

Differential gene expression among infants at high-risk for peanut allergy

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Peanut allergy in infancy: the LEAP cohort

- 9.1% of infants in the LEAP study screening cohort were excluded due to a peanut skin prick test size >4 mm.
- 2.2% of infants randomized to peanut consumption failed their baseline peanut OFC.

The transcriptome in food allergy

- Differential gene expression has been characterized in clinical egg allergy phenotypes and in peanut-stimulated memory T cells of peanut allergic subjects.
- Peripheral blood gene expression patterns associated with acute peanut allergic reactions have been identified.

Hypotheses

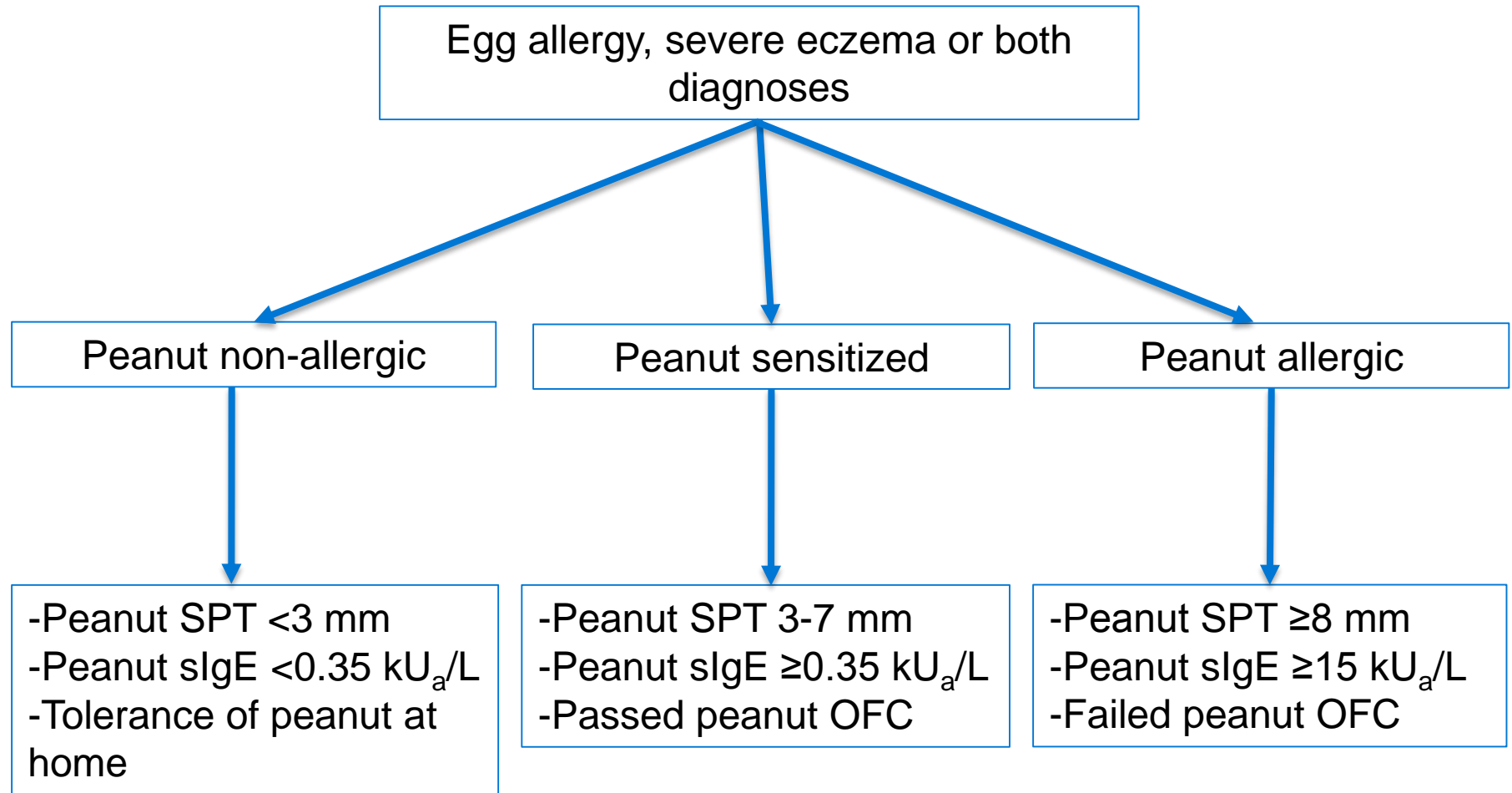
There are differentially expressed genes that will distinguish high-risk infants who are peanut allergic, peanut sensitized and peanut non-allergic.

This differential gene expression can be used to distinguish those who are clinically allergic.

Methods: Study subjects

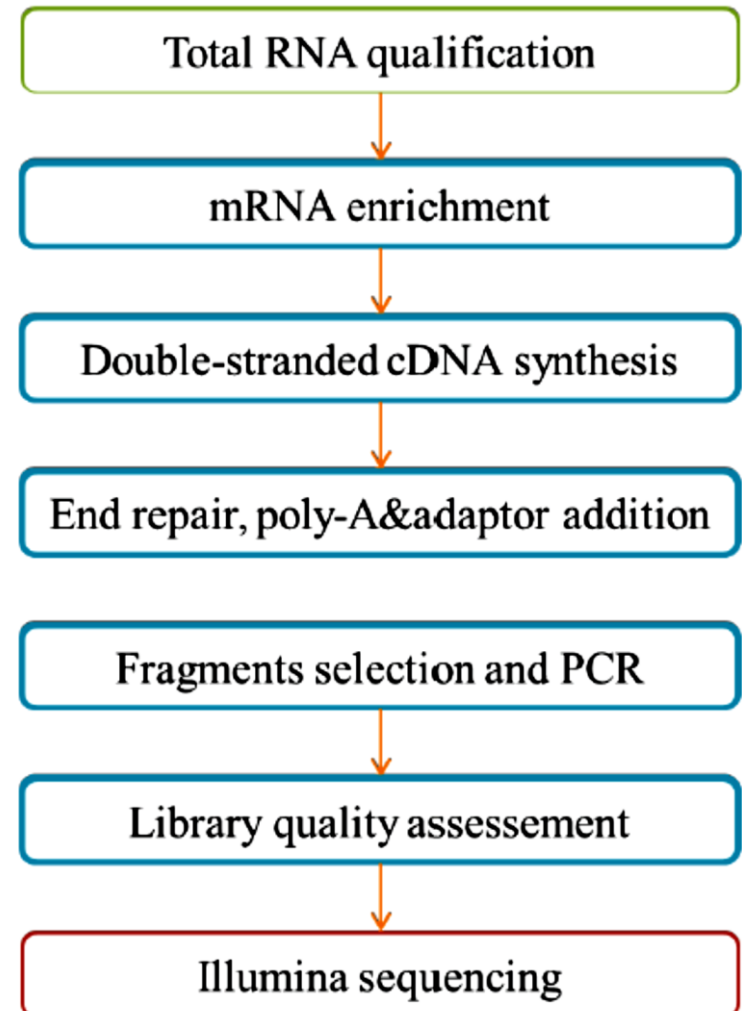
- Infants 4-11 months of age with severe eczema, egg allergy or both diagnoses recruited from an early introduction clinic.
- Peanut skin prick testing was performed (+/- sIgE) and then home peanut introduction, peanut OFC or peanut avoidance were recommended.
- Subjects were categorized as peanut allergic, peanut sensitized or peanut non-allergic.

Methods: Categorization of study subjects



Methods: Transcriptomic analysis of whole blood

- Quality control, library preparation, sequencing and bioinformatics were performed by Novogene, a commercial genomics laboratory



Results: Participant characteristics (N=20)

Age at first visit, median (IQR) months	8 (3.5)
Gender, N (%) male	13 (65)
Age of solid food introduction, median (IQR) months [†]	6 (1)
Duration of exclusive breastfeeding, median (IQR) months [‡]	5.5 (4)
Peanut skin prick test wheal, median (IQR) mm [¥]	4 (4.5)
Peanut specific IgE, median (IQR) kU _a /L [§]	9.46 (16.8)
Peanut allergic, N	8
Peanut sensitized, N	5
Peanut non-allergic, N	7

[†]N=19; [‡]N=18; [¥]N=16; [§]N=13

Results: Differential gene expression, PA vs. PS

Up-regulated in peanut allergic

Gene	Gene Name	Log ₂ fold change	FDR adjusted p-value
LINC00649	Long intergenic non-protein coding RNA 649	0.65	0.01123
CEP192	Centrosomal protein 192	0.58	0.01278
TNFRSF10D (DCR2)	TNF receptor superfamily member 10D	0.52	0.01278

Down-regulated in peanut allergic

Gene	Gene Name	Log ₂ fold change	FDR adjusted p-value
COL18A1	Collagen type XVIII alpha 1 chain	-0.93	0.00299
EVA1B	Eva-1 homolog B	-0.85	0.01123

Results: Differential gene expression, PA vs. PS controlling for age and gender

Up-regulated in peanut allergic			
Gene	Gene Name	Log ₂ fold change	FDR adjusted p-value
LCN2	Lipocalin 2	2.73	0.00098
CAMP	Cathelicidin antimicrobial peptide	2.38	0.00440
LTF	Lactotransferrin	3.50	0.03104
ALPL	Alkaline phosphatase, liver/bone/kidney	3.37	0.03104
ORM1	Orosomucoid 1	3.34	0.04371
TREM1	Triggering receptor expressed on myeloid cells 1	1.66	0.04371
CA4	Carbonic anhydrase 4	2.31	0.04371
RBPMS2	RNA binding protein with multiple splicing 2	2.57	0.04371
Down-regulated in peanut allergic			
Gene	Gene Name	Log ₂ fold change	FDR adjusted p-value
LOC1005061	Uncharacterized LOC1005061	-6.73	0.00050

Summary

- There is differential gene expression between PA and PS infants and this may change upon controlling for age and gender.
- Some up-regulated genes are involved in innate immunity and may reflect dysregulation of the innate immune response in infants with food allergy and atopic dermatitis.

Limitations

- Small sample size
- Validation and reproducibility
- Specificity for peanut
- Challenge-confirmation of peanut allergy

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Power Considerations

