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Rom J Diabetes Nutr Metab Dis. **24**(4):363-368
doi: 10.1515/rjdnmd-2017-0042

# PARTICULARITIES OF THE DIET USED IN MILK ALLERGY

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*received*: July 29, 2017 *accepted*: November 17, 2017
*available online*: December 15, 2017

## Abstract

*Allergies become more common nowadays because of numerous risk factors and better medical resources for diagnostics. So, it is imperative to have at least an idea how to control them rather than treating them. A proper diet for an allergy may prevent it to be clinically significant and improve the patient's life quality and symptoms. Milk allergy is one of the most common ones together with gluten and soy allergies. Older children and adults are easy to manage because they can communicate, and they eat almost everything. But the problem occurs especially in young infants, the most challenging ones because milk is vital for their survival and development. In the following article, we will try to highlight its particularities and explain what a patient with this condition should eat, taking into consideration processed food, found nowadays in every supermarket. We will detail what is allowed what is not allowed to consume, so this kind of a diet should be easy to prescribe by any nutritionist and easy to follow by every patient.*

**key words**: *milk, allergy, casein, soy, meat*

## Food allergy etiology

According to each degree of allergenic effect (antigenic), in the same type of food, major antigens (usually only one) and minor antigens can be found. For example, ovomucoid [1] from the egg white, M fraction from fish [2] and beta lactoglobulin [3] from cow's milk have maximum antigenicity comparatively with other antigens from the same foods.

Through conservation, culinary processing [4] and digestion, food suffers modifications that can reduce the degree of antigenicity or on the contrary can increase it. Thereby, tomatoes become more allergenic as they become ripe because of incorporating the M-glycosidic fragment in their protein complex [5]. Furthermore, beta lactoglobulins' antigenicity is accentuated through incubation with lactose because of the increase of glycosidic binding reactions responsible for the browning action. Also, heat denaturation amplifies some foods' antigenic capacities (ex. Fish [6]) or diminishes it (ex. boiled milk can be better tolerated if the sensibility is toward heat sensitive proteins [7]).

During digestion, following action of enzymatic factors, new antigens can appear that have a different binding capacity than of the original antigens. On the other hand, it must be taken into consideration that through the act of feeding, haptens are introduced in the body. These are incomplete antigenic substances with

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very low molecular weight. They become antigenic only by binding with large colloidal molecules like proteins. Often, from the haptens category, a lot of substances are used in preparing food [8].

An important issue, correlated with food antigenicity is crossed sensibilisation at substances from the same family of nutritive products [9]. The phenomenon is more obvious at vegetal antigens from the same botanical family.

For example, plum allergy implies an allergy to almonds, apricots, blackberries, sour cherries, nectarines, peaches, dates, belonging to the same botanical family. Also, parsley allergy can be associated with aniseed, cumin, carrots, celery, coriander, dill, sweet cumin and parsnip. Moreover, a food allergy at mustard, frequently implies an allergy for broccoli, Brussels cabbage, white cabbage, cauliflower, cress, horse-radish, turnips, Swedish turnip and radish.

Regarding animal-born nutrients crossed sensibility is very limited. For example some children are allergic to cow milk but can tolerate goat milk, even this response being very variable. Concerning milk allergy in the following paragraphs we will refer to the diet correlated to this type of allergy.

**Milk free diet**

Milk allergy is remediated by a diet without milk. This might be difficult when it comes to babies. There are situations when milk intolerance occurs to mother milk. In these cases the mom's diet is examined to find the potential allergen that can pass through the milk and give the child an allergy. Some aliments like eggs or soy can be eliminated from the mother's diet and the problem is solved. If cow milk is tried for feeding the infant, and it still develops a moderate form of allergy, sometimes boiling it for 15-30 minutes is enough. In this manner, if the patient is sensible to thermolabile proteins (albumin and gamma globulin), their antigenicity is destroyed. Casein isn't modified by high temperatures, so is case of sensibility to this compound we use other dietetic therapy methods [10].

Destroying antigenicity form heat sensitive proteins is obtained through transforming milk in powdered milk and treating it with lactic acid.

If the allergy doesn't disappear even in the above mentioned conditions, goat or soy milk can be used. Its utilization is alright only if the patient is allergic to cow milk lactalbumin, protein compound of milk with antigenicity specific to every species. Sometimes patients are allergic to lactalbumin belonging to different species, this explains that in the goat milk case, it can be used only in 40% of patients allergic to cow milk. In this situation sensibilization is produced for other protein fractions from milk (ex. lactoglobulin) without antigen specificity to species, so allergy appears to cow, goat or sheep milk. It has to be mentioned that sheep milk isn't recommended to infants under 1 year.

In many cases, cow milk allergy is treated with the use of soy milk [11]. This is available in different commercial forms enriched with vitamins and minerals. Except for proteins coming from soy, soy milk contains carbohydrates from glucose syrup, corn syrup or corn starch. Products with soy milk are recommended especially to infants, because in older kids or adults a rejection reaction may appear due to its awful taste. As it was mentioned before, soy milk can be a substituent to cow milk in 45% of allergies, the other cases might have simultaneous allergy. Some soy products used for infant feeding are mentioned in Table 1.

If soy milk isn't tolerated, casein hydrolysates are used [12]. These are used as milk substituents also. Except for bovine casein,

enzymatically hydrolysated, commercial compounds contain fats (from corn and coconut oil), hydrates (from sugar, glucose and tapioca), vitamins and minerals. Milk substituents casein-based have an awful smell and taste. In Table 2, the composition of two of the most used milk substituents is shown.

**Table 1.** Soy milk for milk free diet.

| Product name | Brand | Protein source | Carbohydrate source | Lipid source |
|---|---|---|---|---|
| Isomil | Ross | Protein soy extract + L-methionine | Sucrose from corn starch | Corn oil, coconut oil, soy oil |
| Prossobee | Mead Johnson | Protein soy extract + L –methionine | Glucose syrup | Coconut oil, corn oil, soy oil |
| Wysoy | Wyeth | Protein soy extract + L-methionine | Sucrose, corn syrup | Soy oil, coconut oil, cow destearinated fat |
| Mull-Soy | Syntex | Soy flour | Sucrose | Soy oil |
| Neo-Mull-soy | Syntex | Soy protein extract | Sucrose | Soy oil |

**Table 2.** Milk substitutes from casein hydrolysates.

| Name of product | Brand | Protein source | Carbohydrate source | Lipid source |
|---|---|---|---|---|
| Nutramigen | Mead Johnson | Casein enzymatic hydrolyses | Sucrose Tapioca | Corn oil |
| Pregestimil | Mead Johnson | Casein enzymatic hydrolyses | Glucose Tapioca | Corn oil Coconut oil |

**Table 3.** Milk substitutes with meat protein source.

| Name of product | Brand | Protein source | Carbohydrate source | Lipids source |
|---|---|---|---|---|
| Peptide 0-2 | SHS | Meat and soy hydrolysates, peptides and amino-acids | Maltodextrins | Vegetal and animal fats |
| Peptide 0-2 MCT | SHS | Meat, soy hydrolysates, peptides an amino-acids | Maltodextrins | Vegetal fats, oil with medium triglycerides chain |
| Comminuted chicken | Cow & Gate | Very fine chicken meat dispersed in water | Without | Chicken fat |

Besides the above mentioned substituents, for children nutrition milk substituents with meat hydrolysates or fine chicken meat for protein source can be used. Their usage is followed sometimes by very good therapeutic results. The name and compositions of these compounds is shown in Table 3.

In case that milk substituents aren't accepted, daily food intake has to be completed with at least 500 mg of calcium per day [13]. This is necessary because milk and its derivatives represent the main source of calcium (75% of daily intake) [14]. It is indispensable for somato-psychic development of children, having also antiallergenic proprieties. It is resorted to calcium enriched foods (excepting milk products), of pharmaceutical products that contain this mineral [15]. Concurrent meat intake is increased to compensate the protein deficit installed through not consuming milk and its derivatives. A suitable vitamin intake will be assured (especially vitamin A and riboflavin). Regarding a baby's diversification that has cow milk allergy, products with low allergenic potential will be used (rice, lamb meat, apple marmalade, pear, carrots, squash) [16].

Nutrition difficulties appear at older ages when milk restriction is hard to maintain, taking

into consideration that this product is dissimulated in a wide range of products that are found in the subject's nutrition (ex. pastry products, soups, biscuits, margarine, butter, chocolate, creams, candy, pasta, etc). The complete elimination of nutrition sources that contain milk is made by taking into account the recommendations from Table 4, carefully analyzing labels from products and the ingredients composition that is present. The patient must know exactly what are the foods that he can eat and can be used to make different menus'. We mention the fact that the list of new products must be completed with updated lists periodically to enrich the possibilities of diversity of nutrition.

**Table 4.** Allowed and forbidden food in the milk free diet.

| Foods that don't contain milk or derivatives | Foods that contain milk and derivatives |
|---|---|
| Complete substituents for milk<br>Formula S<br>Nutramigen<br>Progestimil<br>Prosobee<br>Isomil<br>Wysoy<br>Peptide 0-2 | All types of dairy<br>Fresh, condensed and powdered and cream milk<br>Cheese (all types)<br>Yogurt<br>Kefir |
| Fats<br>Vegetal fats<br>Meat or chicken fat<br>Cream made without milk (cream)<br>Margarine without milk<br>Peanut butter | Fats<br>Butter<br>Cream<br>Margarine with milk<br>Cream with milk |
| Bread and grains<br>Some children type cereals (rice for kids Robinsons, Boots)<br>Some types of biscuits (original Farley's)<br>Some breakfast cereals (cornflakes)<br>Wheat , corn, rice, secara, orz flour<br>Spaghetti, pasta<br>Bread without added milk<br>Tapioca, sago<br>Puddings without added milk | Bread and grains<br>Kid cereals that contain milk (kid rice Farley's)<br>Biscuits with added milk (ex. those with low sugar Farley's Cow and Gate)<br>Cereals for breakfast with added milk (Special K, some types of muesli)<br>Porridge with cereals and cream or milk<br>Bread with added milk<br>Muffins<br>Puddings with added milk |
| Meat and fish<br>All types of prepared meat without added milk | Meat and fish<br>Meat products with milk derivatives (schnitzel with cream, fish fried in butter, etc.) |
| Eggs<br>Allowed, excepting products mixed with milk | Eggs<br>Products with eggs and milk |
| Vegetables<br>Any type of vegetable fresh, frozen or canned<br>Some type of instant potatoes or chips<br>Potatoes made without butter, margarine, cream or cheese | Vegetables<br>Canned vegetables in sauces with milk or dairy<br>Instant potatoes with milk or dairy<br>French fries with butter, margarine, cream or cheese |
| Fruits<br>Any natural fresh fruit, canned, frozen or juice | Fruits<br>Food combinations between fruits and dairy (ex. yogurt with fruits, strawberries with whipped cream, etc.) |
| Sweets<br>Sugar, glucose, gem, honey, syrup, marmalade, molasses<br>Some types of simple chocolate, jelly | Sweets<br>Milk chocolates, caramels, candy with milk, cookies, fruit yogurt, ice cream |

**Table 4.** *Continued.*

| Foods that don't contain milk or derivatives | Foods that contain milk and derivatives |
|---|---|
| Drinks<br>Soy milk<br>Tea<br>Coffee<br>Cocoa<br>Some types of drinkable chocolate<br>Fruit juices<br>Wine<br>Alcoholic drinks | Drinks<br>Bird milk<br>Drinks with chocolate milk |
| Soups, sauces, salad dressings<br>Home-made soups without milk or dairy<br>Some types of bought soups<br>Some types of mayonnaise and salad dressings | Soups, sauces, and salad dressings<br>The ones that contain milk or derivatives |
| Miscellaneous<br>Sodium bicarbonate<br>Salt<br>Pepper<br>Vinegar<br>Mustard<br>Vanilla extract<br>Gelatin<br>Instant breakfast : Nescao, BLecao, Phoscao, Banania | Miscellaneous<br>Any other product with milk or dairy |

**Table 5.** How to make a menu without milk or dairy.

| | |
|---|---|
| Breakfast | Fruit or juice, porridge with water, soy milk, eggs, salami without milk or dairy, biscuits without dairy, coffee without milk, bread without added milk |
| Lunch | Soups (without milk), meat, vegetables (prepared without milk or cream), fruits, coffee, juice, bread without milk |
| Dinner | Meat, vegetables, potatoes, fruit or gelatins with fruit, coffee, tea, fruit juice, oil, brad without added milk |

*preparation of these menus' is made regarding the patients' culinary preferences and their calorie necessary, seasoning is made with the products mentioned above

It will be taken into account the fact that although some of the products like Kosher margarines, don't contain milk, are colored with tartrazine, additive known for its allergenic proprieties [17].

In Table 5 we have an example of a menu without milk or dairy.

Withholding milk from daily nutrition must be total. But some individuals tolerate small quantities from this type of food, so the dairy restriction doesn't have to be absolute. A larger nutrition diversity may be permitted.

Reintroducing cow milk in the child's alimentation is tried at more than a year after excluding it. Feeding is begun with 5 ml of cow milk with the used substituent. If no allergic reaction appears, the cow milk dose is increased, replacing the substituents [18].

## Conclusions

Allergy to animal or mother milk creates for the implied subject serious nutritional deficits (regarding proteins, lipids, carbohydrates, calcium, etc.), newborns being the more dramatic category of these type of patients.

The notions mentioned above come to cover the gap that exists regarding their feeding. Although their number isn't high, the

consequences for patients and their family are serious if they don't respect the proper diet.

## REFERENCES


**1. Caubet JC, Wang J.** Current understanding of egg allergy. *Pediatr Clin North Am* 58: 427–443, 2011.

**2. Pascual CY, Reche M, Fiandor A, Valbuena T, Cuevas T, Esteban MM**. Fish allergy in childhood. *Pediatr Allergy Immunol* 19: 573-579, 2008.

**3. Sélo I, Clément G, Bernard H et al.** Allergy to bovine beta-lactoglobulin: specificity of human IgE to tryptic peptides. *Clin Exp Allergy* 29: 1055-1063, 1999.

**4. Paschke A**. Aspects of food processing and its effect on allergen structure. *Mol Nutr Food Res* 53: 959-962, 2009.

**5. Dölle S, Schwarz D, Lehmann K et al**. Tomato allergy: impact of genotype and environmental factors on the biological response. *J Sci Food Agric* 91: 2234-2240, 2011.

**6. Kobayashi Y, Kuriyama T, Nakagawara R, Aihara M, Hamada-Sato N**. Allergy to fish collagen: Thermostability of collagen and IgE reactivity of patients' sera with extracts of 11 species of bony and cartilaginous fish. *Allergology International* 65: 450-458, 2016.

**7. Bu G, Luo Y, Chen F, Liu K, Zhu T.** Milk processing as a tool to reduce cow's milk allergenicity: a mini-review. *Dairy Sci Technol* 93: 211–223, 2013.

**8. Liu ZQ, Yang PC.** Hapten may play an important role in food allergen-related intestinal immune inflammation. *N Am J Med Sci* 3: 103–106, 2011.

**9. García BE, Lizaso MT.** Cross-reactivity syndromes in food allergy. *J Investig Allergol Clin Immunol* 21: 162-170, 2011.

**10. Kennedy K**. Providing a dairy-free diet for children. *Community Pract* 83: 38-40, 2010.

**11. Tzifi F, Grammeniatis V, Papadopoulos M.** Soy- and rice-based formula and infant allergic to cow's milk. *Endocr Metab Immune Disord Drug Targets* 14: 38-46, 2014.

**12. Committee on Nutrition**. American Academy of Pediatrics. Committee on Nutrition. Hypoallergenic infant formulas. *Pediatrics* 106(2 Pt 1): 346-349, 2000.

**13. Giovannini M, D'Auria E, Caffarelli C et al.** Nutritional management and follow up of infants and children with food allergy: Italian Society of Pediatric Nutrition/Italian Society of Pediatric Allergy and Immunology Task Force Position Statement. *Ital J Pediatr* 40: 1, 2014.

**14. Institute of Medicine (US) Committee to Review Dietary Reference Intakes for Vitamin D and Calcium.** Dietary reference intakes for calcium and vitamin D. Ross AC, Taylor CL, Yaktine AL, Del Valle HB (Eds). Washington (DC): National Academies Press (US); 2011.

**15. Bueno AL, Czepielewski.MA.** The importance for growth of dietary intake of calcium and vitamin D. *J Pediatr (Rio J)* 84*: 386-394*, 2008.

**16. Jirapinyo P, Densupsoontorn N, Kangwanpornsiri C, Wongarn R.** Chicken-based formula is better tolerated than extensively hydrolyzed casein formula for the management of cow milk protein allergy in infants. *Asia Pac J Clin Nutr* 21: 209-214, 2012.

**17. Dupont C**. How to reintroduce cow's milk? *Pediatr Allergy Immunol* 24: 627-632, 2013.

**18. Neuman I, Elian R, Nahum H, Shaked P, Creter D**. The danger of "yellow dyes" (tartrazine) to allergic subjects. *Clin Allergy* 8: 65-68, 1978.