

## Lactose, Fructose, Intolerance – Malabsorption. Hydrogen Breath Test

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Hydrogen Breath lactose - fructose intolerance, also glucose, sorbitol, lactulose, is applied for the first time in the country, but the focus of our research is: Lactose and fructose intolerance, every day was diagnosed with intolerance of lactose and fructose new experience and purpose was diagnosis and differential diagnosis.

All these patients have been clinically followed by the gastroenterologist doctor, while on the laboratory side I have managed the testing, pre-analytical, pre-preparatory, and analytical procedures, the interpretation of the result, in positive cases of fructose and lactose intolerance the response determined in serum digestive enzymes; lactase and aldolase, as they are very important for the doctor in the approach to therapy and had food diet with these enzymes.

Hydrogen breath test, is very accurate to diagnose lactose and fructose intolerance or malabsorption, having the gastroenterologist able to follow the patients and to prevent any possible disease or gastrointestinal complications, also has a connection between hepatic cirrhosis or liver damage, hemolytic anemia, hereditary intolerance, anxiety etc. From the new studies also conclude that relates to the development of tumors by hydrogen environment.

Hydrogen is produced in lactose and fructose positive intolerance patients and that is why the hydrogen level is over 20 ppm lactose and 15 ppm of fructose.

**Method**

Approximately 55 patients with clinical signs: swelling, diarrhea, constipation, gastritis, nausea, etc. have tested and resulted positive for lactose and fructose with hydrogen-breath test.

Pro anamnesis Some patients are also associated with intolerance in: milk, goats, cow, casein, etc.

Apparatus used: Lacto FAN 2. Fisher analysen instrument GmbH. Germany.

Hydrogen breath test used to diagnosed: lactose, fructose intolerance (malabsorption).

The most popular type of intolerance sugar is lactose intolerance type.

Lactose is a disaccharide, has the molecular formula:  $C_{12}H_{22}O_{11}$

This disaccharide derived from the condensation of glucose and galactose, form a  $\beta$ -1  $\rightarrow$  4 glycosidic links. The lactose is about 2-8% of the milk (according to weight). The name comes from lac (gen lactis), the Latin word for milk, plus the suffix: suffix-or - used in biochemistry for denomination of sugars. Compound is white, water-soluble, non-hygroscopic with a soft and sweet taste. For use in the food industry. The role of the enzymatic lactose is to digest it. This enzyme separates a molecule of lactose in to two sub unites, simple sugars: glucose and galactose, which can be absorbed into the walls of the intestine, and then into the circulation of the blood.

The lactose intolerance is caused precisely by the enzyme lactase deficiency which is produced in the intestinal epithelial cells and when it is in deficit the lactose will pass to the untreated intestine so that bacteria metabolize it. The responsible gene for lactose is the LCT gene which is located in the chromosome of position 2q: 21.3

Possible causes of secondary lactase deficiencies include: gastroenteritis, celiac disease, Crohn's disease, ulcerative colitis, long term use of antibiotics, chemotherapy, etc. Also is in present LCT gen congenital, which is rare, and quickly diagnose post natal.

Fructose, or fruit sugar, has this molecular formula:  $C_6H_{12}O_6$

Is ketonic a simple monosaccharide found in many plants, which is often connection with glucose to form saharosis disaccharide sucrose. It is one of three dietary monosaccharides, along with glucose and galactose, which directly absorbed into the

bloodstream during digestion. Fructose is found in honey, fruit and fruit of grape vines, flowers, blackberries and some vegetables.

Of the vertex fructose consumption but intolerance due can contribute to resistance to insulin, obesity, cholesterol, elevated LDL and triglycerides, and in syndrome metabolic, type 2 diabetes and cardiovascular illnesses, adiposities.

Fructose intolerance occurs due to the enzyme deficiency of aldolase B.

Aldolase is a glycolytic enzyme that catalysis the conversion of fructose-diphosphate 1-6 in gliceraldehyd-3-phosphate and dihydroxy acetone phosphate pathway metabolic of glycolysis. Aldolase has 3 classes: aldolase A that is expressed in muscle and erythrocytes, aldolase B expressed in liver and kidneys, aldolase C expressed in the hippocampus and brain purky cells, fructose intolerance diagnosis can detect a link to disease liver cirrhosis or the renal tubular apparatus.

The Aldolase B gene is located in the 9q position chromosome 22. Enzyme deficiency is usually related to the genetic factor! the aldolase deficiency is also associated with neurological neuro muscular disorders, whereas for its occurrence in erythrocytes the deficit of Aldolase A is the cause of hemolytic anemia, and so on.

PE except by the cause may be, irritable bowel syndrome, Crohn, colitis, celiac, these patients can develop and intolerance to dietary fructose.

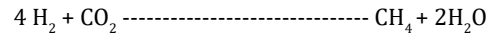
It is very important that from this research, according to the family history of the patients about 60% of them had family history with gastric or intestinal tract tumors, which is related to family genetics but also with a cause such as hydrogen (hydrogen sulphite affects or progresses in fispathology tumors), and it has a base on the body, then subjects lactose and fructose intolerance have a very higher risk be affected by malignant tumors of the gastrointestinal tract such as carcionoma the stomach, bowel, etc. Stopping lactose and fructose products, in cases of intolerance, in addition to improving the patients' condition, and it would be a preventive to these tumors!

Clinical signs of: lactose intolerance, fructose are: abdominal swelling, increased gases, abdominal pain and discomfort, nausea, diarrhea, often alternating with obstipation, indigestion, etc.

The method of diganosification for: lactose, fructose, intolerance, is also the fastest and not invasive with Hydrogen breath test.

Test Principles Hydrogen lactose, fructose intolerance:

In cases of intolerance of lactose and fructose produce two types of gases: methane and hydrogen:



The appliance's working method is Hydrogen absorption, hydrogen suction during patient expiration.

Thus, hydrogen is produced from the fermentation of unprocessed carbohydrates.

Hydrogen is produced by bacteria absorbed through the wall of the small or large intestine or both on, so through the bloodstream and then hydrogen pulmonary circulation released through breathing, which also can measure the amount his of through H BT test, if there is poor absorption, the test will result positive. About 10-20% of peoples have flora that contain: Methanobrevibacter smithii, which converts the 4 hydrogen atoms in 1 molecule of methane, so that these entities can not draw 's breathing rate greater hydrogen pickup, regardless of SIBO and malabsorption of carbohydrates as the excess hydrogen produced in them is converted into methane, and this category of patients can not result in positive hydrogen, so it is not clear if after the test for intolerance, there may be methane production such as hydrogen production, as the H2 device, "FAN" we used for testing the patients have the options for tests: lactos, fructose, glucose, lactulose, and our patients' testing is done in: lactose, and fructose. Clinically it is noted that the presence of methane gives opstipation, the opposite of hydrogen manifested with diarrhea.

#### Patient preparation for Hydrogen Lactose testing Intolerance

Before the examination, the patient should be prepared to interrupt barriers: laxative, antibiotic, barium preparations, proton pump inhibitors, also the colonoscopy test, and other endoscopic examinations is not recommended.

At least 8 hours prior to the test is forbidden: food, cigar (not even smoking tobacco), fluids, coffee, buble gum, toothpastes, and mouth breaks with oral antiseptic solutions that purify the bacteria in the oral cavity in order not to release H2 from the fermentation of residual food and the oral cavity bacteria, to have the correct result.

#### Test procedure: Hydrogen lactose, fructose intolerance

For testing of lactose, the patient will take the breath into the portable apparatus tube, first it is injected, then it is given 25 g of

lactose dissolved with 100 ml of water, after 30 minutes another measurement is made, or the patient's breathing in the tube of the apparatus, and will continue for 180 minutes of the test procedure and, the breath is administered by the patient every 30 minutes [1-11].

In the apparatus can be viewed the curve that starts at the 0 level from the first expiration of the patient, and this is the indicator that the pace has been in the pre-preparatory rules.

Diagnostic criteria: Hydrogen breath test: lactose, fructose, lactulose, glucose, sorbitol, intolerance:

Substance/Type of tests	Dose: g/kg	Interval	Time	Criteria and diagnosis
Lactose/Malabsorption	25	30	180	HOB above 20 ppm H2 Malabsorption
Fructose/Malabsorption	25	30	180	HOB over 15 ppm H2 Malabsorption
Sorbitol/Malabsorption	12.5	30	180	HOB over 15 ppm H2 Malabsorption
Glucose/Bacterial Overgrowth	50	20	120	HOB over 15 ppm H2 Overgrowth
Lactulose/Bacterial overgrowth	10	20	120	HOB over 15 ppm H2 Overgrowth
Sucroze/Malabsorption	50	30	180	HOB above 20 ppm H2 Malabsorption
D-Xylose/Malabsorption	25	30	180	HOB over 15 ppm H2 Malabsorption

Table a

Hydrogen breath test interpretation:

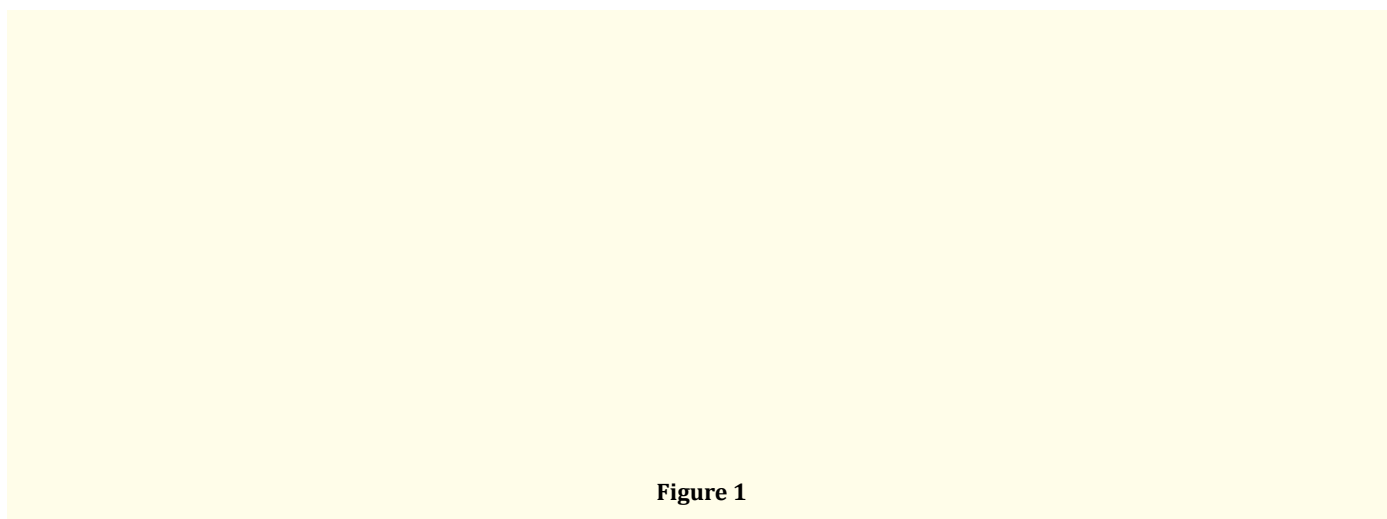


Figure 1

The test will be called positive/malabsorption if it exceeds the reference value over 20 ppm (part per milliliter), according to the Lacto FAN 2-Fischer ANalysen Instruments - Leipzig Germany, which for lactose has cut off the 20 ppm.

While the interpretation of the fructose intolerance result, it has cut off the 15 ppm.

Hydrogen over Baseline with 180 min. 15 ppm is positive/malabsorption

Figure 2

Statistics by cases:

Number of patients	<b>55</b>
Age of patients	18-55 years old
Females	25
Men	30
Origin: Kosovo	100%
Prishtina	40%
Other cities	60%
Symptoms in years (pro anamnesis)	1-5 years
Accompanying symptoms (pro-anamnesis)	97%
dyspepsia	70%
diarrhea	75%
constipation	25%
Diarrhea and constipation	20%
Abdominal fever	60%
Gases	70%
Irritable bowel syndrome	35%
H.pylori	25%
Vitamin B12 deficiency	20%
Without symptomatology	0%

Table b

## Bibliography

1. Lindberg DA. "Hydrogen breath testing in adults: what is it and why is it performed?" *Gastroenterology Nursing* 32 (2009): 19-24.
2. Ghoshal UC., *et al.* "Utility of hydrogen breath tests in diagnosis of small intestinal bacterial overgrowth in malabsorption syndrome and its relationship with oro-cecal transit time". *Indian Journal of Gastroenterology* 25 (2006): 6-10.
3. Ghoshal UC., *et al.* "Frequency of small intestinal bacterial overgrowth in patients with irritable bowel syndrome and chronic non-specific diarrhea". *Journal of Neurogastroenterology and Motility* 16 (2010): 40-46.
4. Pande C., *et al.* "Small-intestinal bacterial overgrowth in cirrhosis is related to the severity of liver disease". *Alimentary Pharmacology and Therapeutics* 29 (2009): 1273-1281.
5. Barrett JS., *et al.* "Prevalence of fructose and lactose malabsorption in patients with gastrointestinal disorders". *Alimentary Pharmacology and Therapeutics* 30 (2009): 165-174.
6. Riordan SM., *et al.* "Fasting breath hydrogen concentrations in gastric and small-intestinal bacterial overgrowth". *Scandinavian Journal of Gastroenterology* 30 (1995): 252-257.
7. Pimentel M., *et al.* "Normalization of lactulose breath testing correlates with symptom improvement in irritable bowel syndrome. a double-blind, randomized, placebo-controlled study". *The American Journal of Gastroenterology* 98 (2003): 412-419.
8. Levitt M D. "Production and excretion of hydrogen gas in man". *The New England Journal of Medicine* 28 (1969): 1122-1127.
9. Macfarlane G., *et al.* "Bacterial metabolism and health-related effects of galacto-oligosaccharides and other prebiotics". *Journal of Applied Microbiology* 104 (2008): 305-344.
10. Shepherd SJ., *et al.* "Randomised, placebo-controlled evidence of dietary triggers for abdominal symptoms in patients with irritable bowel syndrome". *Clinical Gastroenterology and Hepatology* 6 (2008): 765-771.
11. Ong DK., *et al.* "Manipulation of dietary short chain carbohydrates alters the pattern of gas production and genesis of symptoms in irritable bowel syndrome". *Journal of Gastroenterology and Hepatology* 25 (2010): 1366-1373.

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