestinal bacteria. The intestine is provided with its own immune system, which controls the uptake of foreign material at the site of absorption but, in addition to this, important systemic protective functions with the opposite effect lead to:

- the formation of antibodies, mainly of the IgA class, that are secreted by the epithelium into the lumen, and
- suppression of the systemic immunoreactivity to antigens taken up orally (oral tolerance).

As a result of the high bacterial concentration and the slowing down of the transport through the intestine (prolonged contact and increased concentration of the contents of the intestine), the colon has the highest concentration of antigens. Here, the antibacterially active herbs and spices with their high essential-oil content can have a regulating effect (Table 9).

Table 8: Immune system of the intestine [3]

Lymphocytes in	epithelium
	lamina propria
	follicles
Plasma cells	
Macrophages, mast cells, granulocytes	

	Solitary lymph follicles
	Peyer's plaques
	Appendix vermiformis
	Mesenteric lymph nodes

Table 9 : Carminative and antibacterially active herbs and spices [4]

Angelica root
Aniseed
Fennel fruit
Lesser galangal
Pomegranate seeds
Cardamom seeds
Coriander seeds
Caraway fruit
Long pepper
Peppermint leaves
Rosemary leaves
Sage leaves
Cassia bark.

The actual barrier against this permanent colonisation of the intestine with foreign substances is the mucous membrane. The epithelium with its rapid cell turnover, mucus, the gastric and pancreatic secretions, lysosomes, phagocytes and immunological and other factors all have barrier functions. The sum of the mechanical, humoral, cellular, immunological and non-immunological protective factors is known, collectively, by the term *mucosa block*. The mucosa block is an extremely *dynamic system*. The cellular elements are short-lived and/or very mobile. The mucous membrane, on the other hand, guarantees the substance exchange between the intestinal lumen and body milieu.

Outlook

A strong digestion carries out all the necessary steps in the digestion and utilisation of food, without impairing the sense of well-being. A healthy digestion forms the basis for a good quality of life.

The functions of the gastrointestinal tract in the digestion of food are largely dependent on a high level of secretory function and the efficient working of the intestinal immune system. Here, certain components of the food, especially herbs and spices, can provide important control impulses.

Support of the normal digestive activity with mixtures of herbs and spices, in the framework of a diet or in concentrated form, such as with the digestive tonic, Padma Digestin, described above, can give the digestive tract the necessary control impulses. This, on the one hand, in order to deal with the onset of the problems of dyspepsia. But on the other hand it is even more important not to allow these problems to arise in the first place, by taking the appropriate counter-measures in good time.

Conclusions for the therapeutic practice

It is estimated that up to 15 – 35% of adults are currently suffering from various different functional gastrointestinal symptoms (dyspeptic syndrome, irritable stomach, irritable intestine), whereby women seem to be affected twice as frequently as men. The various symptoms can seriously impair the quality of life of those affected.

Today, people are aware of the fact that a perfect diet not only has to be balanced in regard to calories, vitamins and trace elements, but that it should also contain important information for the functioning of the digestion. Here, herbs and spices can assume an important function in a symptom-oriented dietary programme. Starting with the effects of herbs and spices on the senses and passing on to the secondary components of plants, there is a broad spectrum of control impulses for the functional support of the motoricity and secretory capacity of the stomach and the intestines.

One example of such a mixture of herbs and spices, which acts through its generally strengthening properties as a digestive tonic, is Se 'bru 5 (Padma Digestin). This classical mixture from Tibetan Medicine consists of cardamom, lesser galangal, pomegranate seeds, long pepper and cassia bark. From what has been handed down through Tibetan Medicine, it is known that this mixture promotes the digestive processes and permanently regulates the gastric, intestinal and hepatic functions.

Support of the normal digestive activity with mixtures of herbs and spices, in the framework of a diet or in concentrated form, such as with the digestive tonic described above, can provide the digestive tract with the necessary control impulses. This, on the one hand, in order to deal with the onset of the problems of dyspepsia. But on the other hand it is even more important not to allow these problems to arise in the first place, by taking the appropriate counter-measures in good time.

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