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Likelihood Ratios for Reactions to Egg based on Specific IgE and Oral Challenges

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Likelihood Ratios for Reactions to Egg based on Specific IgE and Oral Challenges

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Rationale

- Specific IgE (sIgE) to foods has been used to predict the risk of a systemic reaction when the food is ingested.
- An arbitrary cutoff of 0.35 kU/L is often used to separate a positive likelihood ratio (LR+) from a negative one (LR-), yet there is little evidence supporting the use of this value.

Methods

- Egg-sIgEs were measured and open oral egg challenges were performed on 155 children with a clinical history of egg allergy.
- Random forest (RF) analysis and logistic regression (LR) were performed, with sIgE as the dependent variable and the result of the egg challenge as the independent variable.
- Receiver operating characteristics (ROC) curves were generated for both LR and RF analyses. (Figure 1)

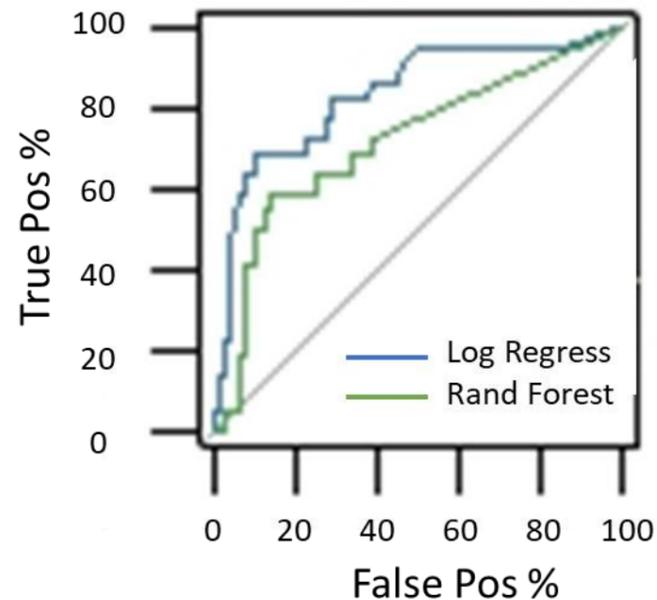


Figure 1: ROC curves for egg-sIgE showing % true positives vs % false positives using either Logistic Regression or Random Forest models

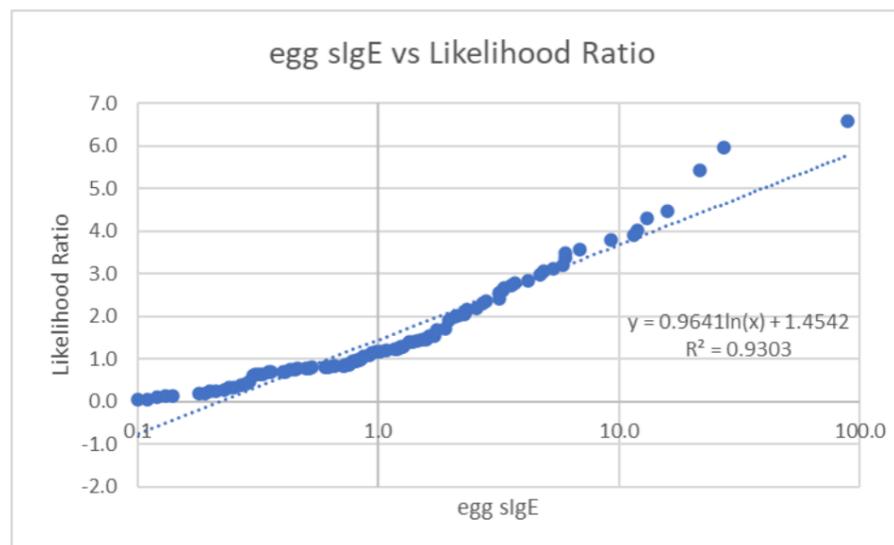


Figure 2: Log(egg sIgE) vs log(Likelihood ratio) showing a linear relationship over the range 0.1 to 100kU/L.

Results

- The area under the curve (AUC) for LR was 0.87 and for RF was 0.77, indicating that LR gave a better model for predicting egg reactions.
- LRs were determined for each value of sIgE represented on the LR ROC curve. The regression equation for this was $LR=0.964\ln(\text{sIgE})+1.4542$ with an R-squared of 0.93. (Figure 2)
- Setting LR to 1 and solving for sIgE gave a cutoff of 0.62 kU/L.
- The usual cutoff of 0.35 kU/L gave a LR of 0.44, indicating a decreased likelihood of egg allergy.

Conclusions

- Use of LRs generated from ROC curves provides a method for calculating cutoffs for sIgE tests and determining LRs for each value of sIgE.
- When combined with Bayesian analysis, this may lead to a more accurate estimate for the probability of food allergy.