Development of a rapid molecular POC diagnostic system for STIs

John Clarkson, CEO
Atlas Genetics

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Introduction to Atlas Genetics

- Point-of-Care (POC) molecular diagnostics (MDx) company with focus on infectious disease
- Founded in 2005 and has 41 employees located in Bath, UK and Boston, MA
- Experienced management team
- Raised ~$55 million from blue chip investors
- Highly differentiated and versatile POC molecular diagnostics platform
- Sample to test result in 30 minutes or less

io® System

Blue Chip Investors

Blue Chip Investors

Funded by Novartis  Johnson & Johnson  CONSORT MEDICAL  Biotech Ventures  RusnanoMedInvest  LSP

Biotech Ventures
Product Overview
Atlas Genetics io® System

Setting the new standard in decentralised molecular diagnostics

- **Accurate:** Performance equivalent to laboratory systems
- **Fast:** Sample to result in ≤ 30 minutes
- **Easy to use:** Designed for CLIA Waiver. No user intervention following addition of unprocessed specimen on to Cartridge
- **Broad application:** multiplex and multi-sample with up to 24 tests per Cartridge brings extensive menu opportunities
- **Low cost of goods:** Cartridge designed for high volume manufacture
io® cartridge assay process

Combines the sensitivity of PCR with the simplicity of electrochemical detection

1. DNA from the raw specimen is purified

2. Rapid PCR amplifies target DNA

3. Electrochemically-labelled probe & double-strand specific DNA Exonuclease are added to PCR product

4. Electrochemically-labelled probe hybridises to the target DNA

5. Exonuclease digests the target DNA-probe complex, releasing the electrochemical label

6. Free electrochemical label is detected using an electrode. The label oxidises at a known potential to produce a current, which is measured
Advantages of Atlas electrochemical detection

Key advantages for electrochemical detection over fluorescence

- Multi-analytic detection (multiplexing)
- Simple, physically robust instrumentation
- Ease of miniaturization
- No requirement for optical clarity; simpler sample processing
- Wide dynamic range
- Direct signal output (signal generated and measured as electrical current)
- Accepted for diagnostics through widespread use of electrochemical blood glucose meters
Multiplexing capability
Currently up to 24 tests per cartridge

4 Detection chambers x 6 Labels = **24 targets on 1 patient sample**

On cartridge fluidics plus electrochemical detection enables multiplex
### Clinical performance of CT assay

#### Lab accuracy at Point-of-Care

<table>
<thead>
<tr>
<th>Patient #</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Predicate Test</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>275¹</td>
<td>95.5%</td>
<td>96.8%</td>
<td>BD</td>
<td>St George's University of London</td>
</tr>
<tr>
<td>182²</td>
<td>94.4%</td>
<td>98.2%</td>
<td>HOLOGIC</td>
<td>Public Health England</td>
</tr>
<tr>
<td>306³</td>
<td>98%</td>
<td>98.1%</td>
<td>Roche</td>
<td>JHU Center for STD Point of Care Tests</td>
</tr>
</tbody>
</table>

¹ Data includes all fresh sample results from formal clinical trial & extended clinical evaluation (submitted for publication by St Georges)
Manufacturing overview

Established manufacturing partners for leading diagnostics and pharma companies

- Assembled at Bespak, a subsidiary of Consort Medical, in U.K.
  - Consort Medical is publicly traded
  - Cartridge designed for volume manufacture
  - Injection-moulded components

- Assembled by LRE Medical GmbH, a subsidiary of Esterline, in Germany
  - Esterline is publicly traded
  - CE Marked
  - Ample manufacturing capacity

- Manufactured at Fleet Bioprocessing in U.K.
  - Capacity: 300,000 cartridges p/a
Future pipeline of STI products
Expanding to higher multiplex tests

Assay development time for each assay of 9-15 months plus clinical trials

- Received CE Mark certification in January 2016
- The first FDA cleared assay for the io® platform will be the CT/NG assay
- Scheduled for launch into the EU markets during the first half of 2017 and into the US market during the second half of 2017
- Multiplex STI (MSTI) will include CT, NG and Trichomonas vaginalis (TV)
- Additional tests planned for the future: CT/NG/TV/MG (MSTI+), NG antibiotic resistant strains, HPV, HSV, HIV
Company formed
- 2005 as a spin out from Osmetech plc (now GenMark Dx)
- First IP filed 2003 for electrochemical detection of nucleic acids

Capital raised:
- 2005 ($1.5m seed)
- 2007 ($3.5 Series A)
- 2011 ($30m Series B)
- 2015 ($20m Series C)

IP

Clinical studies:
- JHU study in collaboration with the Center for POC STD tests in 2010; published 2011
- St Georges, London, 2015

Regulatory clearance
- Europe 2016
Developing a POC system for STIs

Why did Atlas Genetics decide to develop POC molecular tests for sexually transmitted infections, and how long did it take?
Is there a commercial opportunity?

- What real medical need is being addressed?
- What is the current market size, value and growth?
- What are the user requirements?
- Is there a trend/demand for decentralisation/POCT? Can this be validated?
  - What are the drivers – for patients, payors and clinicians?
- What will likely pricing be vs cost of goods?
- What investment will be required, over what time, and with what return?
Unmet medical need
Reducing time to treatment

Current Pathway

1. Initial appointment with clinician
2. Sample collected
3. Sample sent to laboratory for analysis
4. Contact positive patients appointment
5. Follow-up appointment with clinician

90% > 4 days\(^1\)

Atlas Genetics Pathway

1. Initial appointment with clinician
2. Sample collected
3. Sample sent to laboratory for analysis
4. Contact positive patients appointment
5. Follow-up appointment with clinician

30 minutes or less

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\(^1\) 2014 audit on UK chlamydia screening turnaround times; US turnaround times typically 4-10 days
Market size and value
Focus on large and underserved segments

- Market size and growth validated by multiple sources
- No commercially available rapid molecular POC test for STIs in the market today
- Atlas Genetics’ platform addresses lack of high accuracy testing with fast turnaround time to drive rapid market adoption

Targeted Customers

- STD Clinics
- Family Planning
- POLs
- Hospital Labs
- Public Health Labs

Global Infectious Diseases Diagnostic Testing by Major Diseases: ~$10bn\(^1\)

- HAIs 25%
- STIs 20%
- Hepatitis 16%
- HIV 15%
- Respiratory Tract Infections 9%
- Others 15%

Estimated US and EU CT/NG tests: ~67mm\(^2\)

Addressable POC Market Opportunity\(^3\)

40% or ~27mm tests equating to an estimated ~$1bn market opportunity

1 Kalorama November 2015 and Wall Street research
2 CDC data, research analyst’s estimates and commissioned market research by LEK
3 Consensus estimate from healthcare industry, research analysts and commissioned market research by LEK
Growing trend towards decentralisation

CT/NG testing market today
Concentrated in large hospitals/reference labs

MDx Customer Segments

- Labs with Full MDx Capabilities
  - Hologic Tigris
  - Abbott m2000
  - BD ViperXTR
  - Roche 4800

- Clinics / Labs / Hospitals with Limited MDx Capabilities
  - Cepheid Xpert

- Clinics/ Labs / Hospitals with no MDx Capabilities

- STI Clinics & Physician Office Labs

POC platforms
What is required from a POC test?

- Accurate (relative to current practice)
  - CT/NG – central lab tests; Flu A/B – rapid immunoassays?

- Fast (< 30 minutes)
  - Huang et al (2012) 47.5% willing to wait 40 minutes; 28% for 60 mins

- Easy to use
  - must be able to meet CLIA waiver for US market

- Broad application
  - Multiplex and multi-sample

- Provide clinical value
  - measured against current patient pathways

- Affordable
  - measured against current costs and/or reimbursement
What are the drivers

The io system facilitates testing and treatment of patients in one physician visit

- Immediate treatment with right antibiotic, lowering risk of serious complications
- Reduced physician visits lowers patient’s out-of-pocket cost
- Lower direct costs of up to 40%¹ through optimized work-flow
- Lower long term costs by reducing disease spread and complications
- Improved antibiotic stewardship – providing “first-line” treatments instead of “last-line” option could significantly reduce overuse ²
- Additional revenue stream with over US$25/test profit³ to physician
- Administrative savings from reduced burden of patient follow up (up to 40% of patients are lost to follow up)⁴
- Utilize existing reimbursement codes allowing quick market adoption⁵
- Test and Treat provides better patient management and patient experience

Provides significant value to all stakeholders in the healthcare continuum, including patients, clinicians and payors, which will drive rapid market adoption

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² The Review on Antimicrobial Resistance, Chaired by Jim O’Neill
³ Profit/test estimate for US physician, based on current reimbursement and product pricing
⁴ Young Women Often Unreachable After STI Testing, ACEP News by Kerri Wachter (August 2009)
⁵ Current Procedural Terminology (CPT) code for CT/NG test is 87801
Instrument

• Most customers will not purchase capital equipment

Cartridge

• Current CPT code reimbursement for lab molecular tests is ~ $48, or $96 for a combo tests such as CT/NG
  - But average reimbursement is much lower
  - Continued downward pressure on reimbursement e.g. PAMA
• Most geographies require a compelling business case for the clinician
• Most POC settings will require a distributor (taking 20-30% margin)
# Cartridge Pricing

## Value Chain for CT/NG in the US

<table>
<thead>
<tr>
<th>Component</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT Code for CT/NG</td>
<td>$96</td>
</tr>
<tr>
<td>Selling Price to Clinician</td>
<td>$35</td>
</tr>
<tr>
<td>Average Reimbursement Received</td>
<td>$60</td>
</tr>
<tr>
<td>Price to Distributor</td>
<td>$25</td>
</tr>
<tr>
<td>Cost of cartridge</td>
<td>$7</td>
</tr>
</tbody>
</table>

**Current cartridge-based products**

**Clinician’s Margin**
- $25

**Distributor Gross Margin**
- 28%

**Manufacturer Gross Margin**
- ca. 70%

Requires cartridge COGs of $7 or less.
Cartridge Manufacture

- Low Cost of Goods is essential for low/mid-plex POC MDx applications
- Companies must make significant investments in manufacturing to ensure low COGs with consistent quality
What total investment will be required?
And what return will investors make?

Industry average around $50m for development of POC MDx systems.