

## Alpha – Gal Syndrome and Red Meat Allergy in Human

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**Abstract:** The present paper deals with the study of a kind of food allergy developed after the bite of Loan- star tick and the consumption of red meat in human. This is called as the alpha-gal – syndrome (AGS) allergy in human. The mammalian meat allergy (MMA) is developed due to the injection of galactose alpha- 1,3- galactose sugar molecule in the human body by a Loan- star tick.

**Keywords:** Alpha – Gal Syndrome, Loan- Star Tick, Red Meat Allergy in Human, Galactose Alpha- 1,3, Galactose Sugar Molecule.

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## INTRODUCTION

This a kind of serious, potentially life-threatening allergic reaction developed for an atypical

sugar molecule galactose – alpha- 1,3- galactose in human after the bite of a Lone- Star tick (*Amblyomma americanum*) found in the United States (Figure 1).



**Figure 1:** A Loan- star tick (*Amblyomma americanum*) responsible to cause Alpha-gal allergy in human (Photo credited from James Gathany and Michael L. Levin CDC)

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The Lone- star ticks are carried by the deer and these ticks carry the alpha-gal sugar molecule. The syndrome was discovered in 2009 and since then the syndrome has increasingly been studied by the researchers. In United States, nearly 34000 alpha-gal syndrome (AGS) cases have already been reported till 2018. It has been observed that some other ticks like *Ixodes holocyclus* are also involved in Europe, Asia and Australia (Kwak *et al.*, 2018 & Crispell *et al.*, 2019 [1, 2]).

Alpha- gal of mammalian meat allergy (MMA) is a life-threatening allergic reaction developed by the Lone- star tick bite only after the consumption of red meat. Since the alpha-gal sugar is mostly found in mammalian red meat, the people suffering from alpha-gal syndrome cannot consume the mammalian red meat like meat, mutton, beef and pork. The alpha-gal sugar is also found in milk and milk products like gelatin, thickening agent carrageenan and a cancer medicine as cetuximab. However, they are not found in birds, reptiles and fishes (Crispell *et al.*, 2019 & Sharma and Karim 2021 [2, 3]).

The bacteria responsible to enhance the level of alpha-gal in ticks has been found as *Anaplasma phagocytophilum* (Alejandro *et al.*, 2019 [4]). The allergy is acquired when a person is bitten by a Lone-star tick. The tick's saliva containing alpha-gal sugar is injected into a person during the course of feeding. The human body in response to this alpha -gal sugar produces enough IgE antibodies in equilibrium. Later on, when red meat is consumed, the body's immune system in para mounting the attack and digesting the alpha-gal sugar simultaneously exposed the disease symptoms instantly (Commins *et al.*, 2013, Patricia *et al.*, 2021 [5, 6]).

Further, AGS has always been associated with unusual delayed onset of symptoms. Symptoms often appear between 4 to 8 hours after consuming the red meat. This is characterized by the anaphylactic shock symptoms, hives, swelling in lips, tongue and Throat, severe itching, itchy scaly skin, wheezing and sneezing, heart burn, shortness of breath, difficult breathing, low blood pressure, dizziness, fainting, headache, nausea, vomiting, stomach pain and diarrhea. Once the symptoms appeared in an individual it does not easily go away. Some of the risk factors associated with the AGS are as sudden drop of blood pressure, rapid pulse rate, constriction of airways causing difficult breathing and the loss of consciousness. It takes about 1 to 2 years to disappear the symptoms, if no more bites are occurring further. Finally, preventing from tick bites might reduce the chances of developing AGS in future (Wolver *et al.*, 2013, Van Nunen *et al.*, 2015, Mabelane & Ogunbanjo 2019 [7-9]). The red meat allergy is diagnosed by performing a blood test. There is no cure for this allergy except the application of over- the-

counter drug antihistamines. Sometimes, epinephrine may also need to be administered (Mabelane and Ogunbanjo 2019 [9]).

## CONCLUSION

The present paper discusses the status of alpha-gal syndrome in human. The syndrome is developed when a Lone- star tick injected alpha-gal sugar in the human body with the consumption of red meat thereafter. In most of the cases, the life- threatening symptoms appear. Last but not the least, though the alpha-gal syndrome and its connection to tick bite is recent for sure but appears a little bit paradoxical. There are some other parts of the world, where the syndrome has been identified but the Lone-Star ticks are not found; might be this is due to other kind of ticks involved. However, more researches are still required to better understand the status of alpha-gal syndrome in human.

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## REFERENCES

1. Kwak, M., Somerville, C., & van Nunen, S. (2018). A novel Australian tick *Ixodes* (Endopalgiger) australiensis inducing mammalian meat allergy after tick bite. *Asia Pacific Allergy*, 8(3), 31.
2. Crispell, G., Commins, S. P., Archer-Hartman, S. A., Choudhary, S., Dharmarajan, G., Azadi, P., & Karim, S. (2019). Discovery of alpha-gal-containing antigens in North American tick species believed to induce red meat allergy. *Frontiers in immunology*, 10, 1056.
3. Sharma, S. R., & Karim, S. (2021). Tick saliva and the alpha-gal syndrome: finding a needle in a haystack. *Frontiers in Cellular and Infection Microbiology*, 11, 680264. Doi.10.3389/fcimb.2021.680264.
4. Cabezas-Cruz, A., Hodžić, A., Román-Carrasco, P., Mateos-Hernández, L., Duscher, G. G., Sinha, D. K., ... & De La Fuente, J. (2019). Environmental and molecular drivers of the  $\alpha$ -Gal syndrome. *Frontiers in Immunology*, 1210.
5. Commins, S. P., & Platts-Mills, T. A. (2013). Delayed anaphylaxis to red meat in patients with IgE specific for galactose alpha-1, 3-galactose

- (alpha-gal). *Current allergy and asthma reports*, 13, 72-77.
6. Román-Carrasco, P., Hemmer, W., Cabezas-Cruz, A., Hodžić, A., de la Fuente, J., & Swoboda, I. (2021). The  $\alpha$ -Gal syndrome and potential mechanisms. *Frontiers in Allergy*, 2, 783279. doi.10.3389/falgy.2021.783279.
  7. Wolver, S. E., Sun, D. R., Commins, S. P., & Schwartz, L. B. (2013). A peculiar cause of anaphylaxis: no more steak? The journey to discovery of a newly recognized allergy to galactose-alpha-1, 3-galactose found in mammalian meat. *Journal of general internal medicine*, 28, 322-325.
  8. van Nunen, S. (2015). Tick-induced allergies: mammalian meat allergy, tick anaphylaxis and their significance. *Asia Pacific Allergy*, 5(1), 3-16. Doi.10.5415/apallergy.2015.5.1.3.
  9. Mabelane, T., & Ogunbanjo, G. A. (2019). Ingestion of mammalian meat and alpha-gal allergy: clinical relevance in primary care. *African Journal of Primary Health Care and Family Medicine*, 11(1), 1-5.