Abstract

Objective: to review the pathophysiology in order to explain the clinical manifestation and treatment of this syndrome, which has not been completely explained yet.

Methods: references were searched on recent review articles, personal files, and Medline.

Results: irritable bowel syndrome in children or chronic nonspecific diarrhea is a very frequent reason for pediatric gastroenterology visits. It is a benign disease and disappears with age, but may cause extreme worry to parents. The pathophysiology is still unclear, and there is not laboratory corroborcation. Thus, it is frequently diagnosed incorrectly, although it has proper clinical manifestation (if there is no diet or medicine manipulation). Dietary advice is usually efficient, and is based on pathophysiologic data. The use of drug is still discussed.

Conclusions: irritable bowel syndrome must be always considered in oligosymptomatic children without signs of malnutrition, with diarrhea, between 6 months and 5 years of age. Drugs are not necessary, and their action is still unclear. Food manipulation based on pathophysiology is enough.


Introduction

Intestinal dysmotility, associated or caused by several factors, is probably the basis for many clinical manifestations in pediatric patients, such as: colic in the young infant, chronic nonspecific diarrhea, recurrent abdominal pain, functional constipation, regurgitation, rumination, cyclic vomiting, and intestinal pseudoobstruction.1-4

The age is important concerning the type of clinical manifestation, since it is related to physiological stages of maturation.2

Chronic nonspecific diarrhea (or irritable bowel in children), functional diarrhea, or diarrhea in children that are starting to walk, are restrict to the age group of 6 to 36 months.1 Kneepkens broadens this period to 1 to 5 years of age.5

This age group includes the weaning period and the introduction of new foods. So, it is easy to mix up the beginning of these diseases with such changes.

For this reason, in our setting, a lot of mistaken diagnoses occur, as well as the wrong use of restrictive diets. Still, the fact that chronic nonspecific diarrhea goes along with other diseases in terms of prevalence intensifies the possibility of confusion, differently from what happens in developed countries and in high-income populations.5
The characterization of functional disorder is complicated when the child already uses drugs and inappropriate diets. There is an increased difficulty in the relationship between the doctor and the patient, since the family is already anxious and extremely stressed, and the nutritional pattern is altered due to dietetic handling. The child presenting irritable bowel is almost always well-nourished. The absence of nutritional alteration is an important sign for the correct diagnosis, along with characteristic clinical manifestations; the laboratory can not help much.5-7

So, we can define irritable bowel in children as a probable functional alteration in the intestinal motility, intensified or caused by various factors. In the form of chronic nonspecific diarrhea (equivalent, in the child, to the irritable bowel in the adult), it appears from 6 months to 5 years of age, depending on the physiological maturity. It is usually not accompanied by other signs or symptoms, and there is no nutritional alteration. It causes great familial anxiety, contrasting with the patient’s general good status and well-being.

After the age of 317 or 5 years,5 other manifestations of dysmotility may persist, such as functional constipation and recurrent abdominal pain. Some may occur before 6 months1 or 1 year of age,5,7 such as regurgitation and colic in the newborn.

Chronic nonspecific diarrhea or irritable bowel in children is a frequent reason for pediatric and specialized appointments, but its prevalence is still unknown, due to the lack of epidemiological studies. Cohen considers that it is the most frequent cause of children being referred to pediatric gastroenterology services. Of the 500 patients of his study, 111 presented chronic diarrhea without nutritional alteration, and 63 (57%) of these patients carried chronic nonspecific diarrhea.8

Another author shows that 58% of the children referred to specialists due to chronic diarrhea present chronic nonspecific diarrhea (or irritable bowel in children).9

Pathophysiology

The irritable bowel syndrome occurs in both adults and children. Multiple factors are involved in the development of this disease, of organic, functional, and psychological origin, but most of them are not clarified yet.4,10,11

The digestive tract has active contractions of smooth muscle layers, which determine the transit of foods and products of the tract itself through it. This movement is associated with processes such as mixture, digestion, absorption, and secretion. A good coordination of these movements is necessary for the normal performance.

Sophisticated but still insufficient techniques have improved knowledge about normal intestinal motility and about associated processes, leading to a better comprehension of its alterations in several clinical manifestations. Patients may be satisfactorily handled if the clinical conduct is based on these technological advances. However, not all parts of the puzzle have been put together yet.

There are two basic types of movement:
1) propulsive movements, which pull the content along the gastrointestinal tract at a speed that allows good digestion and absorption;
2) mixture movements, which promote a better contact between the components of the content (food and products of the digestive tract).

These movements are commanded by reflexes, which depend on several structures, nervous stimuli, and hormonal action.

The structures involved are all layers of the digestive tract wall (mucosa, submucosa, circular and longitudinal muscle layers, serosa), the myenteric nervous plexus (or Auerback’s), and the submucous plexus (or Meissner’s) - the latter acts basically on secretions and on the local blood flow.4,10,12

The motility pattern of the small bowel varies in fasting and in postprandial periods.

During fasting, it is called migrating myoelectric complex, and presents three phases:
- phase I, of rest, after rhythmic activity of phase III;
- phase II, of irregular contractions, preceding phase III;
- phase III, of rhythmic contractions, which migrate in a relatively slow way from the antrum up to the terminal ileum. The contractions of phase III may also start at points distal from the duodenum, or may not come to the end of the small bowel.

Maybe the migrating myoelectric complex impedes the migration of bacteria from the colon to the small bowel, besides having other functions.4,12

During the postprandial period, the food in stomach, and the nutrients in duodenum interrupt the migrating myoelectric complex and cause the appearance of persistent, segmental contractions, aiming at mixture.4,12

The control of colonic motility is very little known. The most important stimulus for these movements is feeding. These movements are mediated by cholinergic action.4,12

The myenteric plexus controls the peristaltic movements of the digestive tract through its excitatory activity. However, it contains some neurons with inhibitory activity, which is useful to inhibit sphincteral muscles. So, the movement of content through several gastrointestinal segments (stomach, small bowel, colon) is controlled. Acetylcholine is an important neurotransmitter in the excitation of intestinal myogenic movements, but there are others, both excitatory and inhibitory.4,10,12

The autonomic nervous system (sympathetic and parasympathetic), as well as hormonal and emotional influences modulate the activities of the digestive tract.
through reflexes that control secretions, peristalsis, mixture contractions, local inhibitory effects, gastrocolic reflex, enterogastric reflex, ileocolonic reflex, defecation reflex, and reflexes of the central mechanism.4,10,12

In general, the parasympathetic nervous system functions are antagonistic to those of the sympathetic system. The parasympathetic system activation increases activity in all the enteric nervous system, intensifying most of gastrointestinal functions (with some inhibitory effects). The stimulation of the sympathetic nervous system inhibits the activity at the digestive tract. A strong stimulus of the sympathetic system may block the intestinal transit.10 Both sympathetic and parasympathetic systems suffer emotional influence, as we know.

The peptides that act in the intestinal motility are, basically:

1) cholecystokinin, produced in the duodenum in response to the presence of lipids; it acts contracting the gallbladder and inhibiting gastric motility; it also interrupts the fasting pattern;
2) secretin, produced in the duodenum due to an acid stimulus; it acts slightly inhibiting the motility of almost all the gastrointestinal tract;
3) gastric inhibitor peptide, produced in the proximal portion of the small bowel in response to the presence of fatty acids, amino acids, and, in a minor degree, carbohydrates; it also acts decreasing the speed of gastric emptying;10
4) motilin and somatostatin, which act in the fasting period, starting rhythmical, long contractions in the small bowel (phase III);
5) gastrin, which acts interrupting the pattern of motility in the fasting (just as cholecystokinin);
6) encephalins, which act abolishing the irregular contractions that precede the phase of rhythmical movements in the small bowel;
7) others, whose action is not yet very clear.4,12

With this summarized review of the disease quite complex physiology, we can suppose that alterations, such as immaturity in one or several implicated factors would lead to various abnormalities in intestinal motility. Some changes are expected in this process along the years, with the several stages of maturation of these factors.2 Only the changes are expected in this process along the years, with the several stages of maturation of these factors.2 Only the immaturity and the maturation of the complex enteric nervous system, which is formed by 100 million neurons (this number is also found in the spinal cord), could justify dysmotility, which seems to be the basis of the mechanisms involved in the etiology of irritable bowel in children or of chronic nonspecific diarrhea.1-4,10

Besides the alteration in intestinal motility, additional dietetic factors are involved in the genesis of irritable bowel, and these factors are well-controlled in mature and normal bowels.5,7,13

The children that present irritable bowel are different from the normal ones in the patterns of motility after food intake (postprandial activity).4,12,14

When glucose was instilled in the duodenum of children with chronic nonspecific diarrhea, there was no interruption of the migrating myoelectric complex (fasting activity pattern). The migrating myoelectric complex was interrupted by the soy milk instilled in the duodenum, but it was not replaced with normal postprandial activity. In these patients, there was either absence of postprandial activity, or abortive postprandial activity when associated with fasting activity.14

The altered postprandial pattern may be responsible for a decrease in intestinal transit time, and for an increase in the arrival of bile salts, undigested and nonabsorbed nutrients (such as fatty acids, amide, disaccharides, monosaccharides), and fluids at the colon.5

Tomomasa et al. showed that in newborns, the migrating myoelectric complex is not replaced with the postprandial pattern of intestinal activity by food.15 This fact led to the hypothesis that children with irritable bowel would have a retarded intestinal motor maturation; this position is defended by some authors.5 Immaturity in the pattern of intestinal motility in response to food may be the consequence of structural immaturity of the digestive tract (mainly of the myenteric nervous plexus), of the autonomic nervous system, and immaturity in the production of intestinal peptides and neurotransmitters.

Besides motility, different patterns of intestinal secretion are found. Prostaglandins increase the activity of adenylcylase and Na+ - K+ ATPase. In children that present chronic nonspecific diarrhea, Tripp found an increase in these enzymes, which suggests an increased synthesis of prostaglandines.16

In Dodge’s work, increased levels of prostaglandines E2 and F-alpha (mainly) were found in pediatric patients presenting irritable bowel.17

Secretion secondary to the presence of bile salts that arrive at the colon, probably due to dysmotility, constitutes a factor that intensifies diarrhea.18 Malabsorption does not seem to be present.7 In chronic nonspecific diarrhea, perfusion studies showed normality in the absorption of glucose, electrolytes, and water at the proximal jejunum.19 The presence of undigested foods in feces, including amide granules, suggests only a decreased transit time.7

Ingested substances would participate in the appearance of smooth feces because of inappropriate quantities and unusual portions of these substances in the digestive tract. They would not lead to an adequate postprandial activity in replacement with the migrating myoelectric complex, and would also determine secretion and osmotic mechanism.4,5,7,12,13

The following factors contribute to the persistence of the clinical status:
– low-fat diets;
– exaggerated intake of juices that contain certain carbohydrates;
– exaggerated intake of liquids.\textsuperscript{5,7,13}

So, the excessive intake of substances that do not inhibit or that weakly inhibit the migrating myoelectric complex seem to have great importance in relation to the intake of foods that potentially inhibit fasting activity in the small bowel. Fats are strong inhibitors of fasting activity, causing the appearance of postprandial activity, since they secrete cholecystokinin, among other properties. This is not true to the carbohydrotires.\textsuperscript{7,14}

Ciampolini’s work makes us think that excesses of fats and carbohydrates in the diet - in absolute quantities, not only relative - also alter intestinal motility.\textsuperscript{20}

In adults, Small detected significant differences in the contractions that characterize the postprandial period in patients with irritable bowel and in normal voluntary.\textsuperscript{21}

Also in adults, studies suggest a participation of foods in the genesis of irritable bowel symptoms.\textsuperscript{22,23}

Postprandial increases of 5-hydroxytryptamine in the blood of voluntary presenting irritable bowel, predominantly with symptoms of diarrhea, also suggest the association. The peaks of 5-hydroxytryptamine activity were higher and longer than in healthy voluntary.\textsuperscript{24}

Concerning liquids, children’s bowels are more demanded concerning absorption. More than half of the liquid volume, in comparison to adults, arrives at the duodenum and cecum, resulting in five times more water in feces per kg of weight per day.\textsuperscript{7}

Of all the factors seen, with some points to clear up, a very characteristic clinical status for chronic nonspecific diarrhea or for irritable bowel in children is formed.

**Clinical diagnosis**

The diagnosis is usually clinical, since the manifestations and clinical history are quite characteristic. We can summarize the clinical status with the expression: “a child that is well but who is defecating badly”. Sometimes, though, it is hard to separate good and bad aspects, and this may lead to equivocated diagnoses.

Sometimes the child is not well, or is malnourished, because the caloric and protein intake is not adequate since the onset of the symptoms.\textsuperscript{5,6}

Sometimes the feces are not well due to age characteristics. Normal defecations are very variable in the age group of the chronic nonspecific diarrhea. In normal children, the frequency may be superior to three.\textsuperscript{25}

Undigested foods may be seen in feces of children 1 year old (73\%) up to 4 years old (17\%), according to Weaver’s data.\textsuperscript{26} The feces contain more water and may be smooth.\textsuperscript{7,26}

Foods recognized in feces mean an accelerated transit time, which is also normal in children at the same age group of chronic nonspecific diarrhea.\textsuperscript{26} Could we say, then, that children with irritable bowel have an accentuation in fecal characteristics in this period of maturation? The answer seems to be affirmative. These children, then, would present an exaggeration in the evacuative characteristics of this age group.

The clinical status of chronic nonspecific diarrhea (irritable bowel in children) can be summarized by the following items:

– onset at the age of 6 months to 5 years;\textsuperscript{1,5,7}
– persistent or recurrent symptoms;\textsuperscript{1,5,7}
– increased frequency of evacuations when compared to the normal pattern for the age, with low-consistency stools;\textsuperscript{1,5,7,8}
– first defecation of the day with higher consistency and volume, followed by other smoother ones, usually in the morning or after meals; the child usually does not defecate while sleeping;\textsuperscript{1,5,7,27}
– variable aspect of stools, sometimes light-colored, sometimes colorful, with a strong smell or without any smell, with pieces of food; they may contain mucus and “sand” (undigested amide grains);\textsuperscript{1,5,7,28}
– on examination, the child is well-nourished, healthy, and active, and may present only “rashes” and abdominal pain; \textsuperscript{1,5,7,28}
– normal development, growth, and weight gain, except when hypocaloric and hypoproteic diets are instituted;\textsuperscript{7,28}
– the feeding of these children usually contains excess of liquids, juices (for fear of dehydration), and lack of fat; calories are provided almost completely by carbon hydrates;\textsuperscript{5,7,18,29}
– it may get installed after infectious acute diarrhea or other viral infection, and be accompanied by stress periods;\textsuperscript{6,27,29,30}
– more intense colic in the infant and constipation may occur before the onset of characteristic signs and symptoms.\textsuperscript{1,5,7}

Situations requiring differential diagnosis are rare, and the laboratory analysis is almost always unnecessary or little important when such evident signs and symptoms are present.\textsuperscript{7}

**Laboratory diagnosis**

In children with characteristic clinical manifestations, we can complement the diagnosis with few exams using fresh stools, as suggested by Judd\textsuperscript{7}: fecal pH, reductive substances, fat globule assay through a direct exam with Sudan III, leukocytes and red blood cells in feces, and/or occult blood and parasitological examination of feces.
In chronic nonspecific diarrhea, the fecal pH is equal to or higher than 5.5, and the reductive substance is below 1+. Fat globules may appear, but in a number inferior to 40 per enhanced field. Leukocytes and red blood cells may be found in a small number, but occult blood is negative. No parasites should be found on routine examination of feces and on Cryptosporidium assay.7

If pH is lower than 5.5, and the presence of reductive substance (before and after acid hydrolysis) accuses more than 1+, then the may be of malabsorption of carbohydrates.7

If we find more than 40 neutral fat globules per enhanced field, the suspicion of pancreatic insufficiency is installed.7

If leukocytes and red blood cells are found in a big number, and if the presence of occult blood is detected in feces, we may be facing a case of enteritis or colitis.7

On parasitological examination, agents that cause diarrhea, such as Giardia and Cryptosporidium may be found. The exam for the giardiasis may be complemented by the antigen assay in feces.7

Additional laboratory examinations will rarely be necessary when there is no alterations in the child’s nutritional state, but up to the present moment, no exam has proven the diagnosis of chronic nonspecific constipation.5

Differential diagnosis

In children presenting a good nutritional state, few diseases can be considered.

Intolerance to disaccharides, such as lactose and saccharose, if suggested at the screening exam, should be confirmed through a good anamnesis, an breath H2 test, or with a diet excluding the suspected sugar.

Giardia may cause chronic diarrhea without other symptoms, and sometimes, three examinations with 2 to 3-day intervals are necessary for the confirmation of the diagnosis. Cryptosporidium is a similar cause of diarrhea in children without immunodeficiency.7

However, the disease that is most similar to irritable bowel in children is allergic colitis; the finding of occult blood, leukocytes, and red blood cells in the screening examination is suggestive if the absence or rashes or anal fissures is verified.7,28 Colitis caused by cow’s milk (or other allergen) occurs in children younger than 1 year of age, and alters little the general state of the child; however, it is rarer than chronic nonspecific diarrhea.5 As in the 1st year of age new foods are being introduced to the child’s diet, it is easier for the parents and doctors to associate diarrhea with foods, and then wrong diagnoses occur, as well as inadequate handling, which may make the child become malnourished, and the differential diagnosis become even more difficult.5,6,28 Children with allergic colitis show visible or occult blood in feces, leading to iron deficiency anemia (which may be confirmed, if necessary, through hemogram and serum iron dosage).

The combination of a good anamnesis (emphasizing dietary and familial history), good physical examination (seeking for other signs of allergy), screening examinations, and exclusion and reintroduction of the suspected food confirms the basically clinical diagnosis.5,7,28

Functional constipation with soiling should be considered when the diarrhea alters with periods of hard feces, scybala, or unfrequent defecations.5 Screening exams do not help, but a directed anamnesis and physical examination with palpation of fecal mass, whose presence may be confirmed or not by simple abdominal X-ray, discards the possibility of irritable colon in children.5,31

When the nutritional state is altered by food restriction and by the use of hypocaloric and hypoproteic diets, chronic nonspecific diarrhea should be differentiated from cause of malabsorption.

Through a special investigation, we sought to verify the presence of cystic fibrosis, celiac disease, persistent diarrhea, intestinal contamination, allergic enteropathy, protozoan infections (Giardia, Cryptosporidium), among others.5

The choice of exams was well directed, and took place after the collection of minute clinical history, detailed physical examination (which eliminated, in some cases, the need for additional laboratory testing). The prevalence of such diseases at the action site was taken into consideration.

Treatment

The doctor’s first worry when facing a child presenting irritable bowel should be to tranquilize the parents, showing the benignity of the syndrome. We should stand out that their child is not sick, which is shown by the patient’s general state. He/she is only going through a period of uncontrolled maturation, and probably other people in the family have experienced the same process or carry other manifestations of irritable colon according to various age groups.1-5

We usually ask the parents to make a daily report of the feces for the next appointment, considering aspect, consistency, volume and frequency. Children that stay at day-care centers usually already bring a daily report to the first appointment. This sometimes shows a different reality from that reported by the parents.32 Parents are anxious and afraid of not being understood by the doctor in their woe. Frequently, they have been seen by professionals that told them, without further explanations, that their child “did not have problem”. At the same time, other doctors overloaded them with examinations and dietary conducts, claiming the child presented a “multiple food allergy” or another disease. This first step in the treatment will probably be the base for its success.

Now we are going to discuss the validity of the use of drugs. It is difficult to use drugs if we do not know exactly where they will act.

Although we know that dysmotility is the base of the problem, and that abnormal or immature postprandial
movements do not replace the migrating myoelectric complex satisfactorily, we do not know the exact mechanism of these facts yet. What mediators would be secreted or inhibited by the presence of food or other factor? Neurotransmitters, hormones, peptides? (See pathophysiology.)

Some children, especially those that present greenish feces (showing that part of the problem is due to the presence of bile acids in the colon), benefit from the use of bismuth salicylate and cholestyramin.7

Patients that present high levels of prostaglandin E2 and mainly prostaglandin F-alpha in serum, may improve these levels and the diarrhea with the use of acetylsalicylic acid.17,33 However, these drugs may cause serious or undesirable side effects, or even unnecessary cost for such a benign situation. Therefore, we reserve its use for very special cases, after a good evaluating the cost-benefit ratio.

Loperamide, for example, may control cases with an increase in prostaglandin levels, but its use is not indicated and is dangerous in children.33,34

The control of irritable bowel in children (chronic nonspecific diarrhea) and also of some characteristic manifestations in other age groups is carried out, according to Kennepkens, by normalizing four “Fs” in alimentation. They are: fat, fibers, fluids, and fruit (juices).5 The fifth element, which consists of drugs, will be present in exceptional cases.

**First “F” - Fat**

This is the dietary component that has the strongest power for interrupting the migrating myoelectric complex, characteristic of the fasting pattern of motility, and replacing it with postprandial “mixture” movements.4,12,35 Carbohydrates and fats have opposite effects on gastric emptying and intestinal transit. Foods in which fat predominates delay gastric emptying when compared to a meal with a relative excess of carbohydrates.36 Fats inhibit the migrating myoelectric complex and activate the “ileal brake”, temporally preventing the passage of intestinal content to distal portions, thus favoring digestion and absorption.4,5,7,12

We managed to improve the clinical status by increasing fat in the diet. Fat may be responsible for about 35 to 40% or more of the daily caloric intake at the beginning of treatment.8 Frequently, we see children with a very low-lipid diet - both offered by parents and oriented by a doctor - during the age period when chronic nonspecific diarrhea occurs. This will certainly intensify the problem.1,29

**Second “F” - Fibers**

They help in water absorption. They also absorb fatty acids and bile salts that arrive at the colon due to inadequate postprandial motility, and therefore stimulate secretion, causing the appearance of smoother and greenish feces.7

The increase of fibers in the children’s diet, who usually reject them, should be done in the most attractive possible way.7 Our conduct is to orient its use by the whole family, since it is benefic and since this way the child will not feel different or sick. When it is not possible to achieve this objective, medicamentous fibers should be exceptionally used.7

Fibers are also frequently excluded from the diet of children presenting irritable colon by both parents and doctors, since they consider the appearance of undigested foods in the feces a sign of malabsorption.1,29 The most commonly recognized foods in feces are vegetables, leaves, fruits, and legumes, which cause the fibers to be considered the responsible for the situation.

**Third “F” - Fluids**

Normal children already have an increased movement of liquids in the intestine. This makes the evacuations be more frequent, and the feces be smoother than in adults.26 The excessive intake of liquids by a normal child may alone cause diarrhea.37

Infant diet is very rich in liquids (milk, juices, soups), and parents of children that present smooth feces are encouraged to use them even more, for fear of dehydration and in replacement with milk (when they are defined as allergic).28

When a great amount of fruit juices is offered, the problem is intensified (fourth “F”). Liquids should be gradually reduced to approximately 100 ml/kg/day. Juices should be replaced with pure water, which will be ingested only in case of thirst, not for pleasure. In older children, parents should try to introduce the use of glasses instead of milk bottles, which contributes to the desired reduction.7

**Fourth “F” - Fruits juices**

Fruit in pieces contribute to the quantity of fibers in the diet. In juices, there these fibers are lost.

In our setting, juices are not as widely used as in other several countries, where the consumption of industrialized juices is quite big. According to a market survey, it is estimated that in the United States, 90% of the infants receive from 150 to 600 ml/day of fruit juices (50% of apple juice).7

Juices may intensify the symptoms of irritable colon due to exaggerated intake, presence of sorbitol, or inadequate concentrations of fructose and glucose.5,7,38 Sorbitol seems not to be much important. Higher concentrations of fructose than of glucose have a more intense effect.38

Glucose and amino acids, specially alanine, interfere with the fructose absorption process, which is not well clarified yet. Its use is more profitable in mixed meals, and it is very little profitable when taken isolatedly by both adults and children.5,7,38
Apple and pear juices contain three times more fructose than glucose, besides sorbitol.\(^5\)\(^,\)\(^7\)

Juice clarification processes, even those that do not have sorbitol and excessive fructose, cause the appearance of symptoms, maybe because of the presence of nonabsorbable products in the enzymatic digestion of the pulp pectin and hemicellulose.\(^5\)

In the control of chronic nonspecific diarrhea, the use of fruits in the form of juices should be avoided, mainly those industrialized and clarified. As we saw, the nonabsorbable contents of fructose and carbohydrates contribute to the maintenance of the diarrheal status, due to the excess of water inflow at the colon aiming at osmotic equilibrium.

Fruits that present adequate concentrations of fructose and glucose, liquefied or as nonclarified juices, are good options for the replacement of those more aggressive ones. Grapes and oranges do not contain sorbitol, and the concentration of fructose is equal to that of glucose.\(^5\)\(^,\)\(^7\) So, they can not be consumed in excess, because of the fluid control.

To end up, besides what was presented as treatment for irritable bowel in children, new therapeutic proposals that did not have their effect shown have been arising, such as the use of sodium cromoglycate and probiotics.\(^3\)\(^9\) Significant results in the reduction of irritable bowel symptoms were achieved with the use of *L. plantarum*. One of the mechanisms proposed to its action would be the great production of nitric oxide, which is synthesized by the microorganism through at least three mechanisms. Among the neurotransmitters that act inhibiting intestinal motility, we find the nitric oxide, recently discovered. The absence of nitric fibers has been proposed as the basis for some defects in the gastrointestinal musculature relaxation, such as hypertrophic stenosis of the pylorus and aganglionic megacolon.\(^4\)\(^0\)

Drugs (the fifth element) should be reserved to exceptions to this benign syndrome, which is usually spontaneously resolved between 2 and 4 years of age. There is no association with any nonfunctional gastrointestinal disease at any age.\(^7\)

In the future, a more complete and directed treatment may arise, when knowledge about neurotransmitters that act in motility, ontogeny, genes that are involved in the neuronal population, and influences of cells recently discovered on the myogenic control of gastrointestinal movements (cells of Cajal) are better known. Cells of Cajal seem to work as an intestinal pacemaker.\(^4\)\(^1\)

Facts such as those showed by Wester should be better analyzed. In this study, the author found a great decrease in the neuronal population of the myenteric plexus along the first 4 years of life.\(^4\)\(^2\) A clinical correlation with new investigations should be sought. Maybe then the symptomatic differences of the disease in several age groups will be explained.

References