



REVIEW OF 400 CONSECUTIVE ORAL FOOD CHALLENGES TO ALMOND

Mary Grace Baker, MD

BACKGROUND

- Tree nut allergy is common, but the diagnosis is complicated by the finding that many more patients have evidence of sensitization than demonstrate clinical reactivity
- Almond allergy is the third most reported tree nut allergy, although reactions are generally mild compared to other nuts
- Almond is of interest due to its prevalence in the American diet, nutritional value, and availability in safe products (no cross-contact)
- Most patients in our practice have been observed to pass almond OFCs



BACKGROUND

- Prior studies have examined patients undergoing almond OFCs but were limited by small cohorts with favorable testing

Study	# of patients	Pass Rate	Notes
Couch et al	n=54	100%	Most patients had SPT < 3mm and sIgE <2.0
Elizur et al	n=49	98%	Included patients with tree nut allergy sensitized to almond
Ludman et al	n=14	71%	No additional data due to small number

METHODS: PROJECT DESIGN

- We reviewed the electronic medical record to identify all almond OFCs performed at our pediatric, university-based outpatient practice from October 2015-July 2017
- OFC details (dosing, reactions, treatments) as well as demographics, clinical, and laboratory data were compiled
- Data were analyzed using the Fisher's exact and Student's *t*-tests



METHODS: OFCS

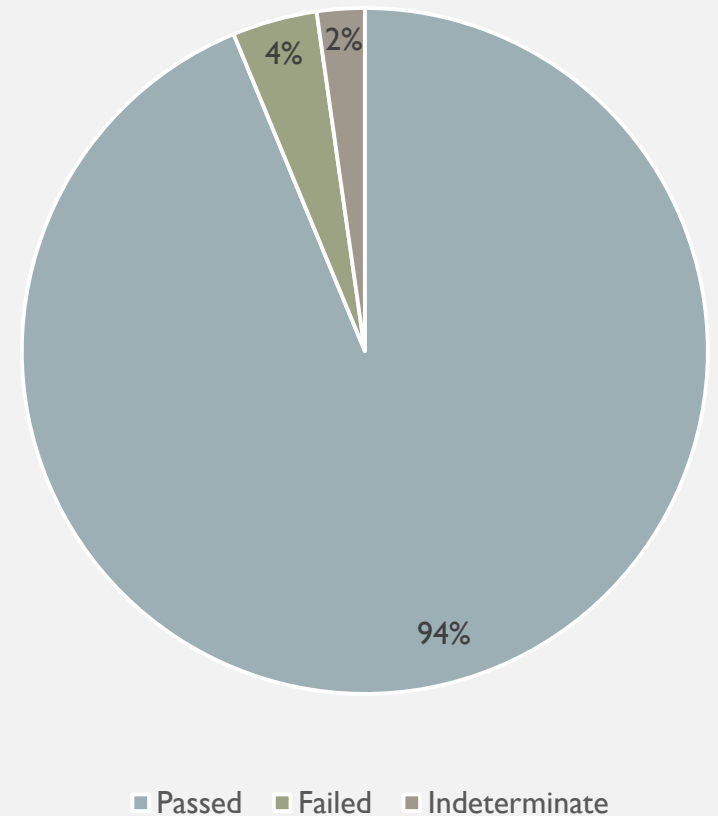
- OFC Offering Process
 - OFCs were offered at the discretion of the primary allergist
 - No cut-off age, test results, etc precluded OFC
 - Generally no recent reaction history
 - Predicted likelihood of passing was usually >50%
- OFC Procedure
 - Each OFC was performed according to standard guidelines with a goal of an age-appropriate serving



RESULTS

- **400 OFCs were reviewed**
 - **375 negative challenges (94%)**
 - 17% were also avoiding cow's milk
 - Almond sIgE Range: <0.10-68 kU_A/L
 - Almond SPT Range: 0-13 mm
 - **16 positive challenges (4%)**
 - Almond sIgE Range: 0.53->100 kU_A/L
 - Almond SPT Range: 0-12 mm
 - Reactions were generally mild
 - Most common symptoms were oral (n=7) or cutaneous (n=7)
 - Epinephrine was administered to 2 patients
 - **9 indeterminate challenges (2%)**

OFC Outcome



Variable	Passed OFC	Failed OFC	p value
Number	n=375 (93.8%)	n=16 (4.0%)	n/a
Sex (% male)	n=236 (62.9%)	n=11 (69%)	0.79
Average Age	7.4 years (0.6-25)	6.4 years	0.41
Sensitized to Almond	n=354 (94%)	n=16 (100%)	1.0
Previously Exposed	n=91 (24%)	n=7 (44%)	0.13
Previously Reacted	n=37 (10%)	n=2 (13%)	0.67
Median Almond IgE	1.41 (n=369)	2.54 (n=15)	n/a
Mean Almond IgE	3.08 (n=369)	12.1 (n=15)	.0001
Almond IgE Range	<0.10-68	0.53->100	n/a
Mean Almond SPT	3.23 mm	5.0 mm	.0081
Almond SPT Range	0-13 mm	0-12 mm	n/a
Total IgE	663 (n=205)	891 (n=10)	0.45
Birch sensitization	n=202/315 (64%)	n=11/14 (79%)	0.39
Avoid other tree nuts	n=356/370 (96%)	n=16 (100%)	1.0
Avoid Peanut	n=290 (77%)	n=14 (88%)	0.53
% Atopic dermatitis	n=279 (74%)	n=13 (81%)	0.77
% Asthma	n=162 (43%)	n=8 (50%)	0.61
% EoE	n=7 (2%)	n=1 (6%)	0.28
Avoid cow's milk	n=65 (17%)	n=3 (19%)	0.74

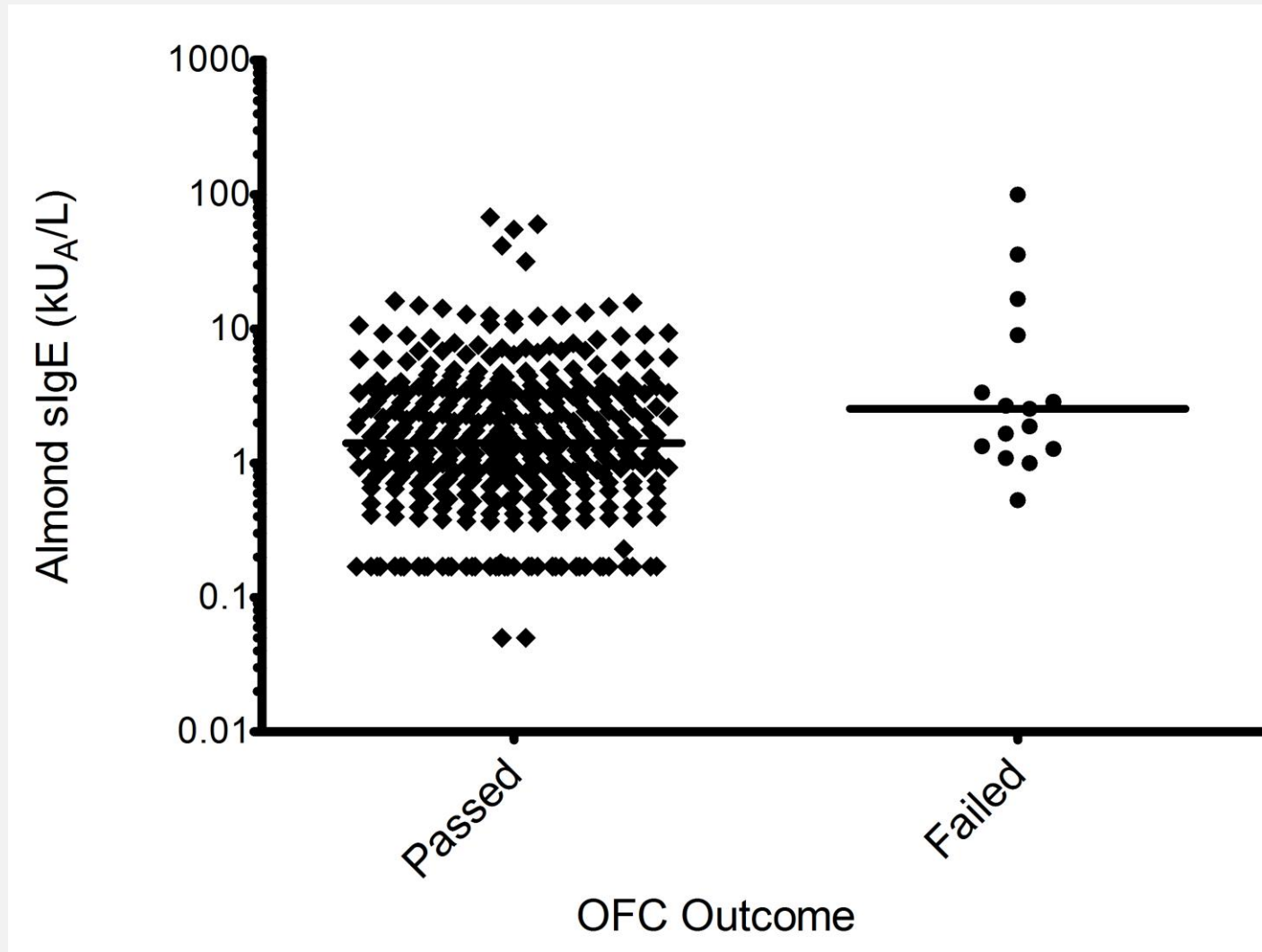
RESULTS

- Comparison of Negative vs Positive OFCs
 - No difference with regard to sex, age, history of almond exposure/reaction, avoidance of other tree nuts, birch sensitization, other allergic diseases, or total IgE
 - There was a trend toward higher almond sIgEs and larger SPTs among those with positive OFCs



RESULTS: ALMOND IGE

Almond sIgE (kU _A /L)	Number of Patients	Pass Rate (%)
<0.35	55	100%
0.35-1.99	237	97.0%
2.0-4.99	95	95.8%
5.0-10.0	31	96.8%
>10.0	22	86.4%



Almond sIgE Scatter Plot. Scatter plot of each patient's almond sIgE in the passed and failed OFC groups (logarithmic scale).

RESULTS: ALMOND SPT

SPT Wheal (mm)	Number of Patients	Pass Rate (%)
< 5 mm	294	97.2%
6-8 mm	81	92.6%
> 9 mm	11	81.8%

DISCUSSION

- Prior studies examining almond OFCs involved small cohorts with very favorable test results
- In this large study of patients with a range of almond sIgE and SPT values, the pass rate was high at 94%
- The likelihood of passing was >95% for patients with almond sIgE <10 kU_A/L and SPT wheal size up to 5 mm
- When reactions occurred, they were generally mild with rare administration of epinephrine



DISCUSSION

- Limitations
 - May not be representative of the general population
 - No uniform criteria for offering OFCs
 - OFC outcome was determined by multiple providers
- Future Directions
 - Interest in examining outcomes of patients with higher sIgE/larger SPTs
- **These results overall suggest that almond OFCs are safe and meaningful for select patients**



REFERENCES

- Sicherer SH, Muñoz-Furlong A, Godbold JH, Sampson HA. US prevalence of self-reported peanut, tree nut, and sesame allergy: 11-year follow-up. *J Allergy Clin Immunol*. 2010;125(6):1322-1326.
- Bock SA, Muñoz-Furlong A, Sampson HA. Further fatalities caused by anaphylactic reactions to food, 2001-2006. *J Allergy Clin Immunol*. 2007;119(4):1016-1018.
- Fleischer DM, Conover-Walker MK, Matsui EC, Wood RA. The natural history of tree nut allergy. *J Allergy Clin Immunol*. 2005;116(5):1087-1093.
- Andorf S, Borres MP, Block W, et al. Association of clinical reactivity with sensitization to allergen components in multifoood-allergic children. *J Allergy Clin Immunol Pract*. 2017;5(5):1325-1334.e1324.
- Elizur A, Appel MY, Nachshon L, et al. NUT Co Reactivity - ACquiring Knowledge for Elimination Recommendations (NUT CRACKER) study. *Allergy*. 2017.
- Uotila R, Kukkonen AK, Pelkonen AS, Makela MJ. Cross-sensitization profiles of edible nuts in a birch-endemic area. *Allergy*. 2016;71(4):514-521.
- Costa J, Mafrá I, Carrapatoso I, Oliveira MB. Almond allergens: molecular characterization, detection, and clinical relevance. *J Agric Food Chem*. 2012;60(6):1337-1349.
- Couch C, Franxman T, Greenhawt M. Characteristics of tree nut challenges in tree nut allergic and tree nut sensitized individuals. *Ann Allergy Asthma Immunol*. 2017;118(5):591-596.e593.
- Ludman S, Ballabeni P, Eigenmann PA, Wassenberg J. Predicting positive food challenges in children sensitised to peanuts/tree nuts. *Pediatr Allergy Immunol*. 2013;24(3):276-281.
- Cox A, Sicherer SH. Peanut and tree nut allergy. *Chem Immunol Allergy*. 2015;101:131-144.

ACKNOWLEDGMENTS

- I would like to extend my warmest thanks to:
 - Dr. Jacob Kattan for his mentorship on this project
 - The nurses and physicians of the Elliot and Roslyn Jaffe Food Allergy Institute who performed and supervised these OFCs
 - Dr. Burks for his mentorship on this presentation