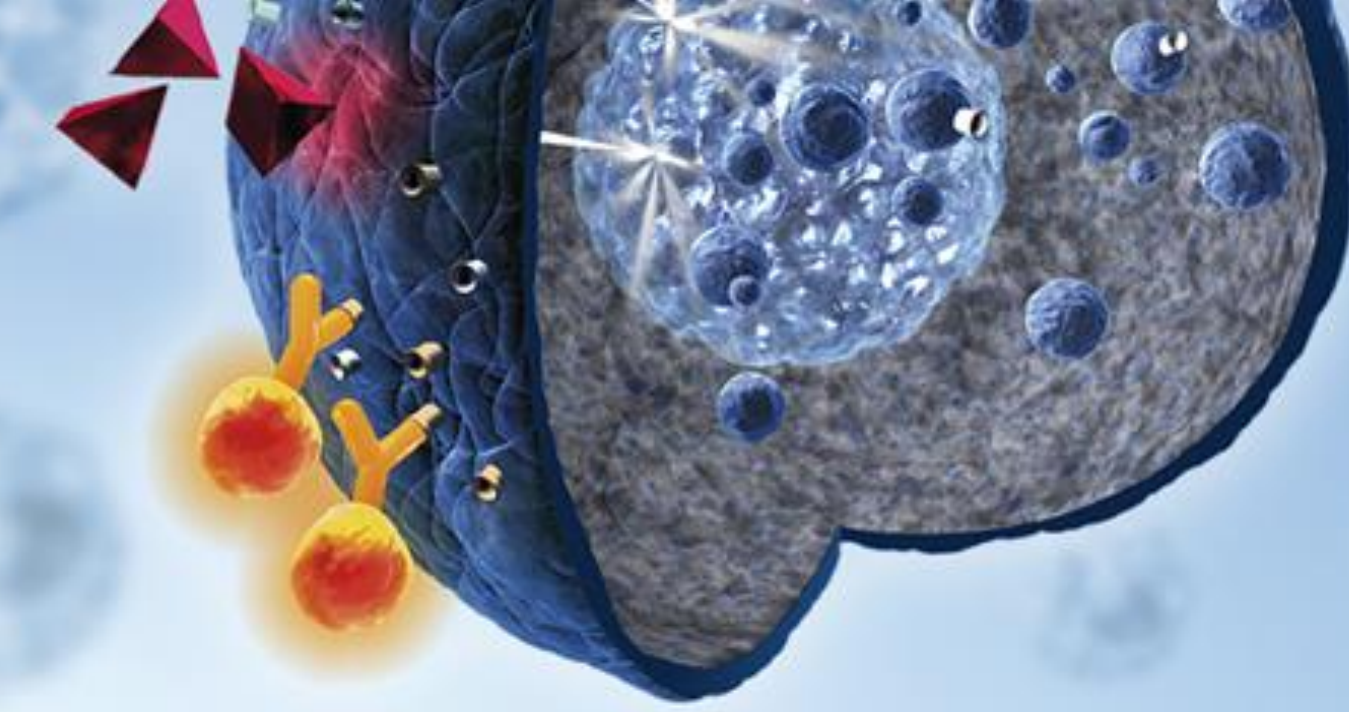


A confidence score for basophil activation test: improving interpretation around diagnostic cutoffs

Léonard Bezingé*, Michele Romano, Christian-Benedikt Gerhold, Christina Bauer, Michael A. Gerspach

BÜHLMANN Laboratories AG,
Schönenbuch, Switzerland

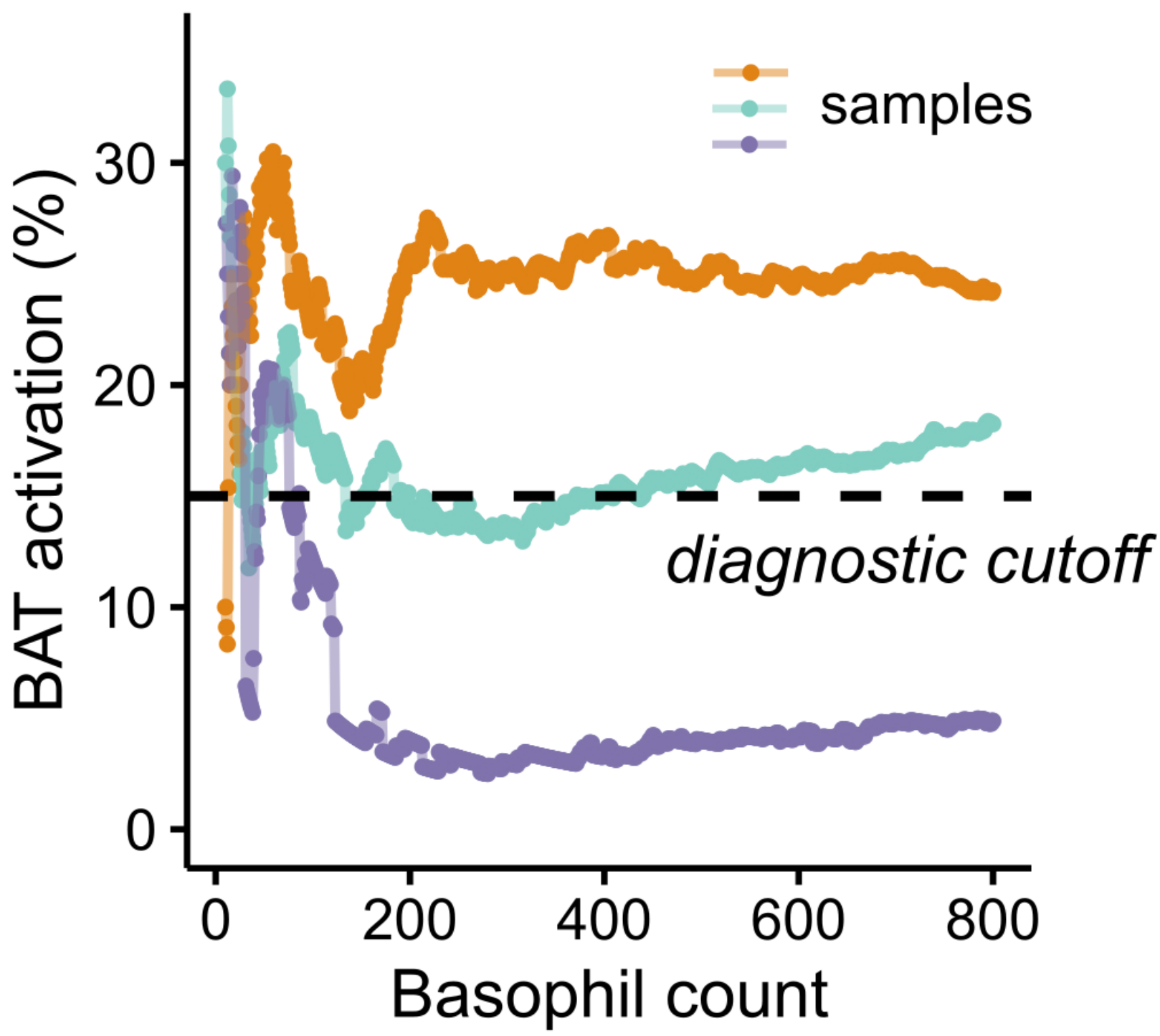
*leb@buhlmannlabs.ch



Introduction

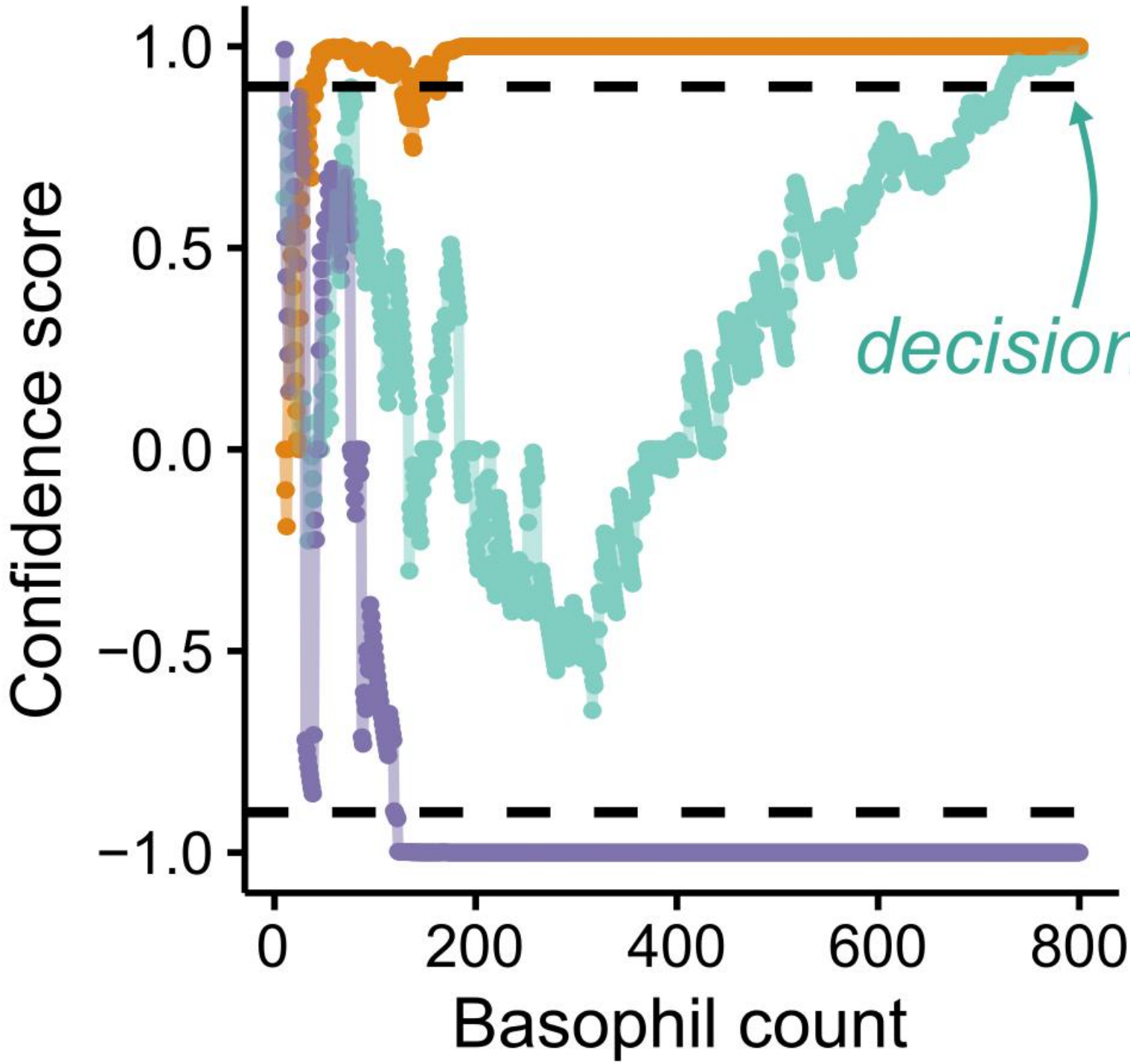
- The basophil activation test (BAT) is an in vitro assay for IgE-mediated allergy diagnostics.
- BAT measures the degree of basophil activation after exposure to an allergen or control.
- Activation values are interpreted using allergen-specific diagnostic cutoff.

Samples with activations near the diagnostic cutoff are difficult to interpret and are highly influenced by basophil counts.



Summary

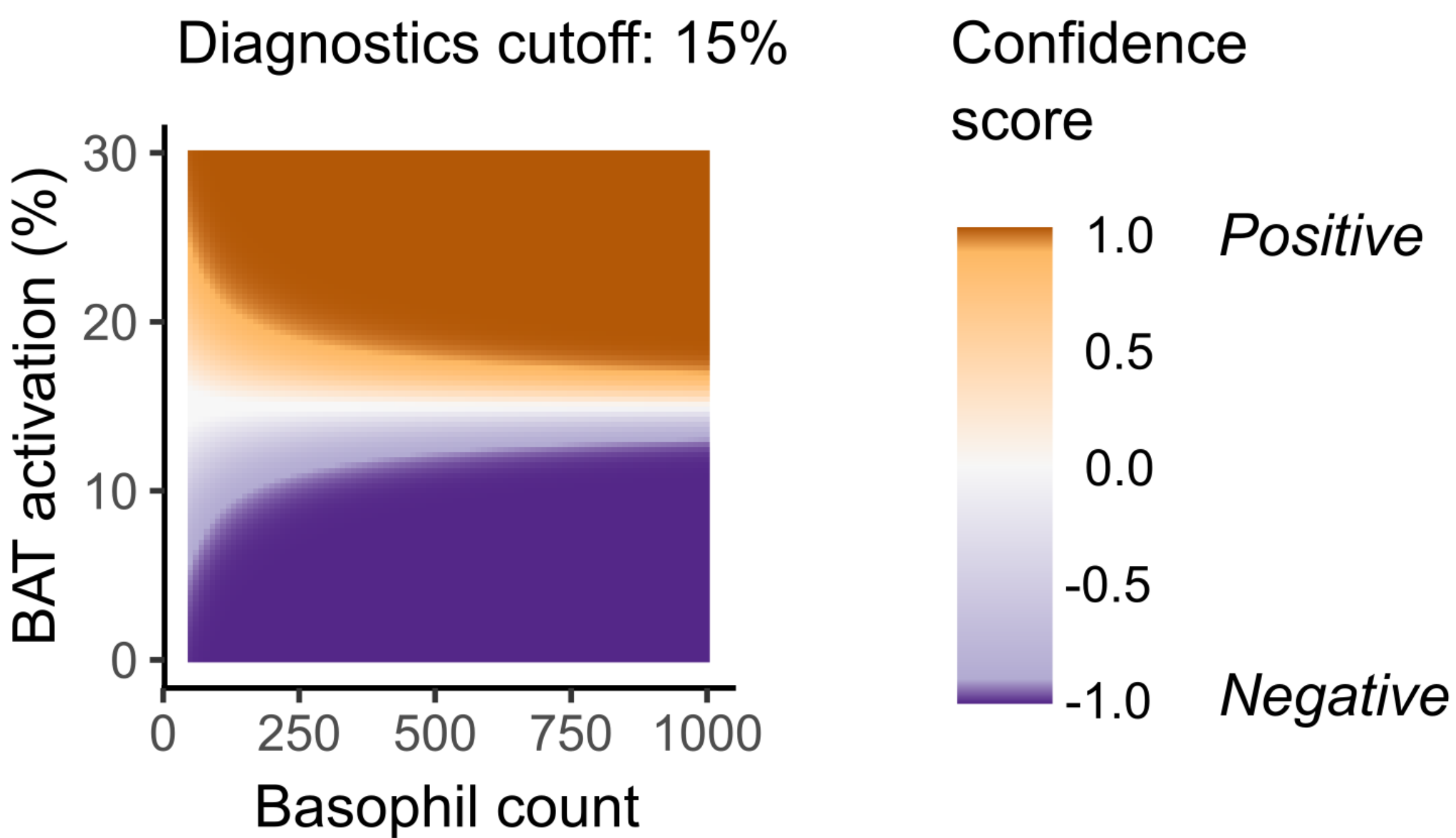
- Comparing activation values to a fixed diagnostic cutoff is too simplistic in cases of low activations near the cutoff, due to test variability.
- The confidence score provides a more nuanced analysis by combining activation levels with basophil counts.
- This method improves diagnostic reliability and supports reproducible, confident clinical decision-making in cellular allergy testing.



Confidence score: a single metric to guide BAT interpretation

- We have previously shown that stochastic variations in activations due to basophil count can be explained through proportion statistics (*Allergy* 2025;80:351).
- Using the interval equality principle, we can transform these intervals into confidence probabilities.

The confidence score combines basophil activation, cell count, and diagnostic cutoff in a single number.

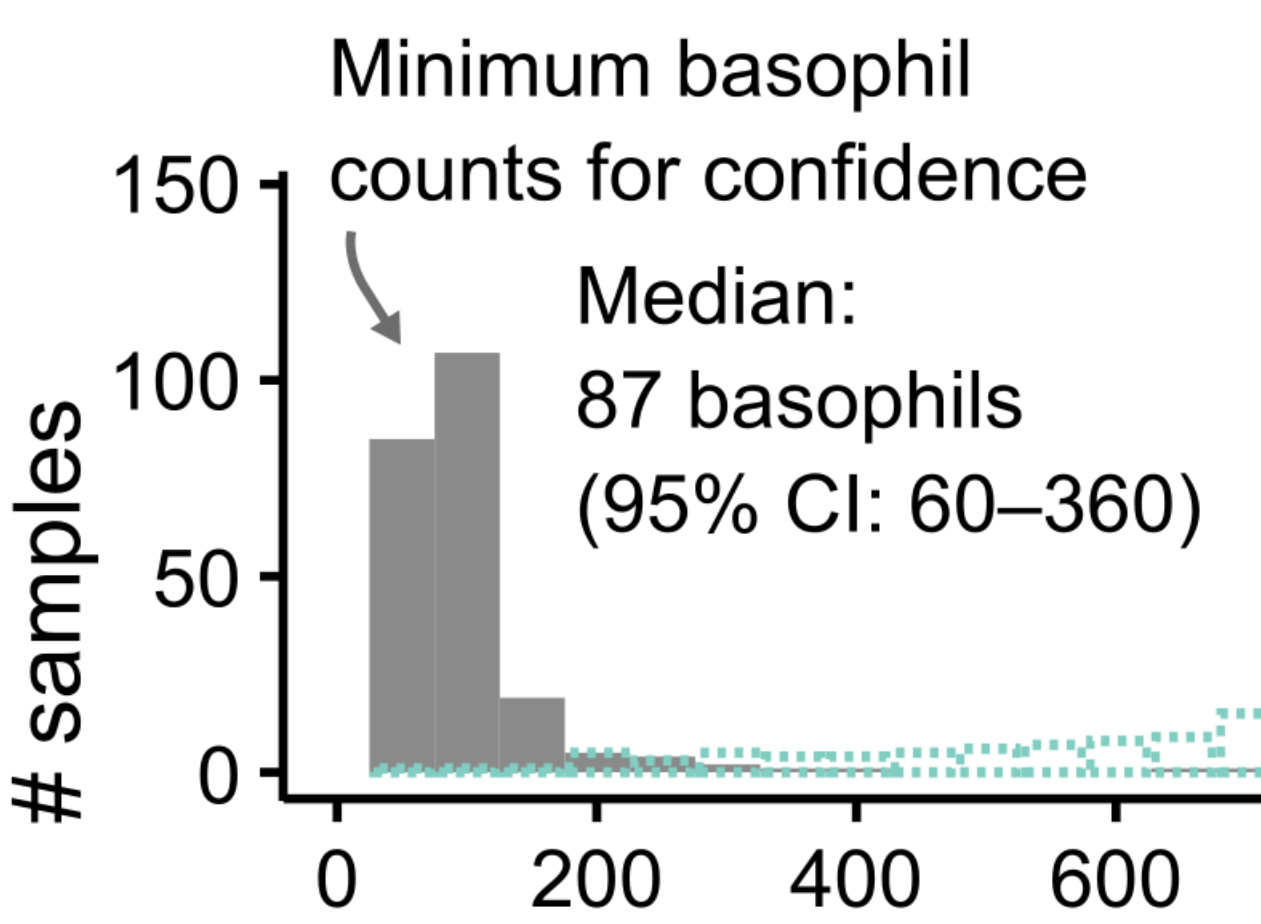


Reliable decisions with fewer basophils

- We demonstrate the utility of the confidence score in BAT analysis of 229 blood donors, including 60 allergic to house dust mite (HDM) and 36 to wasp venom.
- BAT results were considered conclusive after fifty consecutive scores above 0.9 or below -0.9.
- For activations well above or below the diagnostic cutoff (± 10 pp.), most tests were conclusive with fewer than 200 basophils.
- Edge cases near the cutoff required higher counts (up to 800) to ensure statistical confidence.
- Compared to full-volume testing, the confidence score reduced basophil requirements for decision-making by -89% (HDM) and -83% (wasp venom).
- Agreement with full-count BAT results remained high: 98.7% for HDM and 95.2% for wasp venom.

Confidence scores enable efficient decision-making in BAT, considering only as many basophils as needed.

House dust mite BAT



Wasp venom BAT

