



fredlyn



# “Big Eight” Food Allergens

Milk



Soy



Tree Nuts



Eggs



Shellfish



Wheat



Peanuts



Fish

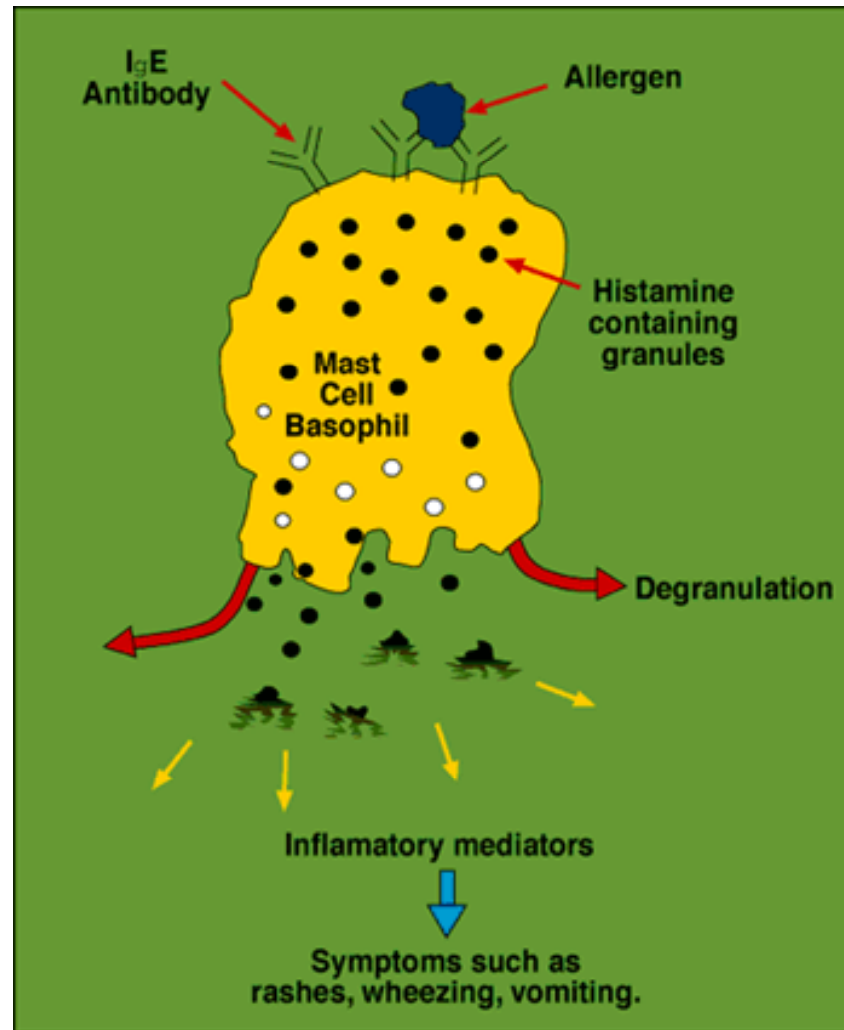


## Impact of Food Allergy

- Food allergy medically related costs estimated to be 500 million dollars annually
- Food-induced anaphylactic reactions are a common cause of ER visits in US
- Approximately 8% of US children under 18 suffer from food allergies
- Costs associated with food recalls due to undeclared allergens
- Costs for sanitation, screening, and verification of processing/packaging facilities
- Costs of increase in regulatory steps and labeling
- Costs associated with food allergic family member

# What is Food Allergy?

- IgE mediated immune response with mast cell degranulation and histamine release



- Contributions from genetics, geography, culture, and food processing

## What Makes a Food Allergenic?

- Proteins or glycoproteins
- Similar protein sequences or structures
- Survive cooking/thermal processing methods intact
- Resistant to acidic/basic conditions, enzymatic digestion

# Nut Allergy

- Approximately 2 million americans have allergy to tree nuts
- Up to 3% of US children under 18 have peanut and/or tree nut allergies
- Nut allergies are rarely outgrown and are often lifelong allergies
- The only accepted treatment for nut allergies is avoidance
- Reaction to tree nuts are among the most severe
- Fatal food anaphylaxis is most often caused by peanuts and tree nuts

PECAN ALLERGY ALERT, Aug. 24, 2011

FAAN Allergy Alert Notice

Central Market is recalling 6-count and single "Pretzel Logic" cookies due to undeclared pecans. The product was sold at Central Market stores in Texas.

The recall affects the 6-count "Pretzel Logic Cookies," UPC 23123700000 and single "Pretzel Logic Cookie," UPC 23125700000.

Consumers may return the product to the place of purchase for a refund. Consumers with questions may contact H-E-B Customer Relations at (210) 938-8357 or (800) 432-3113

## Common Nut Allergens

- Plant protective pathogenesis-related (PR) proteins

2S albumin

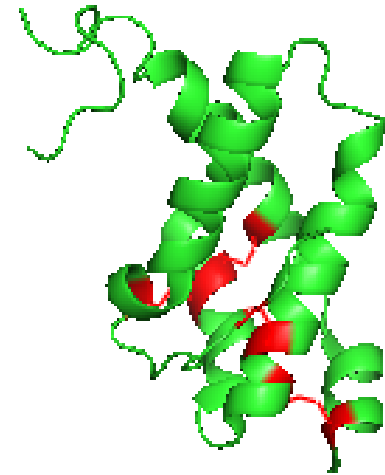
- Seed storage proteins

11S legumin

7S vicillin

## 2S albumin

- Member of the prolamin-superfamily
- Plant protective Pathogenesis –Related (PR) proteins
- Diverse functions including:
  - antifungal
  - protease inhibitors
- Proteolytically processed into large and small subunits
- Structural disulfide bonds link subunits
- Highly resistant to processing methods

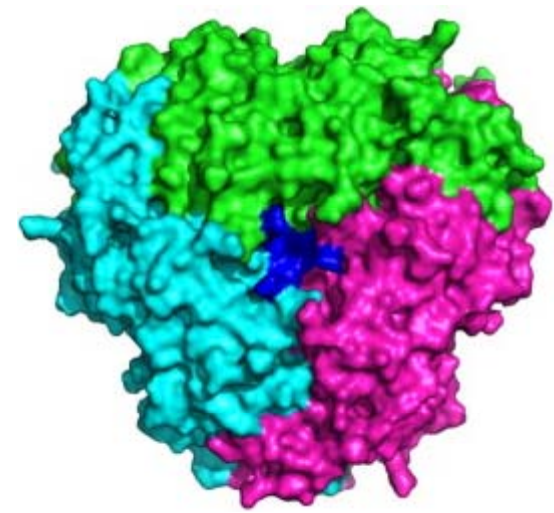
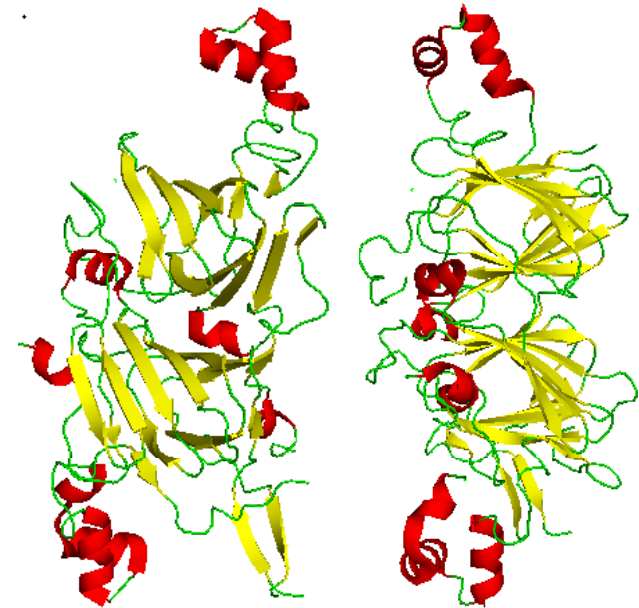


Mueller et al. Allergy. 2011



## 11S legumin

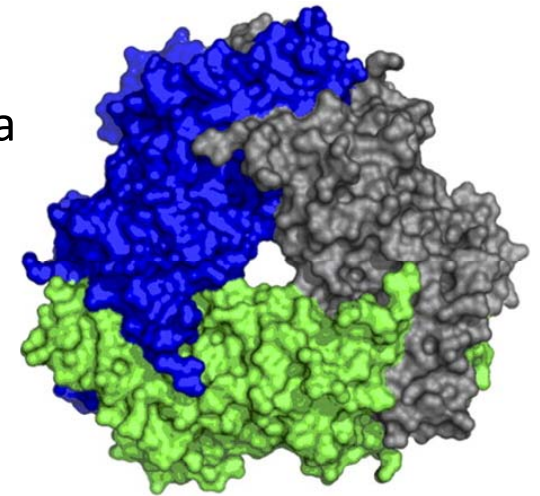
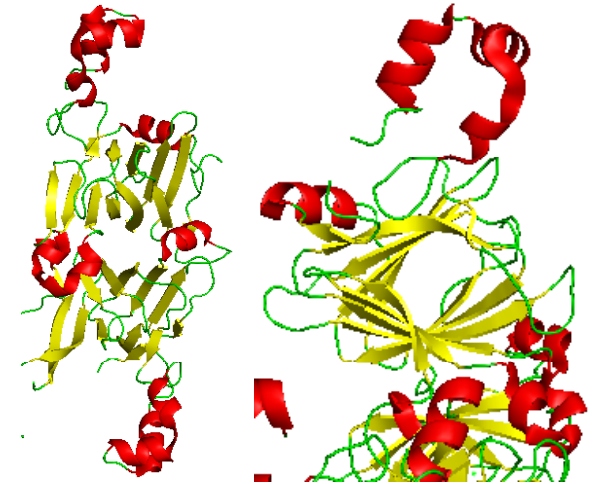
- Seed storage protein
- Member of the cupin-superfamily
- Conserved in prokaryotes and eukaryotes
- Single chain proteolytically processed
- Acidic 30-40kDa and basic 20kDa subunits
- Linked by a disulfide bond
- 3 trimers associate to form hexamers



Jin et al. Mol. Immunol. 2009

## 7S vicillin

- Seed storage protein
- Member of the cupin-superfamily
- Conserved in prokaryotes and eukaryotes
- Typically 40-80kDa protein composed of two cupin barrels
- Trimers forming ring structure molecular mass 150-190kDa
- Sometimes glycosylated



Chruszcz et al. J. Biol. Chem. 2011

## Conserved Nut Allergens Recognized by WHO/IUIS

<u>Nut/Allergen</u>	<u>2S albumin</u>	<u>7S vicillin</u>	<u>11S legumin</u>
<u>Peanut</u>	Ara h 2	Ara h 1	Ara h 3
<u>Walnut</u>	Jug r 1	Jug r 2	Jug r 4
<u>Pecan</u>	Car i 1	Car i ?	Car i 4
<u>Cashew</u>	Ana o 3	Ana o 1	Ana o 2
<u>Almond</u>			Pru du 6
<u>Pistachio</u>	Pis v 1	Pis v 3	Pis v 2/5
<u>Hazel</u>	Cor a 14	Cor a 11	Cor a 9
<u>Brazil</u>	Ber e 1		Ber e 2

## Nut Allergens Summary

- Conserved plant protective and seed storage proteins
- Major allergens (seed storage or plant protective)
  - 2S albumins
  - 11S legumins
  - 7S vicillins
- Resistant to digestion and thermal processing

## **Pecan allergen research objectives**



- 1) Identify and characterize Pecan nut allergens**
- 2) Develop processing methods that can eliminate Pecan allergens**
- 3) Create improved diagnostic tools for detection/tracking of Pecan allergens**

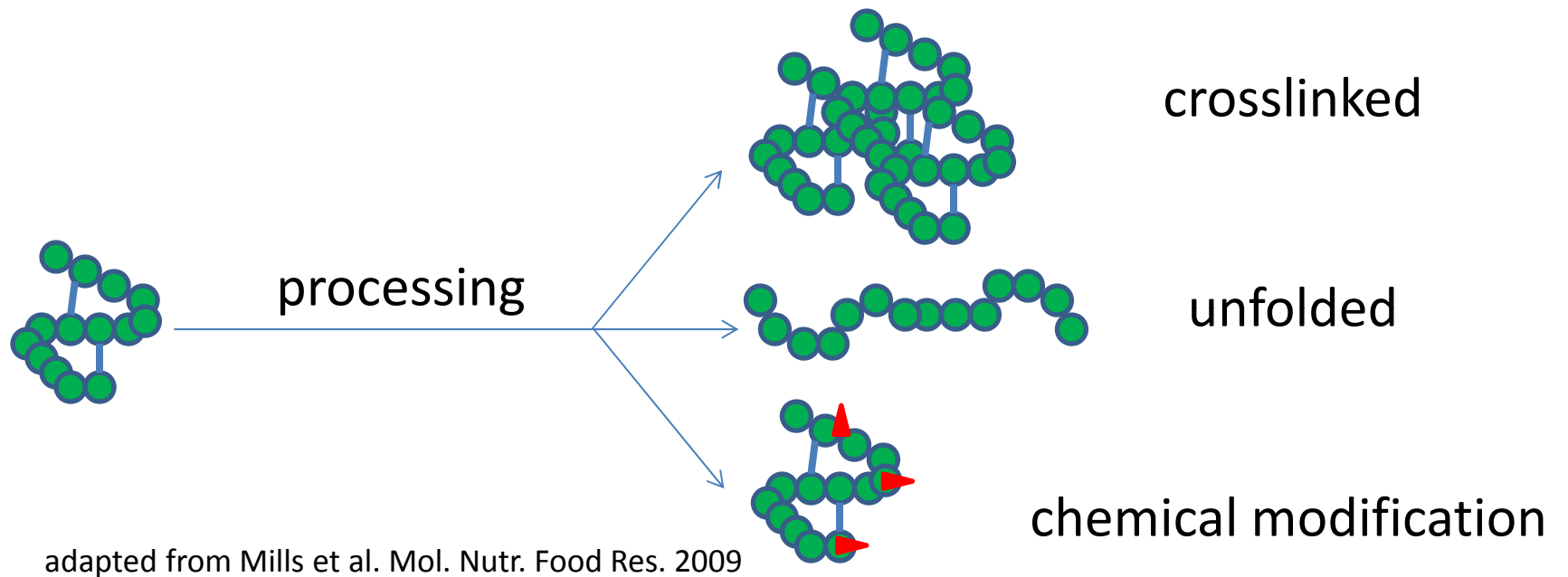
# Pecan Praline King Cake

2012 NOLA.com King Cake Winner



Chris Granger/The Times-Picayune

# Role of Processing on Nut Allergens



Food processing can alter the immunological characteristics of nut allergens

# Pecan Allergen Research

- Continue to learn about Pecan allergen proteins  
2S albumin, 11S legumin, 7S vicillin, and others  
identify processing induced modifications
- Improved food safety  
processing methods to reduce/eliminate Pecan allergens  
better diagnostic methods for detection of Pecan allergens  
molecular methods for tracking Pecan cultivars
- Better understanding of Pecan nut development  
increased nut quality  
better production  
reduction in costs
- Improved crop characteristics  
development of cultivars lacking/with reduced allergens  
identification of genomic and proteomic markers



# Thank you

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