Innovative Desensitization Protocol for Mammalian Meat Allergy in Alpha-Gal Syndrome: A Case Report

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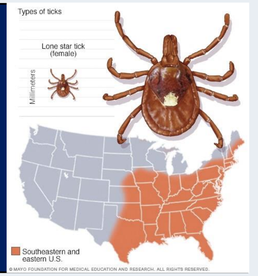

Introduction

- Individuals bitten by the lone star tick (Amblyomma americanum) can develop alpha-gal syndrome (AGS), an IgE-mediated allergic reaction triggered by exposure to galactose-α-1,3-galactose (α-Gal) present in mammalian meat.
- AGS is a public health concern as cases continue to increase annually. It is reported that there were more than 34,000 cases of AGS in the US between 2010 and 2018. Estimates from the Centers for Disease Control and Prevention suggest that there were over 110,000 suspected AGS cases in the US between 2010 to 2022.[1,2]
- Currently, there is no recommended treatment for these patients with mammalian meat allergy (MMA), except to avoid mammalian meat ingestion.
- This report details the case of a 38-year-old man with AGS and severe MMA who was successfully desensitized to meat utilizing a novel oral immunotherapy (OIT) protocol.

Case History

- The patient had no significant past medical history or allergies. He was an avid hunter, 38yo in good physical condition, and works as a home builder.
- He was bit by a lone star tick in Missouri in August 2024 and started having reactions weeks after the tick bite.
- His first reaction occurred 3 hours after ingesting steak. Symptoms included severe abdominal pain, full body hives, and tightening of the throat.
- The patient had 4 subsequent reactions to meat products with symptoms ranging from abdominal pain, rash, changes in vision, dizziness, and difficulty breathing.
- He completed laboratory testing for an α-Gal panel in October 2024 as shown below. It is notable that his total serum IgE was 985 IU/mL and he had positive IgE antibodies specific to beef, pork, lamb, and α-Gal.

α-Gal Panel Results

Specific IgE	Levels of Specific IgE (kU/L)	Class	Class Description
Pork	11.90	IV	Very High
Beef	40.60	V	Very High
Lamb	11.90	IV	Very High
α-Gal	>100	VI	Very High

Total IgE = 985 IU/mL
Reference Range: 6 – 495 IU/mL

Desensitization Protocol

Broth Preparation

30 mg meat boiled in 3L water for 20 min

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10 mL broth (0.01 mg/mL) further diluted in 90 mL water

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Final Broth Concentration = 0.001 mg/mL

Meat: Ribeye steak

Evidence suggests ribeye steak has a higher concentration of α-Gal compared to other cuts like flank, sirloin, or filet mignon. However, individual variations in the presence of α-Gal may depend on the animal and its exposure to certain environmental factors.

Table 1. 28-Day Red Meat Desensitization Protocol

Day	First Dose (7 AM)	Second Dose (1 PM)	Notes
1-2	0.25 mL	0.25 mL	0.00025 mg broth
3	0.5 mL	0.5 mL	0.0005 mg broth
4	1 mL	1 mL	0.001 mg broth
5	2 mL	2 mL	0.002 mg broth
6	4 mL	4 mL	0.004 mg broth
7	8 mL	8 mL	0.008 mg broth
8	16 mL	16 mL	0.016 mg broth
9	2 mg	2 mg	meat
10	4 mg	6 mg	meat
11	12 mg	12 mg	meat
12	24 mg	24 mg	meat
13	28 mg	32 mg	meat
14	40 mg	40 mg	meat
15	60 mg	60 mg	meat
16	80 mg	100 mg	meat
17	120 mg	160 mg	meat
18	240 mg	240 mg	meat
19	400 mg	400 mg	meat
20	750 mg	750 mg	meat
21	1 g	1 g	meat
22	2 g	3 g	meat
23	5 g	5 g	meat
24	10 g	10 g	meat
25	20 g	20 g	meat
26	40 g	40 g	meat (1.4 oz)
27	60 g	60 g	meat (2.1 oz)
28	80 g		meat (2.8 oz)
29	100 g		meat (3.5 oz)
30	170 g		meat (6.0 oz)

Discussion

- The investigators prepared the broth and measured doses in weekly supplies, which were then provided to the patient.
- The patient initiated the desensitization protocol (**Table 1**) in May 2025. The first dose was ingested under the supervision of a healthcare provider. He was instructed to report any allergic symptoms and keep doses of diphenhydramine, famotidine, and an epinephrine injector on hand always.
- The patient denied development of any reactions throughout the desensitization period. He continues a maintenance protocol consisting of consuming 3-6 oz of steak at least 3 times weekly to maintain tolerance. He has increased meat portions over time and tolerates servings exceeding 10 oz of steak. He reports significant improvements in quality of life.
- This is the second successful adult MMA desensitization completed with our protocol. This experimental protocol may help patients avoid hospitalizations related to hypersensitivity reactions that occur via cross-contamination.

Conclusion

The success of this novel desensitization protocol can potentially provide hope for those living with AGS and MMA where ingestion of α-Gal can result in severe or life-threatening reactions. Further examination of this novel treatment for patients with AGS would be prudent.

References

1. Thompson JM, Carpenter A, Kersh GJ, Wachs T, Commins SP, Salzer JS. Geographic distribution of suspected alpha-gal syndrome cases - United States, January 2017-December 2022. MMWR Morb Mortal Wkly Rep [Internet]. 2023 [cited 2025 Aug 21];72(30):815–20. Available from: https://www.cdc.gov/mmwr/volumes/72/wr/mm7230a2.htm?s_cid=mm7230a2_w
2. Ross M, Daley G, Burnard M L, et al. (July 21, 2025) Alpha-Gal on the Rise: The Alarming Growth of Alpha-Gal Syndrome in High-Risk Regions. Cureus 17(7): e88415. DOI 10.7759/cureus.88415