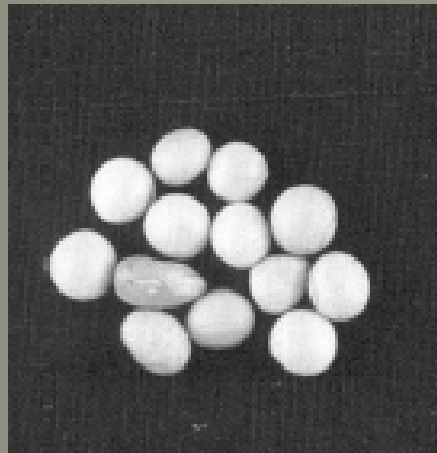


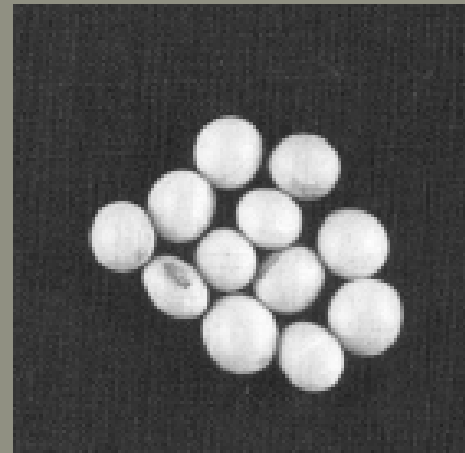
Genetically Modified and Wild Soybeans: An Immunologic Comparison

Authors: Hye-Yung Yum, M.D., Ph.D., Soo-Young Lee, M.D., Ph.D., Kyung-Eun Lee, M., Myung-Hyun Sohn, M.D., Ph.D., and Kyu-Earn Kim, M.D., Ph.D.

Published in: *Allergy and Asthma proceedings*, Vol. 26, Nr. 3, May 2005



WILD Korean soybeans



GMO Soybeans

Background:

Genetically modified organisms (GMO)

- **Soybeans are an economically important crop in Asian countries; inflow of GMO soybeans is increasing**
- **Introduced traits include: insect protection, delayed ripening, virus & disease resistance, modified starch makeups, herbicide tolerance, modified oil contents;**
- **Most traits introduced into genetically engineered crops result in the expression of new proteins**

Background:

Genetically modified organisms (GMO)

- **1,5% of the general population experience food allergic disorder**
- **Before market introduction GMOs have to undergo a safety assesment**



Aim of the study:

- **Assessment of allergenicity of GMO soybeans:**
 - **Compare of wild soybeans and GMOs in terms of their immunologic and physicochemical characteristics**
 - **Quantify specific IgE and perform immunoblotting in sensitive patients**

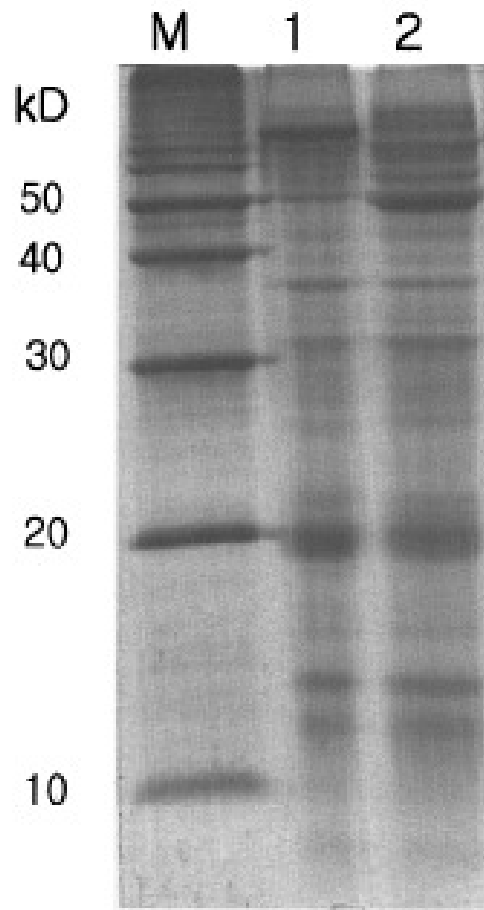
Materials and methods(I):

- **Wild soybeans/GMO soybeans:**
 - Crude extracts
 - Heat treatment
 - Acid treatment
 - Enzyme treatment
- **Different tofu and soymilk samples**

Materials and methods(II):

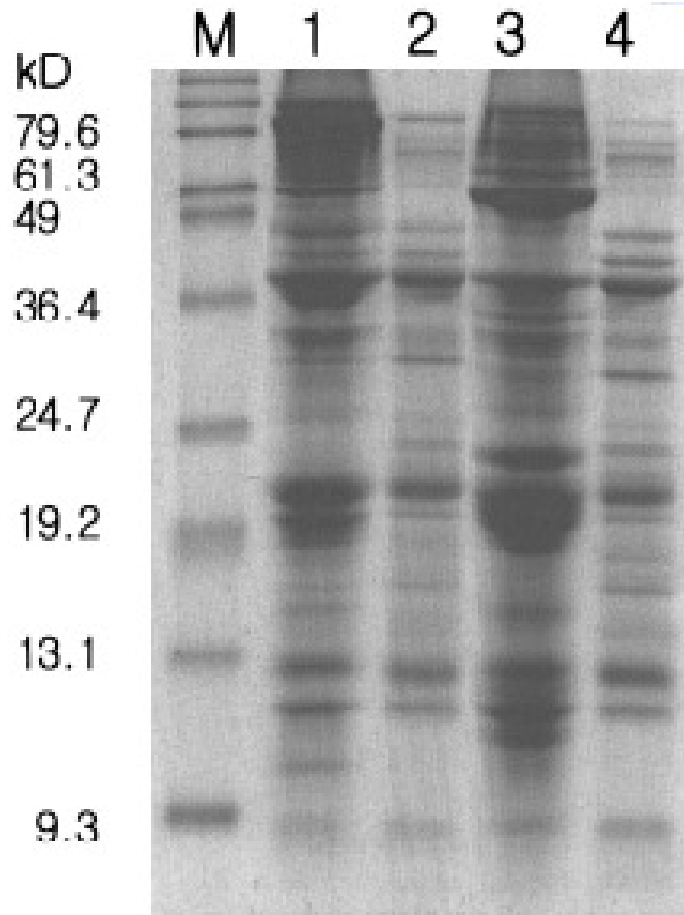
- **SDS – Page (Sodium Dodecyl Sulfate – Polyacrylamid Gel Electrophoresis):** to compare the distribution of protein antigens
- **PCR:** amplification of the promotor 35S region and the recombinant soybean gene
- **Skin – prick testing:** performed with 49 atopic children
- **Capsulated Allergen Product (CAP) Test**
- **IgE Immunoblotting**

Results (I): SDS – Page of crude soybean extract



- **1 = GMO, 2 = wild soybean**
- **10 common protein bands**
- **GMOs revealed a distinct band at 80 kDa**
- **Wild soybeans revealed a distinct band at 50 kDa**

Results (II): SDS – Page of soybeans after heating



- **1=GMO soybeans, 2=GMO soybeans after heating, 3=wild soybeans, 4=wild soybeans after heating**
- **The protein distributions are similar; no bands at 50 or 80kDa as shown by raw samples**

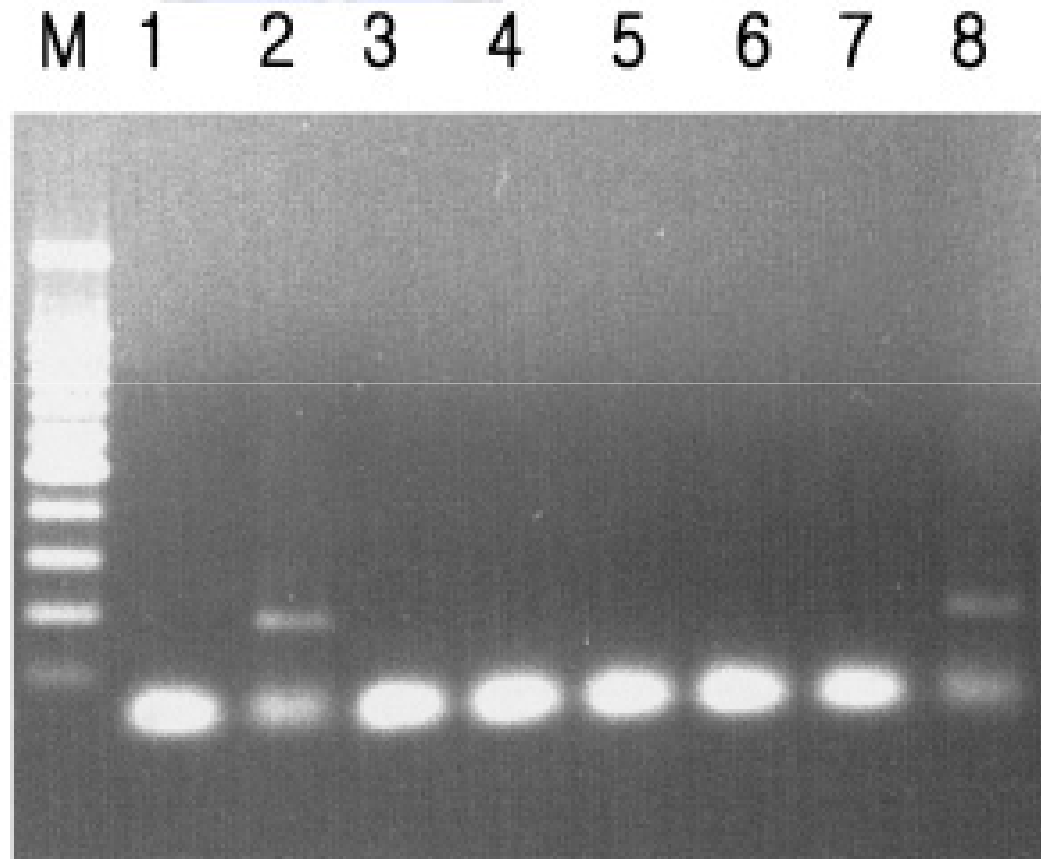
Results (III): Comparison after chemical treatment

- **After acidification the whey fraction and the protein fraction were separated and compared**
 - Both samples showed similar protein bands
- **After digestion with Pepsin the protein concentrations were markedly reduced in wild an GMO soybeans** (food allergens, in general, are stable to digestion)

Results (IV): Detection of promoter 35s

- The 35S promoter region is commonly shared by gene modified products

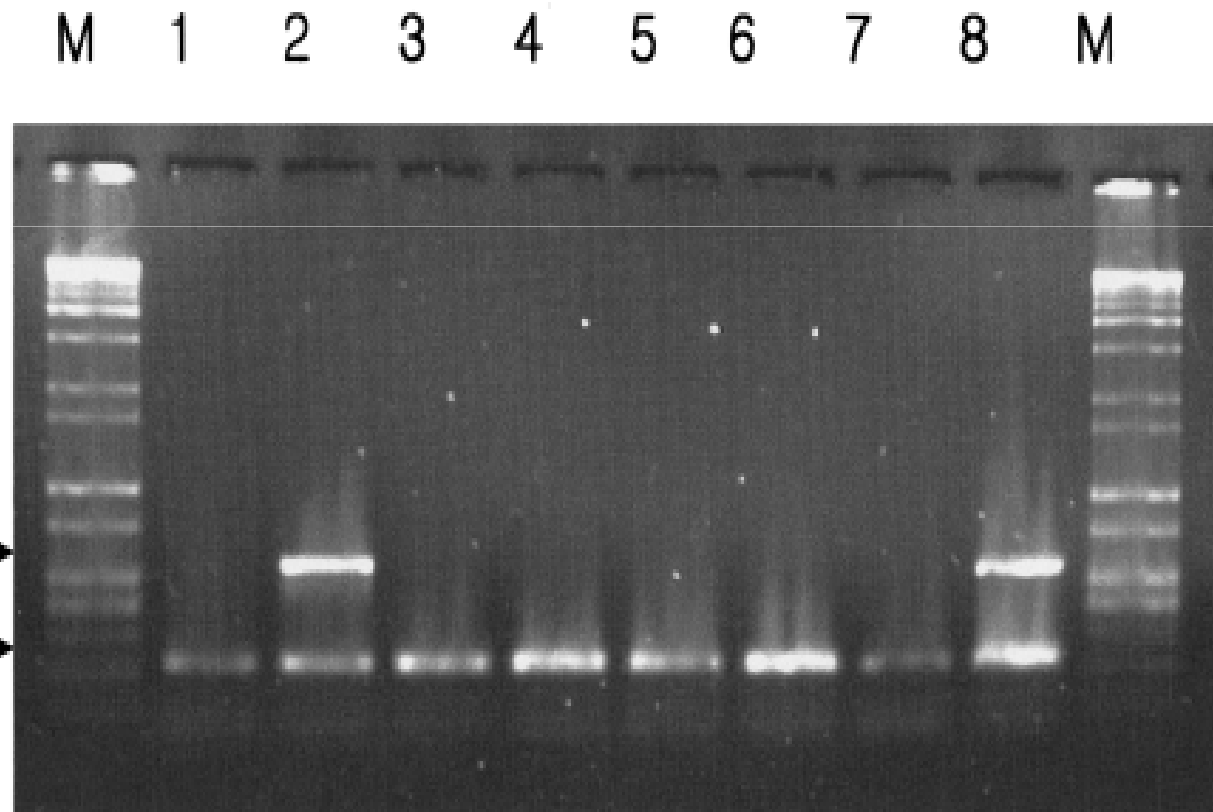
- 195 bp fragments were found in the GMO soybean sample and in one of the analyzed unwrapped tofu samples



Results (V): Detection of the CP4 - EPSPS gene

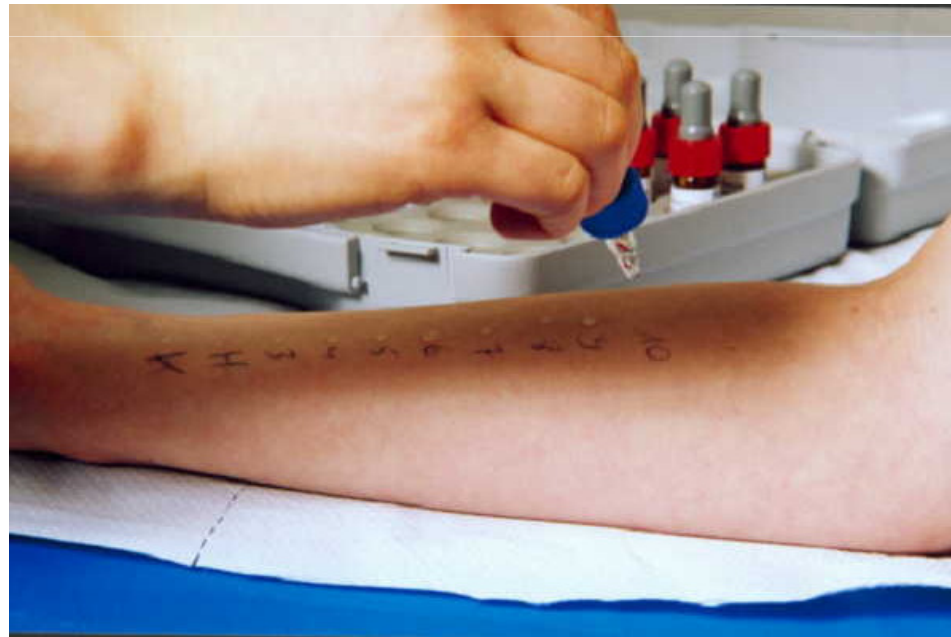
•The **EPSPS gene** encodes for the 3-enolpyruvyl-shikimat-5-phosphat-synthase

The **EPSPS gene** introduces the **herbicide tolerance** into the plant

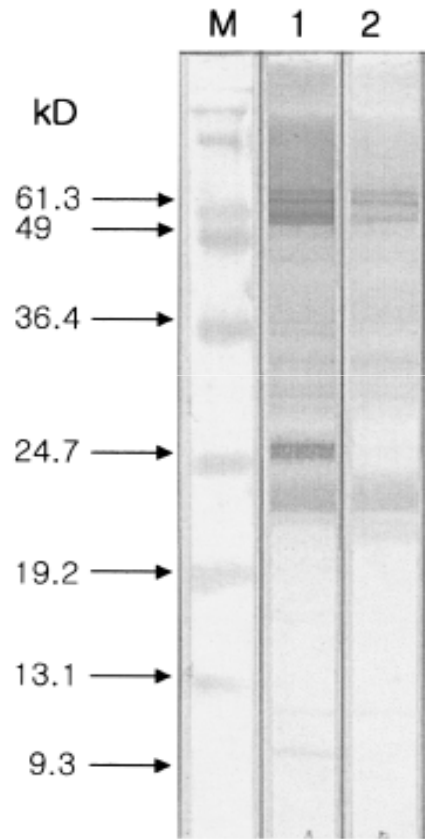


Results (VI): Skin testing

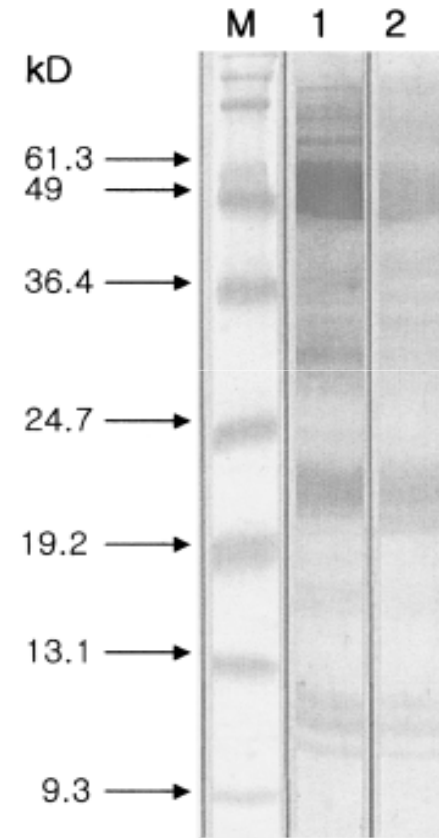
- Skin test was done, using 60 antigens in 49 children with allergies
- **13 children reacted to wild soybeans**
- **8 children reacted to GMO soybeans**



Results (VII): IgE Immunoblotting



GMO soybeans



Wild soybeans