

## Focus on ... Shrimp Tropomyosin

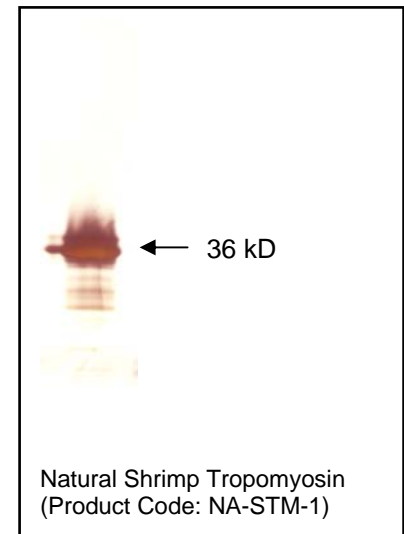
Shellfish is the #1 cause of food allergy in adults in the United States <sup>(1)</sup>. A recent survey found that 1 in 50 Americans has shellfish allergy <sup>(2)</sup>. Most shellfish species, provoking allergic reactions belong to the class crustacea, which includes shrimp, crab, crawfish and lobster with shrimp being the leading culprit. Since 1970 shrimp consumption has more than tripled and it is expected that allergy to shellfish will continue to be on the rise <sup>(3)</sup>. Ingestion of shrimp allergens can induce allergic reactions that range from pruritus, urticaria, angioedema and gastrointestinal symptoms to asthma and life-threatening anaphylaxis <sup>(4)</sup>.

The muscle protein tropomyosin is the major allergen identified in several shrimp species. Species of the shrimp genera *Penaeus* are the most common edible shrimp species in North America. Pen a 1, tropomyosin of Brown shrimp (*Penaeus aztecus*) is heat-stable and is found in both raw and cooked Shrimp <sup>(5-8)</sup>. Approximately 80% of individuals sensitised to Brown shrimp show IgE antibody reactivity to Pen a 1 <sup>(6,9)</sup>. Shrimp tropomyosin (MW 36 kDa) is an abundant protein that constitutes up to 20% of total protein of the edible part of shrimp.

Tropomyosin is a highly conserved protein, with multiple isoforms that is found in both muscle and non-muscle cells of all species of vertebrates and invertebrates (Table 1). Allergenic tropomyosins are found in invertebrates such as crustaceans, arachnids (house dust mites), insects (cockroaches) and mollusks (e.g. squid), but there is a lack of allergenic cross-reactivity between these tropomyosins and those from vertebrates such as bony fish, beef, pork or chicken, which are considered nonallergenic <sup>(8,10)</sup>.

Clinically relevant allergenic tropomyosin in crustaceans other than shrimp are found in lobster (Pan s 1, Hom a 1) <sup>(11-12)</sup>, crab (Cha f 1) <sup>(13)</sup>, squid (Tod p 1) <sup>(14)</sup>, snail (Tur c 1) <sup>(15)</sup> and oyster (Cra g 1) <sup>(16)</sup>. Those identified in other invertebrates are found in house dust mites (Der f 10, Der p 10) <sup>(17-18)</sup>, and cockroaches (Per a 7, Bla g 7) <sup>(10,19-21)</sup>.

Immunological cross-reactivity has been demonstrated between crustaceans, cockroaches and House dust mites, suggesting that tropomyosin is an important cross-sensitising panallergen <sup>(4,10)</sup>. Some studies suggest that this cross-reactivity may be clinically relevant. Sensitization and allergic symptoms to ingested snails and shrimp have been reported following specific immunotherapy with dust mite <sup>(6)</sup>. IgE antibody



reactivity to shrimp among Orthodox Jews, unexposed to shellfish, was demonstrated and appeared to result from cross-reacting tropomyosin in subjects allergic to mite and/or cockroach <sup>(22)</sup>.

Allergy to crustacea is common, thus detection of tropomyosin sensitization may be helpful for diagnosis of shellfish allergy. Purified shrimp tropomyosin can be a useful reagent in diagnostic assays to determine sensitization and allergy to shrimp and other shellfish species.

	<b>Crustacea</b>	<b>Insecta</b>	<b>Arachnida</b>	<b>Vertebrata</b>	<b>Vertebrata</b>
	Pan s 1	Per a 7	Der p 10	Chicken TM	Salmon TM
Shrimp Pen a 1	98	82	81	56	54

1. **Table 1:** Sequence identity (%) between Shrimp tropomyosin (Pen a 1) and other allergenic as well as non-allergenic tropomyosins (TM). Modified from Reese et al.<sup>(5)</sup>

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