Accurate and Affordable Allergen Quantification for the Seed Biotech Industry

Inventors

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What is the problem?

- **Allergenicity of foods and food components**
  - 1-4% of adults and 6-8% of children have food allergies[1]
  - Seeds cause most food-related allergic reactions (tree nuts, peanuts, wheat and soybeans)[2]
- **Seed biotech industry**
  - Required to monitor endogenous allergens (over 30 in soy!) in existing and new seed varieties (particularly GMOs) before they enter the market as food/feed
- **Current allergen measurement uses out-of-date technologies**
  - Poorly quantitative (2D gel electrophoresis)
  - Expensive/time-consuming to develop (Antibody-based)
- **Implementation of new technologies**
  - The seed biotech industry and federal regulatory agencies are entertaining new strategies for measuring allergen levels to standardize the approval process

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How can we help?

- **Mass spectrometers are high-end analytical instruments that can accurately measure the mass of molecules**
- **Seed allergens are typically proteins - proteins have specific mass "signatures" which can be monitored by mass spectrometry**
- **Mass spectrometry can measure the levels of allergens in seed samples**
  - Comparing signals from seed allergens and synthetic labeled allergen standards gives absolute quantities of allergens
  - Design and implement allergen detection schemes cheaply
  - Specific, accurate, and reproducible[5]

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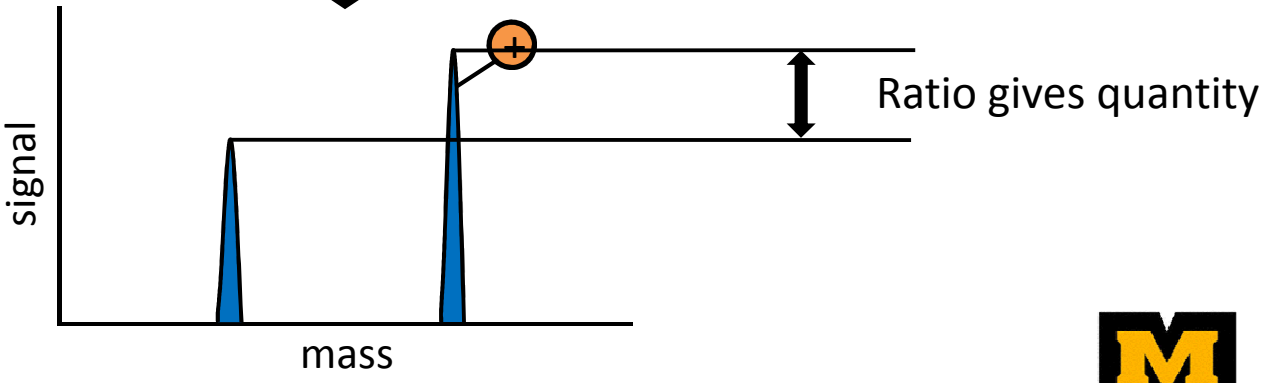
How does it work?

Seed allergen (peptides)

Labeled internal standard

Mix

mass spectrometry can distinguish them



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How does our method compare?

	Conventional (2-D gel-based)	Our method (MS-based)
High-throughput		✓
Sensitive	✓	✓
Selective	✓	✓ ✓
Accurate		✓
Initial cost	**lower**	**higher**
Absolute quantities	**NO**	**YES**

What have we done?

- Our lab has developed a novel process for extracting and measuring seed allergens – a disclosure has been filed
  - We have quantified 10 allergens simultaneously in soybean with ~7% technical variation
- We have ongoing research contracts with the plant biotech industry
  - Contracts from biotech companies for allergen quantification has generated steady funding for nearly two years
  - New contracts are being negotiated
- Our recent results have been published-we lead the field
  - **Stevenson, S. E.;** Chu, Y.; Ozias-Akins, P.; Thelen, J. J., **Validation of gel-free, label-free quantitative proteomics approaches: Applications for seed allergen profiling**. *J Proteomics* **2009**.
  - Lee, D. G.; Houston, N. L.; **Stevenson, S. E.**; Ladics, G. S.; McClain, S.; Privalle, L.; Thelen, J. J., **Mass spectrometry analysis of soybean seed proteins: optimization of gel-free quantitative workflow**. *Analytical Methods* **2010**.
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What do we need?

- Angel or Venture capital
  - provide start-up expenses
    - Equipment purchase/leasing costs
    - Rent for lab space
    - Initial salaries for 1-2 employees

Contracts are predicted take over within the first year!!

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Thank you!

Questions?

References

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3. Wang, P.; Whiteaker, J. R.; Paulovich, A. G., The evolving role of mass spectrometry in cancer biomarker discovery. *Cancer Biol Ther* ***2009, 8, (12), 1083-94.***
4. EFSA Panel on Genetically Modified Organisms, Scientific Opinion on the assessment of allergenicity of GM plants and microorganisms and derived food and feed. European Food Safety Authority (EFSA) Journal, ***2010, 8(7),1700***.
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