

## **INTERFERENCE IN THE FUNCTIONS OF SERUM ALBUMIN IN AN INDIVIDUAL WITH ALLERGY TO COW'S MILK CONSTITUENTS**

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**Abstract:** Bovine serum protein is essential for the homeostasis of the human body, as it plays an important role as a carrier of hydrophobic compounds, which are insoluble in blood plasma. Allergies are allergic reactions (hypersensitivity reactions) are inappropriate responses of the immune system to a substance that is normally harmless. This work aimed to demonstrate the interference of bovine serum albumin functions in individuals who are allergic to cow protein. For this, a systematic literature review of scientific articles, magazines, newspapers and monographs was carried out in databases indexed through the Virtual Health Library (VHL), Scielo and LILACS. The allergy is shown by sneezing, watery and itchy eyes, runny nose, itchy skin and rashes. It was also evident the need for further studies with a nutritional focus as a preventive measure in this clinical condition. **Keywords:** Intolerance. Bovine Serum Protein. Cow milk.

## INTRODUCTION

Food allergy is a situation characterized by an inflammatory reaction that is triggered by a substance present in the food, drink or food additive consumed, which can lead to the appearance of symptoms in different parts of the body such as hands, face, mouth and eyes, in addition to it can also affect the gastrointestinal and respiratory system when the inflammatory reaction is very severe. When our immune system (the body's defense shield against viruses and bacteria) confuses a food (or several) with a threat to our health, an allergic reaction occurs. This can occur in just a few minutes or up to two hours after eating, inhaling or skin contact with food.

The most common food allergy among children and appears in the first year of life. The level of sensitivity varies from person to person, and if you are allergic to cow's milk, your doctor may recommend that you also

avoid milk from other animals, such as goat's milk. In addition to eating milk in its various forms (skimmed, semi-skimmed, full fat, powdered, condensed), those who are allergic must avoid dairy products in general, such as butter, yogurt, cheese, cream and ice cream. But be careful because milk can be present in other products such as sausages, pre-prepared meals, bread, cakes and biscuits and even tuna in water.

Compared to human milk, bovine milk has a higher content of nitrogenous compounds, largely due to the higher content of casein and also of  $\beta$ Lg and bovine serum albumin, proteins absent in human milk. The main constituents of cow's milk that cause allergy are glycoproteins — the most common are beta-lactoglobulin and alpha-casein, followed by beta-casein, alpha-lactoglobulin, bovine serum albumin and bovine gammaglobulin. Among the common symptoms are vomiting, colic, diarrhea, abdominal pain, constipation. (ZUCATTI et al, 2019)

Albumin is a globular protein composed only of amino acids, being the most abundant in human blood. depending on where it is found, albumin receives different names: Seroalbumin: Present in blood plasma; Ovalbumin: Present in egg white; Lactoalbumin: Present in milk. Albumin carries out the transport of thyroid hormone through the bloodstream, helps conduct the yellowish bile pigment (bilirubin), the result of some processes carried out in the body, and which remains in the blood plasma until it is expelled in the urine. (CHAVES, 2015)

Among the albumins, bovine serum albumin (BSA) plays an important role as a carrier of hydrophobic compounds, which are insoluble in blood plasma, in addition to acting in the elimination of oxygen free radicals and deactivation of several lipophilic toxic metabolites, such as bilirubin, and a great affinity for small aromatic compounds

(INDYK, et al., 2015; HE, CARTER, 1992). Among the different aromatic compounds of small molar mass, which can be carried by BSA, there is, for example, eugenol. (DAMIANI, 2004)

Thimerosal, when in contact with the biological environment, can interact with biomolecules and can be distributed in different tissues. One of these macromolecules is serum albumin, which is the most abundant protein in plasma and in the human body. In mammals, albumin is synthesized in the liver and is the transport of fatty acids, metal ions, drugs, vitamins and hormones. (MAJOREKA et al 2012; GELAMO; TABAKE; 2000)

Thus, in order to demonstrate the importance of a study on bovine serum protein, it is necessary to conceptualize: what are allergies and their main causes, in addition to the symptoms presented; explain the relationship between bovine milk and BSA; and point out the impact of the functions of this protein in individuals who are allergic to cow's milk.

## **GOALS**

### **GENERAL GOAL**

To verify the interference of allergy to bovine serum albumin in the human body.

### **SPECIFIC GOALS**

Investigate how the components of cow's milk

Ascertain the benefits of knowledge about glycoproteins

Identify to what extent allergy to milk protein can change the life of the Brazilian population

## **METHODOLOGY**

This scientific article aims to expose a literature review based on works and studies of COHORT but the literature review found in academic sites regarding the influence of

bovine serum albumin in the human body were not discarded.

Having as determining and guiding authors, DA SILVA (2019), CHAVES (2015) and Zucatti et al., (2019) as a deep and rigorous verification of the current publications on a certain area of knowledge. The basis used for the research was Google Scholar, Scielo and LILACS.

The guiding studies were chosen based on the years 2015 to 2020, however, older studies were not discarded due to the relevance of the theme, therefore, from the initial scientific sample, the articles that were most associated with the proposed theme were chosen, being done thus, a deep analysis on the subject.

Works in Portuguese and English were prioritized, however, those in Spanish were not excluded, in addition, those with studies related to childhood, from 5 to 10 years, were prioritized, and those of older individuals were not discarded.

## **RESULTS**

Before being studied, allergies were already known. The first recorded case of allergic reaction happened 5000 years ago in ancient Egypt, due to an anaphylactic reaction and wasp sting suffered by Pharaoh Menes, resulting in the death of the monarch. The Egyptian knowledge of medicine was vast and advanced for the time, they had knowledge about asthma and how to use plants in medicinal treatments. (ALBERTI et al, 2010)

At the height of industrialization, in the 19th century, John Bostock, a British physician, observed that every June, he noticed symptoms corresponding to catarrh. symptoms and how to combine the patient's discomfort, but without success. Over the years, this work gained popularity and instead of "Summer catarrh", it was called "Hay fever". Years later, Charles Blackley, also a British physician, discovered pollen as the cause of

the discomfort suffered by John. (ALBERTI et al, 2010)

Clemens von Pirquet, Austrian and pediatrician, in 1906 was responsible for coining the word allergy, as a substitute for the word immunity, which until then was used as a nomenclature for reactions characterized as adverse, however it was only in the 1930s that the word "Allergy came to be identified as a set of harmful immune system reactions to the human body.

It was from this advance in identification that treatment centers and clinics began to emerge whose main objective was to treat this type of adverse reaction to the human body, in view of the exponential growth of this type of reaction, they were very successful, thanks to the advance of industrialization. Exactly in the year 1937, the first antihistamine was developed by Daniel Bovet, Swiss pharmacologist, who would receive the Nobel Prize in 1957 for the development of this product. (CATALDI, 2014)

Allergies are characterized by an increase in the ability of B lymphocytes to synthesize immunoglobulin of the IgE isotype against antigens that access the body via inhalation, ingestion or penetration through the skin (MOREIRA, 2006). An increase in allergic problems caused by food in children and young people has been observed in recent decades. (LARRAMENDI, 2003)

Lactose intolerance is the intolerance of two monosaccharide carbohydrates, glucose and galactose, this intolerance is the most common and affects all age groups (MAHAN; STUMP, 2005). After the ingestion of milk and its derivatives by those with lactose intolerance, there is a set of signs and symptoms such as diarrhea, abdominal pain and distension, flatulence, nausea, vomiting, borborygmus and constipation (PORTO et al., 2005). Symptoms usually manifest from 30 minutes to 2 hours after consumption.

In humans, lactase activity is detected around the third month of pregnancy, but with very low values, increasing from the 26th week onwards, reaching 30% of newborn values at the 34th week, increasing rapidly between the 36th and 38th weeks, and at the end their values are equivalent to those of a one-year-old child (MOBASSALECH et al., 2003).

Compared to human milk, bovine milk has a higher content of nitrogenous compounds, largely due to the higher content of casein and also of  $\beta$ Lg and bovine serum albumin, proteins absent in human milk. The main constituents of cow's milk that cause allergy are glycoproteins — the most common are beta-lactoglobulin and alpha-casein, followed by beta-casein, alpha-lactoglobulin, bovine serum albumin and bovine gammaglobulin. Among the common symptoms are vomiting, colic, diarrhea, abdominal pain, constipation. (ZUCATTI et al, 2019)

There are different types of known albumins, such as ovalbumin, human serum albumin (HSA) and BSA, the latter being the one with the highest concentration in bovine blood and responsible for various functions such as regulation of oncotic pressure, transport and distribution of divalent ions, hormones, bilirubin and fatty acids; scavenging oxygen free radicals and deactivating toxic lipophilic metabolites; in addition to having a high affinity for fatty compounds and for small negatively charged aromatic compounds (FARRUGIA, 2010; TAGHVIMI; HAMISHEHKAR, 2017; TAN; HO, 2018).

Advantages such as high stability, similarity to HSA and relatively low cost (AFSHARAN et al., 2016) contribute to the use of BSA in research both for its use in controlled drug delivery systems and for obtaining RAM-BSA materials, as mentioned in the thread above.

In 1837, the properties of albumin for the

human organism were recognized for the first time, from a man called Ancell, from the first fruit of this study, its complexity has been revealing. However, its properties have not yet been completely unveiled, thus generating a lot of curiosity on the part of researchers.

Albumins are readily soluble in water and can only be precipitated by high concentrations of neutral salts such as ammonium sulfate. When heated to 50°C or more, albumin rapidly forms hydrophobic aggregates that do not revert to monomers upon cooling. At slightly lower temperatures, aggregation is also expected to occur, but at relatively slower rates. (CARPENTER, 2010)

## CONCLUSIONS

Albumin is a globular protein composed only of nine essential amino acids: isoleucine, tryptophan, histidine, methionine, phenylalanine, leucine, lysine, threonine and valine, being the most abundant in human blood. depending on where it is found, albumin receives different names: Seroalbumin: Present in blood plasma; Ovalbumin: Present in egg white; Lactalbumin: Present in milk. The main constituents of cow's milk that cause allergy are glycoproteins — the most common are beta-lactoglobulin and alpha-casein, followed by beta-casein, alpha-lactoglobulin, bovine serum albumin and

Bovine gamma globulin

Knowing that this substance is responsible for giving more viscosity to the blood, contributing to the maintenance of the PH and transport of nutrients, such as calcium, fats and magnesium, in addition to helping to regulate the osmotic pressure: control the amount of water between the tissues and the blood. It is noted that patients with cow's milk allergy may have such physiological functions compromised by the inefficiency of bovine serum albumin.

In addition to the functions already

mentioned, albumin is also responsible for transporting thyroid hormone through the bloodstream, assists in the conduction of the yellowish bile pigment (bilirubin), the result of some processes carried out in the body, and which remains in the blood plasma. until it is expelled in the urine.

It was also observed that when the levels of this protein are low, symptoms such as Malnutrition; Prolonged diarrhea; Nephrotic syndrome; Liver failure; Increased secretion by the kidneys (ascites, nephropathy or enteropathy); Intestinal disorders, due to loss in amino acid absorption during digestion.

After verifying these facts, it is clear the need for more longitudinal studies analyzing the interferences of the functions of bovine serum albumin in a patient with allergy to the constituents of cow's milk, thus enabling the gathering of information with the aim of improving the nutritional approach in terms of public policies in Brazil.

## REFERENCES

- ALBERTI, Luiz Ronaldo; CALDEIRA, Daniel Adonai Machado; PETROIANU, Andy. **Comparação entre história de alergia e infecção em crianças e adolescentes**. RBM rev. bras. med, 2010. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- CARVALHO JUNIOR, F. F. **Apresentação clínica da alergia ao leite de vaca com sintomatologia respiratória**. Jornal de Pneumologia, São Paulo, v. 27, n. 1, jan./fev. 2001. Disponível em: [www.scielo.com.br](http://www.scielo.com.br). Acesso em: 16 de maio de 2023
- CATALDI, Mauro e cols. **Receptores de histamina e anti-histamínicos: da descoberta às aplicações clínicas. História da Alergia**, v. 100, p. 214-226, 2014. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- CHAVES, Estela de Mira. **alergia à proteína do leite de vaca: uma breve abordagem**. 2015. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- CARPENTER, J. F.; IZUTSU, K.; RANDOLPH, T. W. **Freezing- and drying-induced perturbations of protein structure and mechanisms of protein protection by stabilizing additives**. In: REY, L., Freezing-drying/ lyophilization of pharmaceutical and biological products, Louis Rey (ed.), 2010. Disponível em: [www.scielo.com.org](http://www.scielo.com.org). Acesso em: 16 de maio de 2023
- DAMIANI, Durval. **Diabetes mellitus tipo 1 e os anticorpos contra albumina sérica bovina**. Revista da Associação Médica Brasileira, v. 50, n. 2, p. 119-119, 2004. Disponível em: [www.scielo.org.br](http://www.scielo.org.br). Acesso em: 16 de maio de 2023
- DA SILVA PEREIRA, Ana Carolina; MOURA, Suelane Medeiros; CONSTANT, Patrícia Beltrão Lessa. **Alergia alimentar: sistema imunológico e principais alimentos envolvidos**. Semina: Ciências Biológicas e da Saúde, v. 29, n. 2, p. 189200, 2008. Disponível em: [www.scielo.org.br](http://www.scielo.org.br). Acesso em: 16 de maio de 2023
- FERNANDES, M. E. **Alergia alimentar em cães**. 2005. Dissertação. (Mestrado em Saúde Pública) – Faculdade de Saúde Pública, Universidade de São Paulo, São Paulo. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- FERREIRA, C. T.; SEIDMAN, E. **Alergia alimentar: atualização prática do ponto de vista gastroenterológico**. Jornal de Pediatria, Rio de Janeiro, v. 83, n. 1, p. 720, 2007. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- FRANCO, B. D. G. M.; LANGRAF, M. **Microbiologia dos alimentos**. São Paulo: Atheneu, 1996. 182 p. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- LEIS, R.; TOJO, R.; PAVÓN, P.; DOUWES, A. **Prevalence of lactose malabsorption in Galicia. Journal of Pediatric Gastroenterology and Nutrition**. v. 25, n. 9, p. 296-300, 1997. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- LOPES, C. RAVASQUEIRA, A.; SILVA, I.; CAIADO, J.; DUARTE, F.; DIDENKO, I.; SALGADO, M.; SILVA, S. P.; FERRÃO, A.; PITÉ, H.; PATRÍCIO, L.; BORREGO, L. M. Allergy School Hannover 2006: **Allergy, from diagnosis to treatment**. Revista Portuguesa de Imunoalergologia, Lisboa, v. 14, n. 4, p. 355-364, 2006. Disponível em: [www.googleacademico.com.br](http://www.googleacademico.com.br). Acesso em: 16 de maio de 2023
- MOREIRA, L. F. **Estudo dos componentes nutricionais e imunológicos na perda de peso em Camundongos com alergia alimentar**. 2006. Dissertação (Mestrado em Patologia Geral) – Universidade Federal de Minas Gerais, Belo Horizonte. Disponível em: [www.scielo.org.br](http://www.scielo.org.br). Acesso em: 16 de maio de 2023
- ZUCATTI, Kelly Pozzer; MELLO, Kauan Trindade; NESPOLO, Cássia Regina. **alergia às proteínas do leite bovino e possíveis substituintes**. 2019. Disponível em: [www.googleacademico.org.br](http://www.googleacademico.org.br). Acesso em: 16 de maio de 2023