

Food processing and allergenicity

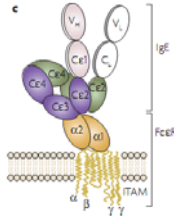
the case of soy

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Soybean

- Inexpensive
- High protein content (37%)
- Nutritional and health benefits (cardiovascular health, anti-inflammatory and anticancer)
- Increased use in food products



Soy allergy

- Prevalence: 0.6% (Sweden) to 3.6% (Italy) overall 2.1% (general adult population)
- One of the "big 8" most allergenic foods
- Symptoms (mild to systemic)
 - Dermatological
 - Gastrointestinal
 - Respiratory
 - Systemic



Present in:

Bakery ingredients, Beer, Noodles, Prepared meat products, Meat analogs, Breakfast cereals, Food drinks, Baby food, Candy products, Sausage casings, Imitation dairy products, Flavorings, Infant formula, Salad condiments



Burney et al (2010) EuroPrevall analysis.

Major soy allergenic proteins

Gly m 5	Gly m 6
β-conglycinin / 7S globulin	Glycinin / 11S globulin
150 – 200 kDa	≈ 350 kDa
α-subunit (54 – 77 kDa)	5 major subunits (62-72 kDa)
α'-subunit (54 – 82 kDa)	- Acidic chain (33, 29 and 27 kDa)
β-subunit (42 – 55 kDa)	- Basic chain (≈ 16 kDa)
51% sequence identity with Ara h 1	Acidic chain epitopes identical to Ara h 3
Highly thermostable allergens	

Gly m 4: cross-reactive allergen

- Bet v 1 homologue (birch pollen allergen)
- 46-53% sequence identity
- 17 kDa
- Heat labile or partly heat stable (?)

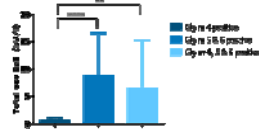


Three groups of patients

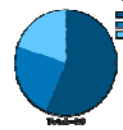
Patient division based on sIgE levels



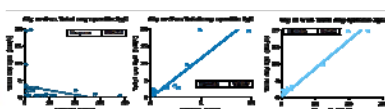
Total soy IgE responses



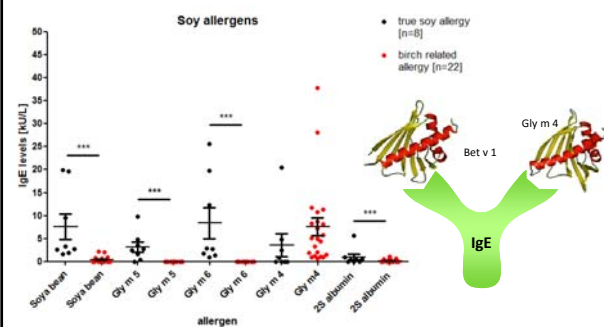
Patient division based on soy products



Total soy extract is not a good diagnostic marker for soy allergy. In the studied group (n=30), 53.3% of patients would be misdiagnosed based on sIgE for total soy only.

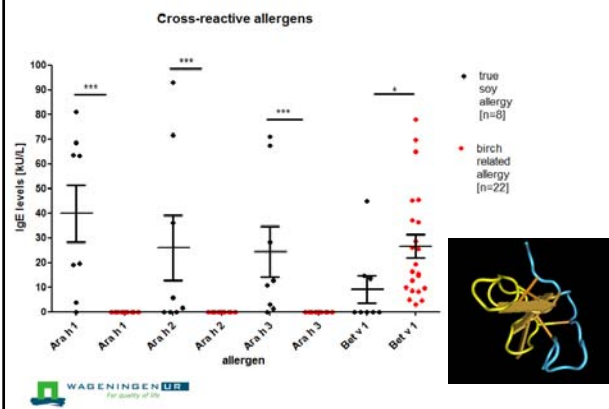


Specific IgE levels in two groups of soy allergic patients



Teodorowicz, 2016

Specific IgE levels in two groups of soy allergic patients



Conclusions

- Total soy extract is not a good diagnostic marker for soy allergy.
- Soy milk (related products) cause allergic symptoms in the majority (56.7%) of soy allergic patients due to cross reactivity of Gly m 4 with Bet v 1.
- When the diagnosis of Bet v 1 related soy allergy is confirmed, patients may only need to avoid soy milk (related products) rather than all soy products. Birch pollen-allergic patients should be informed about this potential reaction.

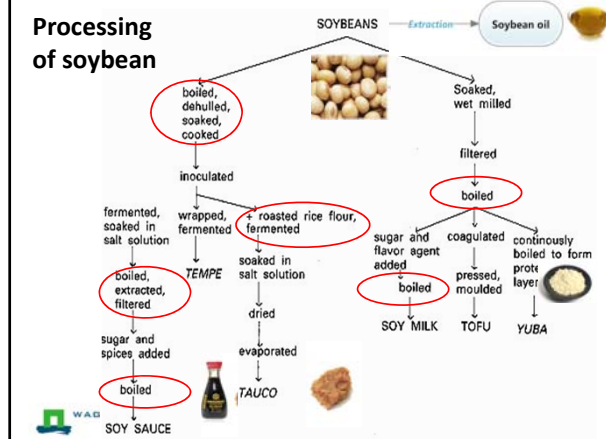
WAGeningen **UR**
 For quality of life

Clinical relevance

	Gly m 4 positive (P23)	Gly m 5, 6 positive(P2)
Questionnaire		
Symptoms	Anaphylaxis, angio-edema, laryngeal edema, nausea, vomiting	Anaphylaxis, urticaria, diarrhea, laryngeal edema
Product(s)	Alpro Soya milk (>250 ml)	Soy sprouts, soy sauce, cookies
Hayfever?	Yes	No
Influence daily life	Avoiding all products containing soy	Always checking labels of products, medication always with me
ImmunoCAP IgE (kU/l)		
Total soy	<0.35	9.6
Gly m 4	11.8	<0.35
Gly m 5	<0.35	3.6
Gly m 6	<0.35	12.3
Bet v 1	45.1	<0.35

WAGeningen **UR**
 For quality of life

Processing of soybean



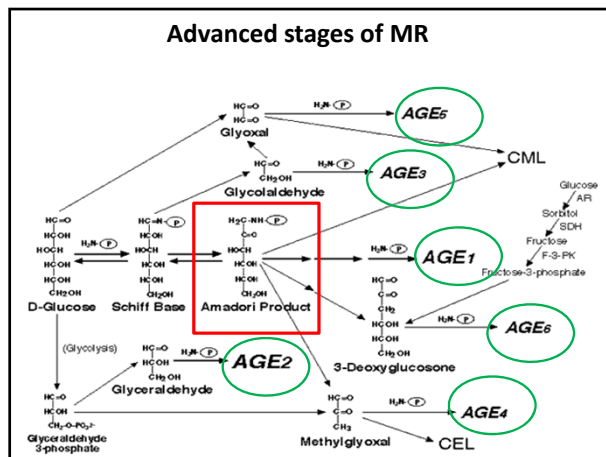
Maillard reaction – soy model

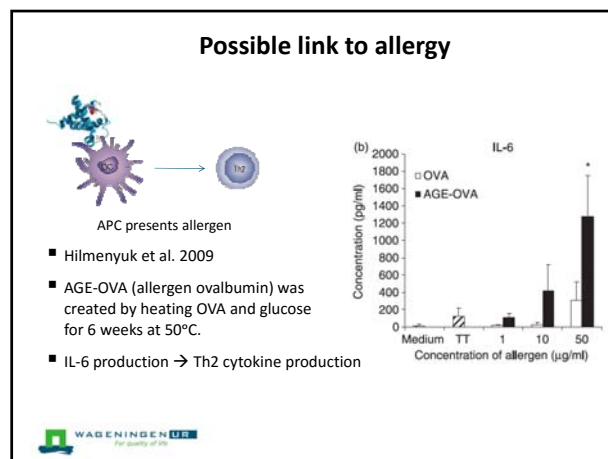
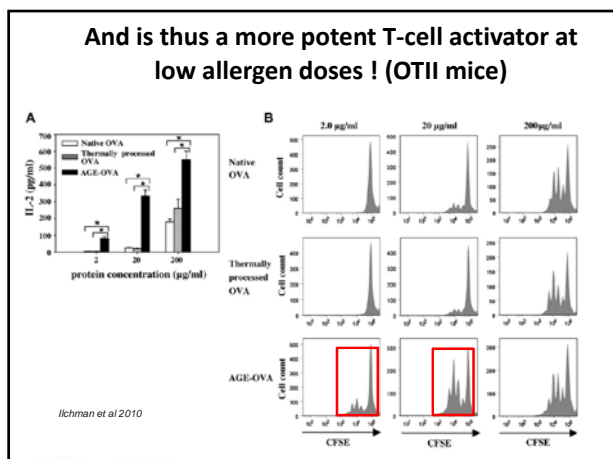
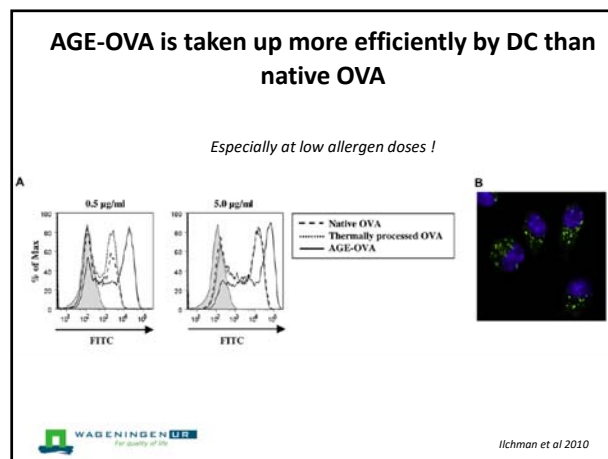
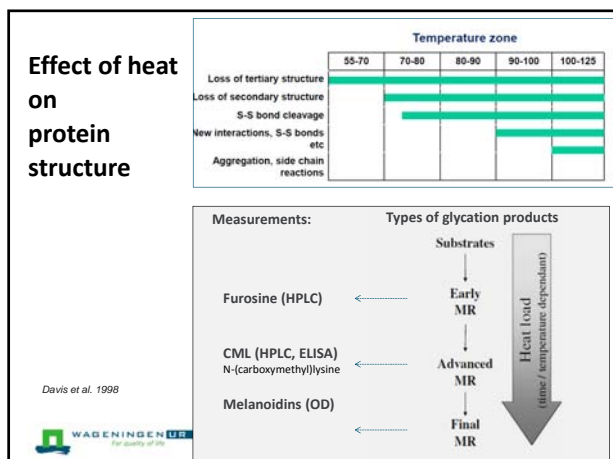
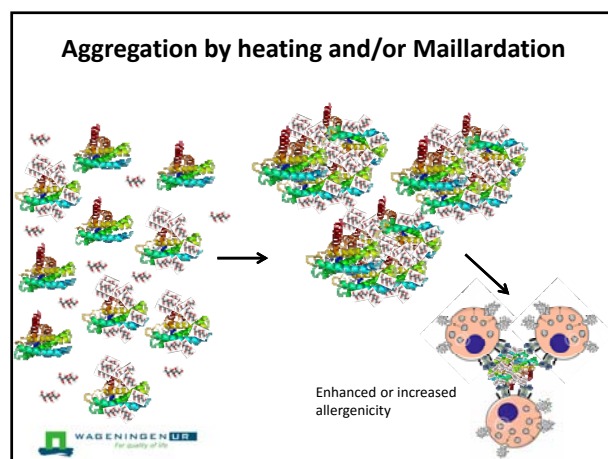
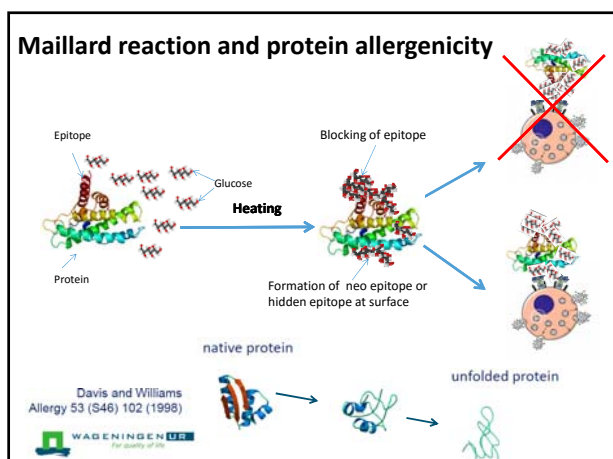
soy + reducing sugars → processing (high temperatures) → Maillard reaction products (MRPs)

Development of color, aroma, flavor, texture of processed foods. Levels of AGEs correlate with induction of diabetes, cardiovascular disease, renal disease, Alzheimer disease, aging, allergy, chronic inflammation and cancer

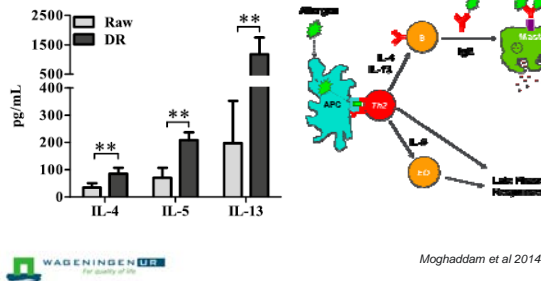
Louis-Camille Maillard

Advanced stages of MR

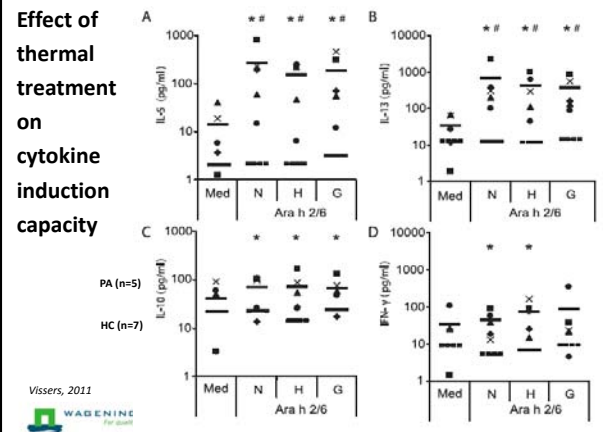




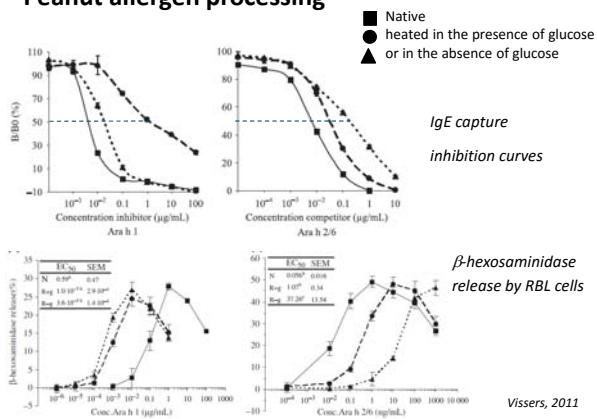
Dry roasted (DR) peanut is a more potent Th2 inducer than raw peanut



Effect of thermal treatment on cytokine induction capacity



Peanut allergen processing

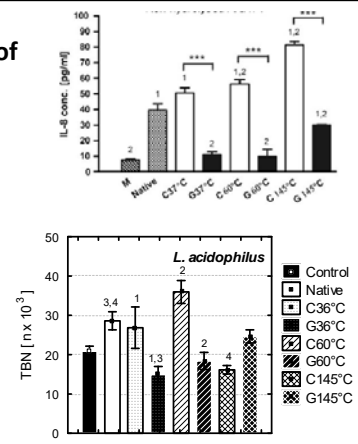


Blocking capacity of processed Ara h 1

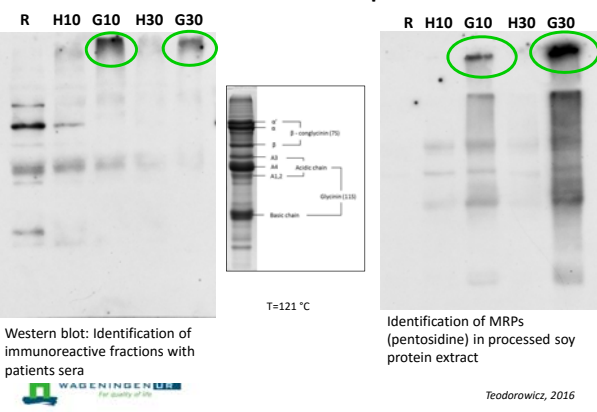
IL-8 by Caco-2 cells

Inhibition of bacterial adhesion to Caco-2 cells by treated Ara h 1

Teodorowicz, 2014



SPE - Identification with pentosidine



The Basophil Activation Test

