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Review Article

Physiological Lactose Tolerance Test

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Abstract

This study evaluates a more accurate method for assessing lactose intolerance by comparing traditional lactose breath tests with a new physiological approach using whole milk. Traditional tests, based on hydrogen (H_2) and methane (CH_4) levels in exhaled breath after ingesting powdered lactose, often yield inaccurate results due to factors like gastric emptying and intestinal transit time, which distort lactase activity assessments. Involving 20 children (ages 5–11), the study shows that using whole milk provides a more reliable correlation between clinical symptoms and test results, avoiding the inaccuracies associated with powdered lactose.

Keywords: Lactose Intolerance; Physiological Tolerance Test; Hydrogen Breath Test; Methane Breath Test; Whole Milk; Gastrointestinal Disorders

Summary

To assess the degree of lactose tolerance, the measurement of hydrogen (H_2), methane (CH_4), and CO_2 in exhaled breath after lactose administration is commonly used.

However, the test proposed by Ali Rezaie et al. (Guidelines: Hydrogen and MethaneBased Breath Testing in Gastrointestinal Disorders: The North American Consensus, Ali Rezaie, MD, MSc, FRCP) [1] does not accurately reflect the true nature of lactose intolerance. The results of lactose digestion based on H_2 and CH_4 levels in breath do not depend solely on intestinal lactase activity, but are instead influenced by gastric emptying and intestinal transit time.

The administration of powdered lactose dissolved in water (1 or 2 g/kg body weight) induces accelerated gastric emptying and an abnormal secretion pattern of gastrointestinal hormones, such as motilin, pancreatic polypeptide, somatostatin, and cholecystokinin [2-4], as well as a decrease in glucagon-like peptide (GLP-1) secretion, which occurs after consuming fat-containing milk. This slower gastric emptying, which is not observed when lactose is administered in water [5], justifies the different results. This hormonal interplay [2-4] is responsible for rapid gastric emptying and increased intestinal transit speed, leading to distorted results due to undigested lactose reaching the colon, a phenomenon independent of lactase activity at the brush border of the small intestine.

As a result, the hydrogen and methane produced in large quantities in the colon and partially exhaled reflect a temporary state, influenced by various factors, especially the fat content, but also the salt, protein, and carbohydrate content of the test milk, as well as previous diet, which may vary from day to day. These results, therefore, do not directly reflect lactase activity.

We propose a more physiological lactose tolerance test by administering a glass of cow's milk, or milk from another mammal, containing fats, proteins, and carbohydrates. The dietary fat induces the secretion of GLP-1 receptor agonists, resulting in delayed gastric emptying [5] and improved lactose digestion.

Materials and Methods

In a group of 20 children and adolescents, aged between 5 and 11 years, and weighing between 18 and 42 kg, 2 grams of lactose per kilogram of body weight, dissolved in water, were administered. Exhaled breath samples were collected at 3, 4, 5, and 6 hours after administration. Hydrogen, methane (ppm), and CO_2 were measured (Quintron, BreathTracker, Milwaukee, USA), and unpleasant symptoms following the lactose overload were recorded. Four weeks later, the same group was given a 200 ml glass of whole cow's milk, containing 9 grams of lactose. Exhaled breath samples were collected and analyzed as done previously with powdered lactose. Post-overload symptoms and clinical correlation were noted.

Results

The mean hydrogen and methane levels, corrected for CO_2, after the intake of powdered lactose dissolved in water were: mean 39.8, standard deviation (st. dev.) 7.84, n = 20. Fourteen children subsequently developed severe abdominal pain and diarrhea, showing a poor acceptance of the large amount of lactose. The mean hydrogen and methane levels, corrected for CO_2, after consuming a 200 ml glass of cow's milk with 9 grams of lactose were: mean 4.10, st. dev. 1.44, n = 20. The difference between both results was significant ($p < 0.05$). None of the children experienced symptoms, showing a good correlation between clinical symptoms and test results.

Conclusions

It is preferable to perform the physiological lactose intolerance test by administering a 200 ml glass of milk. This method significantly reduces the number of positive test results, and none of the children and adolescents studied experienced subsequent issues. A strong correlation between clinical symptoms and test results

Bibliography

1. Rezaie A., *et al*. "Guidelines: Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders: The North American Consensus". *The American Journal of Gastroenterology* 112.5 (2017): 775-784.

2. Boyd KA., *et al*. "High-fat diet effects on gut motility, hormone, and appetite responses to duodenal lipid in healthy men". *American Journal of Physiology-Gastrointestinal and Liver Physiology* 285 (2003): G188-G196.

3. French SJ., *et al*. "Adaptation to high-fat diets: effects on eating behaviour and plasma cholecystokinin". *British Journal of Nutrition* 73 (1995): 179-189.

4. Spannagel AW., *et al*. "Adaptation to fat markedly increases pancreatic secretory response to intraduodenal fat in rats". *American Journal of Physiology-Gastrointestinal and Liver Physiology*, 270 (1996): G128-G135.

5. Mark L van Zuylen., *et al*. "Perioperative management of long-acting glucagon-like peptide-1 (GLP-1) receptor agonists: concerns for delayed gastric emptying and pulmonary aspiration". *British Journal of Anaesthesia* 132.4 (2024): 644-648.