

Celiac Disease and Lactose Intolerance

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Abstract Celiac disease and lactose intolerance are nutritional diseases where withdrawal of a specific nutrient is therapeutical. Celiac disease is underdiagnosed while lactose intolerance is over diagnosed, including in naïve or treated celiac patients. The present review highlights myths and realities and revisits common misconceptions in the relationship between celiac disease and lactose intolerance. It is hoped that the care providers will increase the rate of diagnosis of celiac disease, while decreasing the over diagnosis of lactose intolerance for the benefit of the patients.

Keywords: *celiac disease, lactose intolerance, dairy food, hydrogen breath test, health promotion*

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1. Introduction

Celiac disease (CD) is an autoimmune condition affecting genetically predisposed individuals by the consumption of gluten-containing grains or ingredients of them. CD affects approximately 1-1.5% of Western populations and its incidence is increasing, a phenomenon shared by many other autoimmune diseases [1,2]. Co-emergence of increased gluten consumption, HLA-DQ2 and -DQ8 genotypes frequency and CD incidence reinforce the environmental over genetic influence in the contemporary CD surge.

In fact, CD is actually a multifaceted disease, highly variable in its clinical presentation, many of them are extra-intestinal manifestations [3]. Despite being considered a chronic disorder, it can be present acutely [4]. Intriguingly, the kaleidoscope of CD is turning constantly, thus complicating the puzzle of the disease. In recent decades, we have witnessed a phenotypic epidemiological shift toward an advanced age, increased prevalence of latent, hypo-symptomatic or asymptomatic behavior and presentation with non-enteric classical manifestations [5,6,7]. All these changes make the diagnosis of the disease more difficult and the reliance on symptomatology more remote. In fact, multiple reasons exist for the delay in its diagnosis, as summarized recently [1], one of them is the overlap of CD symptomatology with more common food intolerances [8]. One of the most prevalent food intolerances worldwide is lactose intolerance due to lactase insufficiency or deficiency [9]. The present review will describe the cross relationship between CD and lactose intolerance (LI).

Lactose intolerance should be distinguished from lactose sensitivity, which mirrors the lactase enzymatic capacities, since "size does matter". In LI, lactase degradation of the disaccharide is more pronounced compared to sensitivity, where the enzymatic activity is suppressed to a partial degree. There are several types of LI, ranging from alactasia to secondary and transient LI. Secondary LI is due to viral/ bacterial or parasitic infections, food allergies including cow's protein allergy, Crohn's and CDs or any other reason that compromises the apical enterocyte brush border [9,10,11]. Usually, the tolerance to lactose intake returns after 1-2 month, depending on the initiation etiology. The presenting symptoms of LI are abdominal pain, bloating, cramping, borborygmi, meteorism or overt diarrhea and perianal erythema in babies. Less often, it might present as nausea, flatulence or systemically as headaches, fatigue, loss of concentration, myalgia, arthralgia, mouth aphthae or even urinary difficulties [9,11,12]. It should be stressed that many of those signs and symptoms exist in CD patients, resulting in over diagnosis of LI, mainly in the pediatric age, ending up with missed diagnosis of CD [13].

Often, milk protein allergy and lactose intolerance conditions overlap in the general public and the two separated entities are mixed, driving a plethora of myths and misconceptions [14,15]. Milk protein allergy is a pure allergic condition and should be separated from LI which is defined as a non-allergic food intolerance. Despite symptomatic overlap, all over the life cycle, and withdrawal therapy for both of them, the two should be diagnosed, treated and followed as different entities. A separated approach can prevent missing CD [13]. After setting the stage for CD and LI separately, the current review will zoom on LI in face of CD.

2. Lactose is Health Promoting Nutrient in Celiac Disease

The beneficial effects of cow's milk and dairy products' proteins in CD were lately summarized [16]. Following are the salutogenic effects of lactose consumption in CD patients [Table 1]. When consumed as cow's milk, several additional beneficial effects can be added. Due to the fact that whole cow's milk contains multiple nutritional components like calcium, phosphorus, vitamins, growth factors and antibodies, the sweetness of the lactose encourages milk intake [10,15,17,18]. This increased consumption of whole milk can protect against multiple metabolic conditions, cardiovascular diseases and cancers [15,17,19,20,21].

Table 1. Lactose as a health promotor in celiac disease

Lactose activities	Celiac disease abnormalities	References
Source of energy	malnutrition	[15]
Low glycemic index	Diabetes mellitus type 1	[15]
Calcium absorption enhancer	Osteopenia/osteoporosis	[15]
Probiotic	Dysbiosis	[9,15]
<i>Bifidobacterium</i> growth encourager	Decreased microbiota diversity	[15]
SCFA enrichment in gut lumen	Decreased luminal SCFA	[15]
Increase sweetness, encourage its intake	Lower caloric absorption	[15]

3. The Incidence of Celiac Disease in Lactose Intolerance and Vice Versa

The symptomatology overlap, the mutual increased incidence and the response to specific food withdrawal are common features of CD and LI [22,23]. More so, the over diagnosis of LI [13,14,15] and the under diagnosis of CD [24,25], further complicates the two disorder relationship. Most of the CD patients with substantial intestinal damage experience secondary LI due to decreased lactase activity in the enterocyte's brush border [15,26]. A less invasive test is to use the Lactose hydrogen breath test (HBT) not only for LI diagnosis, but to monitor mucosal healing in treated CD patients [27]. Interestingly, LI is one of the reasons for partial responsiveness to gluten withdrawal in CD [28] and in non-responder's CD, LI mount to 8% of them [29]. Patients with LI are at high risk of CD. 24% of them were diagnosed as CD and in many, lactase deficiency was the only manifestation of CD [30]. The authors suggest to serologically screen every positive HBT patient for CD, before embarking on milk-exclusion diet. When checked on infants with gluten-sensitive enteropathy, secondary LI was found in 19.05% of them [31]. Notably, LI occurred independently of age at diagnosis, duration of the basic disease, severity of symptoms and degree of duodenal mucosal damage [31]. In another study, lactose malabsorption was less common in newly diagnosed CD, reaching 10% of them [32].

4. Dairy Products Consumption in Lactose Intolerance

There is no absolute volume of whole cow's milk tolerated in LI. Based on LI Chinese adult population, they can tolerate cow's milk <160 ml/day, however LI was related to various milk consumer's behaviors [33]. Most of the LI patients will tolerate asymptotically 0.5-7.0 g lactose and some can drink even 240-500 ml of whole cow's milk daily. It should be stressed that when fermented, like yogurt, the added probiotic starters reduce the lactose content, thus, much better tolerated by LI patients [9]. The lactose reside mainly in the liquid part of the milk resulting in a much lower content of lactose in the fermented dairy products. For example, 30 g of hard cheese contains 0.1-0.9 g lactose. Finally, butter and drags are negligible in lactose, both suitable for LI patient's consumption [15].

5. Cow's Milk and Dairy Products in Celiac Disease: Lot to Give, Got to Live Healthy and Happily.

Unfortunately, the recent popular trend, applied by many health providers, including para-medical and alternative care taking people is the avoidance of cow's milk and dairy products. Taking into account the additional over diagnosis of LI, lactose intake is suppressed in the Western societies. Some of it is for no logical reasons or established scientific backgrounds. Coming back to CD, absolute or long-term withdrawal of cow's milk and dairy products should be avoided. Since the LI in CD is secondary to the intestinal injury and since cow's milk constituents are health promoting factors and functional food, to my amble opinion, they should be recommended in CD [16]. Several studies explored the effects of cow's milk content on CD development. Avoidance of cow's milk-based formula in high-risk CD babies or LI CD patients did not reduce CD progress, nor the T-cell stimulatory epitopes for gluten, respectively [34,35]. Bovine milk intolerance in CD is related to immune reactivity to the whey proteins and not to its carbohydrate component [36]. It is well accepted that the LI in naïve CD patients is rare and if present, it lasts for 1-2 month after initiating gluten free diet [9,15,31,32]. Most recently, as part of the TEDDY study, it was concluded that "intake of milk powder in early childhood is not associated with celiac disease in genetically susceptible children" [37]. It can be concluded that neither cow's milk proteins nor lactose are drivers of CD development. There are several practical recommendations to help the LI patients, including those with CD, concerning cow's milk and dairy food consumption:

1. Divide it to small portions along the day
2. Consume it with another food
3. Yogurt, hard cheeses and kefir are low in lactose
4. In face of LI, lactase preparations will alleviate the symptoms.

6. Conclusions

Lactose intolerance is over diagnosed in the general population and in CD patients. Since there is an overlap of symptoms in the two conditions, they should be correctly diagnosed. LI in CD is secondary and usually transient, lasting 1-2 month after gluten withdrawal initiation. Whole cow's milk and fermented dairy products are health promoting and considered as functional food, including its carbohydrate component and the lactose. They are part of the Mediterranean diet and should be recommended in CD nutritional management.

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