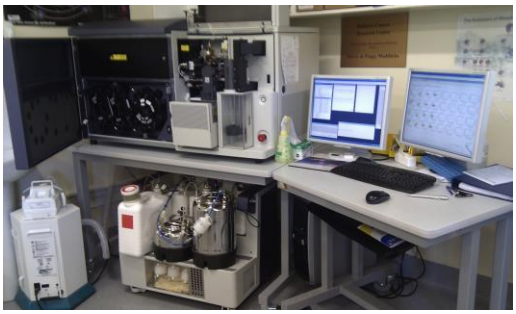
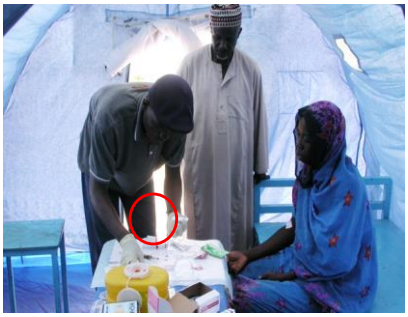
The development of new simplified Dx technologies to reach those in need – our challenges for the next 5 years





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Australasian Viral Hepatitis Conference, August 2018

Simplified diagnostic technologies….

Disclosures:

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Founder and CEO of Nanjing BioPoint Diagnostics (Burnet spinoff)

Inventor on PCT patents for BioPoint® ALT1 test, BioPoint® VL-Plasma® plasma separator device, and Omega Visitect® CD4 T-cell test

Outline - Unmet needs in HBV and HCV Dx

- Developed world – cost and capacity issues
  - Cost and turnaround time for HBV VL, HCV RNA/Ag
  - Alternative biomarkers / triage for Fibroscan
- LMIC – cost, quality, capacity and access issues
  - Quality assured HBV and HCV serology for initial Dx
  - HCV RNA or antigen testing – future prospects for POC?
  - HBV DNA or crAg testing – future prospects for POC?
  - Alternative approaches to diagnostic pathways (ALT?)
- Barriers to translation and commercialisation

Molecular tests for HCV and HBV

- HCV: confirming infection in seropositives
  - ≈30% natural clearance, and Rx clearance with potential for reinfection – who really needs treatment
  - HCV RNA (Cepheid Xpert etc) or HCV core antigen (Abbott) are available, but poor prospects for being true “point of care”
- HBV: viral load
  - High viral load for treatment eligibility
  - Confirming viral suppression during Rx
  - HBV DNA (Roche, Abbott) and HBV core-related antigen available, but poor prospects for POC
- Antigen tests are complicated by need to remove host antibody before antigen can be detected – unlike HBsAg, HBeAg etc (antigen is in excess)

Prospects for molecular (NAT/antigen) tests at “POC”

illumigene by Meridian Bioscience

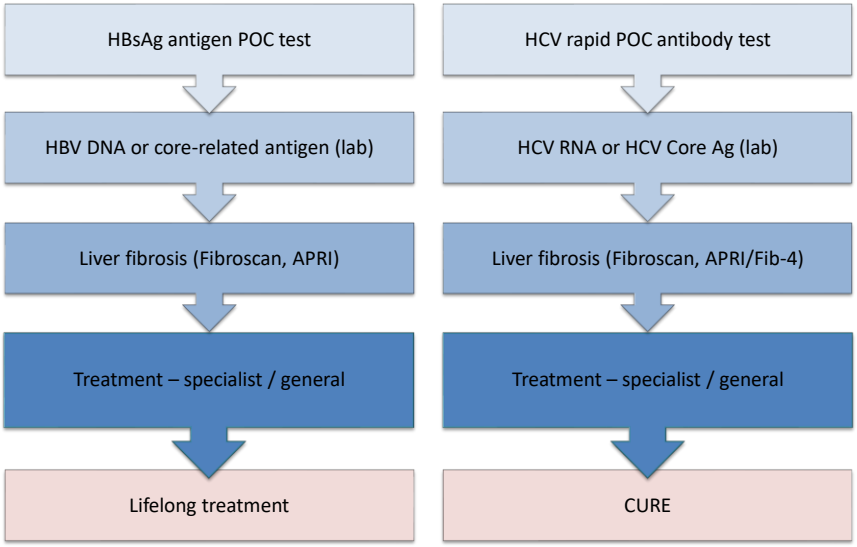
LIAT (lab in a tube) by Roche

Neither platform has HCV or HBV yet
Many other companies following

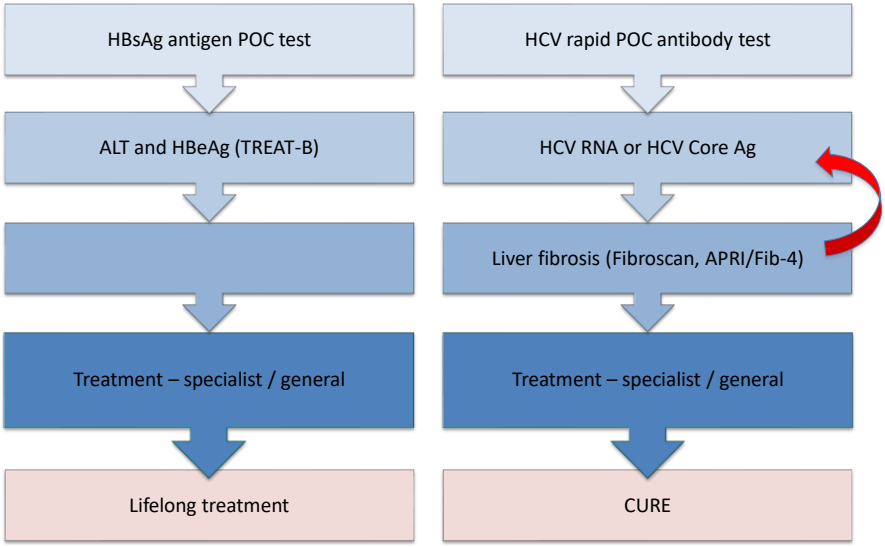
Alternative biomarkers for triage (HBV, HCV?)

- HBV – do we really need viral load?
  - Y. Shimakawa et al J.Hepatol 2018 – “TREAT-B”
  - *Algorithm based on HBeAg and semi-quantitative ALT*
- HCV – can we rely on APRI, Fib-4 or other tests to triage for Fibroscan?
  - Melissa Kelly et al, PLoS One. 2018
  - *BioPoint ALT1 test??*
- Can we move towards true POC tests for triage?

HBV and HCV cascade of care

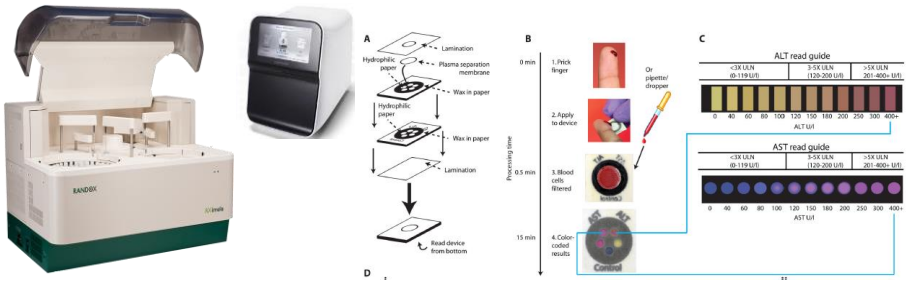


HBV and HCV – potential cascades of care?



POC test for ALT – Why?

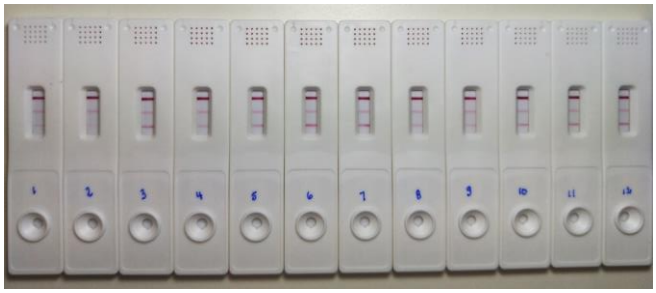
- ALT (Alanine aminotransferase) is a commonly used marker of liver damage (acute and chronic)
- Recommended in monitoring of chronic HBV (etc)
  - Y. Shimakawa et al J.Hepatol 2018 – “TREAT-B”
- EASL guidelines suggest 40 U/L as upper limit of normal
- ALT enzymatic reaction requires expensive instruments, or colorimetric tests that are not sensitive in the relevant range



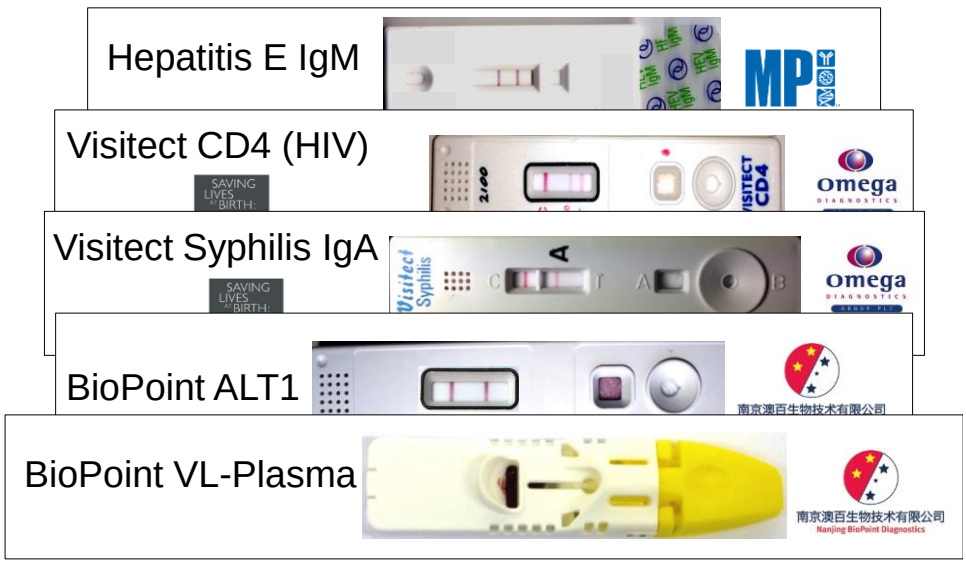
POC test for ALT – How?

- Measure ALT1 as a protein antigen (ALT1 only), rather than enzymatic activity (ALT1 plus ALT2)
- Lateral flow strip with anti-ALT1 antibody test line, colloidal gold anti-ALT1 detection reagent
- 40 µl whole blood or 15 µl plasma, add buffer, wait 20 min
- Read visually (by comparison with R line of 40 U/L) or with optional instrument reader for quantitation

Example results for BioPoint® lateral flow ALT1



Commercialisation – the big barrier



Challenges in translation and commercialisation

- If there is not a commercial case, then tests won't get to market (or will quickly fail)
- Simple, inexpensive tests do not readily attract investment
- Quality is essential, but adds to regulatory costs and final cost of assays (eg WHO prequal)
- CONSENSUS, QUALITY RESEARCH and ADVOCACY are key factors in driving development and uptake of new tests