An overview of the CSIR Health Research Impact Area

4th Biennial Conference

Presented by: Dr Dusty Gardiner

Date: 9 October 2012
CSIR: Some facts and figures

People

• 2355 members of staff
• 1486 in SET * base
• 295 with PhD
• 468 with MSc

Financials (2010/11)

• Total operating income: R 1.72 billion

* SET: Science, engineering and technology

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Health Landscape and Challenges
### CSIR response to health challenges:

#### Intervention Areas

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Point of care diagnostics</th>
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<tbody>
<tr>
<td>(Early, accurate detection of diseases of relevance to SA)</td>
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<table>
<thead>
<tr>
<th>eHealth</th>
<th>Communication platforms (preventative health), telemedicine, epidemiology</th>
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<tbody>
<tr>
<td>(Application of ICT platforms to support healthcare provision)</td>
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<tr>
<th>Affordable and Effective Cures</th>
<th>Novel therapeutics, health technologies, devices and delivery systems</th>
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<td>(cost-effective, robust, validated solutions)</td>
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<tr>
<th>Nutrition</th>
<th>Nutritional fortification, food supplements, value-added traditional foods</th>
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<tbody>
<tr>
<td>(Improved foods and supplements for general wellness and the prevention of specific conditions)</td>
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## CSIR response to health challenges: Service delivery

### Health Care System Component

<table>
<thead>
<tr>
<th>Health Care Delivery</th>
<th>CSIR Intervention</th>
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<tbody>
<tr>
<td>(Planning, coordinating, regulating, organizing, monitoring)</td>
<td>Logistics, health data and information, enterprise architecture</td>
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<tr>
<th>Health Care Providers</th>
<th>CSIR Intervention</th>
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<tbody>
<tr>
<td>(Public health system, practitioners, professional schools)</td>
<td>Patient records and files</td>
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<tr>
<th>Institutions</th>
<th>CSIR Intervention</th>
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<tbody>
<tr>
<td>(Hospitals, clinics, medical aid associations)</td>
<td>Logistics, infrastructure, patient files, therapy management</td>
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<tr>
<th>Society</th>
<th>CSIR Intervention</th>
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<tbody>
<tr>
<td>(Individuals and communities in need of prevention, diagnosis, treatment, rehabilitation)</td>
<td>Personal health information, access to health information</td>
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</table>
Selected examples of CSIR health interventions
Infrastructure: DoH/Global Fund Drug Resistant TB Infrastructure Project

Global Fund Project stats
- 8 sites (of 22 MDR facilities in SA)
- 400 new long term care beds

Public Health Facilities in South Africa
- Hospitals
- TB centres
- Primary health centres

Overlay on population distribution
ICT and Health

Integrated Health Information System

- Existing District Health Information System
- Integration and interoperability: National normative standards framework (DoH)
- mHealth Platform

Facility-level data

Household-level data

Mobile data collection and dissemination
Point of care diagnosis: Improved treatment efficiency

A rapid test performed at the point of care, even if less sensitive than a lab-based molecular test, can result in accurate diagnosis and treatment of more patients overall.

Nucleic Acid Tests: 2-3 Weeks, Test to Results

- Sample
- Testing
- Shipment
- Notification
- Physician
- Treatment

\[ \text{Sensitivity (90\%) \times Return Rate (70\%) = 63\% Treated} \]

Rapid Tests: <40 min

- Sample
- On-Site Testing
- Treatment

\[ \text{Sensitivity (70\%) \times Return Rate (100\%) = 70\% Treated} \]

Point of care diagnosis


**Cellnostics**: blood count analysis. Lenseless microscopy at the point of care. Partner: NHLS; clinical validation.
African traditional medicine: Standardised traditional medicine products; quality

- **Harpagophytum procumbens** (Devil’s claw)
- **Pelargonium sidoides**
- **Sutherlandia**
- **African ginger**

HPLC MS Standardization
Emerging health technologies
Nano medicine: Drug delivery

- Focus on delivery system for front line TB drugs
- Reduced dose and toxicity, reduced frequency of treatment

McNeil, J., Leukocyte Biol. 78: 585-594, 2005

Swai et al., unpublished data

In vivo studies - isoniazid
In vivo studies - rifampicin

Conventional therapy
Sustained release

Plasma Conc. (ug / ml)

MIC
 Toxic level

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Aptamer technology: TB diagnosis

Sputum smear
100 years old: false negatives

X-ray
Subjective
Limited to pulmonary TB

PCR: GeneXpert MTB/RIF – accurate, sensitive, expensive

Aptamers - oligonucleic acid or peptide molecules that bind to a specific target

Aptamers bind to TB biomarkers with high affinity in sputum samples

Optically sorting cancerous from healthy cells

P. Mthunzi et al, IEEE, JSTQE 2010

Optically differentiated stem cells

Applications in tissue engineering, diagnostics and personalised medicine
The CSIR has deployed multi-disciplinary capabilities to provide solutions for key health challenges.

A balance is being maintained between delivering solutions for immediate health needs and building and deploying capabilities in emerging health technologies.
Thank you

Matthew Chetty - ICT
Geoff Abbot - Infrastructure
Peta de Jager - Infrastructure
Jeremy Wallis - Diagnosis
Riaan Coetzee - Diagnosis
Dr Makobetsa Khati - Aptamers
Dr Patience Mthunzi - Lasers
Dr Hulda Swai – Nanomedicine
Dr Vinesh Maharaj – Traditional Medicine
Dr Rachel Chikwamba - Health RIA