



A systematic review and meta-analysis of the accuracy and methodology of the ¹³C mixed triglyceride breath test for the evaluation of pancreatic function.

Sarah Powell-Brett¹, Lewis Hall^{1,2}, Michael Edwards¹, Keith Roberts¹

1: University Hospitals Birmingham NHS Foundation Trust, 2: University Of Birmingham



Background

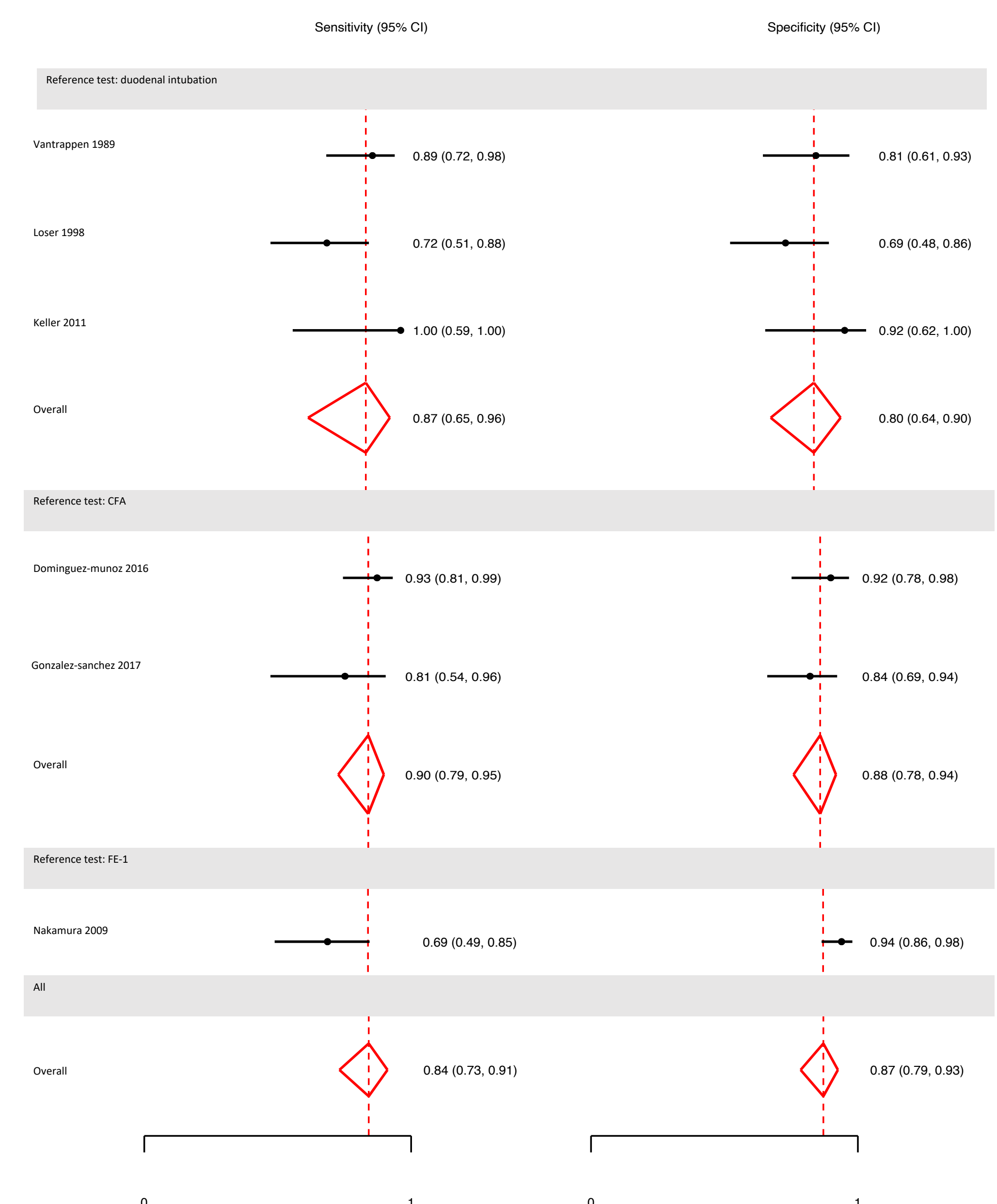
- PEI diagnosis is challenging.
- ¹³C MTGT = non-invasive, safe and accurate.
- Very sensitive to external factors and poorly standardised.
- Currently limited to specialist centres and research environments.
- This systematic review appraises existing literature on methodology and accuracy of the ¹³C MTGT to try and make it more accessible for widespread use.

Methods

- systematic literature search of PUBMED, MEDLINE, and EMBASE databases
- Prospectively PROSPERO Registered, performed according to PRISMA guidelines
- Articles describing use of the ¹³C MTGT in the analysis of pancreatic function in adults.
- Data extraction on methods combined in a narrative synthesis.
- Studies assessing accuracy combined for quantitative analysis .

Results

- 39 studies included for qualitative review
- 6 included in quantitative synthesis
- Areas with majority consensus or good supporting evidence combined in a suggested protocol
- Areas of uncertainty highlighted yellow
- Duration of PERT cessation:
 - Poor reporting, theoretically 24 hours enough
- Addition of metoclopramide:
 - Unlikely to be beneficial with a 6 hour test
- Ideal test meal: currently suggest toast and butter to total 16g of fat but wide variation.
- Total testing time frame:
 - Potential to shorten to 4 hrs with further work
- Pooled sensitivity and specificity of the ¹³C MTGT for diagnosing PEI of 0.84 (95% CI: 0.73-0.91) and 0.87 (95% CI: 0.79-0.93)



Discussion

- No clear standard of breath test methodology
- Good sensitivity and specificity
- Set protocol based on the current literature
- Further investigation of the ideal test meal and total test timeframe are needed.
- **With refinement, the ¹³C MTGT could become a valuable, non-invasive PEI diagnostic tool that could be used outside of specialist centres.**

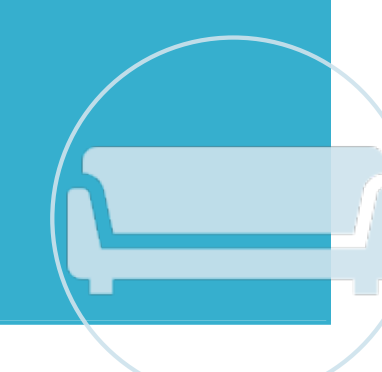
- Control of ¹³C rich ingestion 2-3 days
- Limit physical activity
- No Smoking 12 hrs
- **PERT cessation 24 hrs**
- Early start time
- **NO Metoclopramide**

Pre-test



- 250mg substrate
- **Fatty test meal**
- Remain sedentary
- No smoking
- Water only
- ½ hourly sampling
- Exetainer and straw collection

In-test



- **6 hour sampling**
- IRMS analysis of ¹³CO₂:¹²CO₂
- Estimate CO₂ production, Haycock formula.
- Calculate cPDR

Post-test



Abbreviations

PEI: Pancreatic exocrine insufficiency, **¹³CMTGT:** 13 Carbon mixed triglyceride breath test, **PERT:** Pancreatic exocrine replacement therapy, **cPDR:** cumulative percent dose recovery (of 13 Carbon),