Neglected Tropical Diseases
Progress and challenges towards elimination goals – the new agenda

Professor David Molyneux
Centre for Neglected Tropical Diseases
Liverpool School of Tropical Medicine
“Last year, WHO launched an integrated strategy for the management of several of the neglected tropical diseases, all of which disproportionately affect the poorest of the poor in Africa.

Instead of a host of individual programmes going their separate ways, we now have a unified, integrated strategy that simplifies drug distribution, reduces duplication, and lessens some of the demands on health systems and staff.”
Apparently there are only three diseases on that planet!
“Only 0.6% of overseas development assistance for health is allocated to neglected tropical diseases, despite such diseases affecting at least 1 billion people.”

See Comment page 3
Group of circa 17 tropical infectious diseases which

- cause immense suffering
- life-long disabilities
- impair childhood growth and development
- promote poverty, impair education and economic development
- do not receive attention and funding as do “the big three” (AIDS, TB, malaria)
Public-private partnerships and donated products

The “bottom billion” are most at risk affecting the poorest of the poor in rural and urban areas of low-income countries

Evidence that they increase morbidity and transmission of “the big three” but provide entry points for improved control
Unrecognised large scale successes

- Filariasis China - 350 million now free of threat of disease. Transmission arrested (other smaller scale examples-Korea, Egypt, Sri Lanka, Thailand, Suriname, Togo)
- Onchocerciasis (River blindness) no longer a public health problem in 10 countries in West Africa;
- Chagas’ disease domestic transmission eliminated in 5 countries of South America and transfusion transmission eliminated
- Schistosomiasis controlled in China and Egypt
Unrecognised large scale successes

- Leprosy eliminated as a public health problem through MDT-prevalence reduced by 90%; only 6 countries out of 122 remain
- Guinea Eradication Programme from circa 900,000 in 1990 to 1060 in 2011- only 4 countries remain endemic-
- Active trachoma prevalence in Morocco and Oman in under 10’s reduced 90%
- Soil transmitted helminth-Cambodia reached WHA target - 75% children under regular treatment by 2010
The Role of Pharma

**Merck & Co Inc**
Mectizan for as long as needed for onchocerciasis and filariasis in Africa

**Pfizer**
Azithromycin for trachoma 120 million doses

**Sanofi Aventis**
Support for drugs for sleeping sickness treatment

**Merck Serono**
Donation of 250 m tablets annually of praziquantel (100 m treatments)

**Novartis**
Continuing commitment to MDT for leprosy; triclabendazole for fascioliasis

**GlaxoSmithKline**
Albendazole for lymphatic filariasis at least to 2020

**Johnson & Johnson**
Mebendazole for intestinal worms

**Eisai**
Provision of DEC for filariasis

**Gilead**
Ambisome for visceral leishmaniasis
Guinea Worm

- The ancient disease-"fiery serpent" of the Bible
- One of two diseases targeted for eradication/extinction
- Biologically the simplest and easiest target-no animal reservoir
- Long life cycle
- No medical intervention
Guinea Worm

- Eradication target
- No medical intervention available
- Asia free of disease
- Only 4 countries left endemic in Africa: Sudan, Mali, Ethiopia and Chad
- Precertification-3 years without a case: Nigeria, Niger, Togo
Guinea Worm

1. Surveillance
2. Clean water provision
3. Filtering potentially contaminated water
4. Temephos to kill copepods in water bodies
5. Health Education/Community involvement
6. Case containment
7. Reward systems/intense surveillance
   Rumour registers/follow up
Couverture en Eau Potable

92% des villages anciennement endémiques visités ont une source moderne d’approvisionnement en eau potable (forages)
Vaccination du ver de guinée
Si vous voyez ce ver
Contactez immédiatement votre responsable de santé
STOP VER DE GUINEE!

Reçois une récompense en déclarant toute personne ayant cette maladie à un agent de santé.

Comité Technique National de Pré certification de l'Eradication du ver de Guinée du Burkina Faso

200 pages
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<th>CODE</th>
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<th>5 à 14 ans</th>
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**TOTAL:** 37 39 21 30 39 160
CAS DE VER DE GUINÉE DOIT FAIRE L'OBJET D'UNE DÉCLARATION OBLIGATOIRE

<table>
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<th>NOMBRE DE CAS DE VER DE GUINÉE NOTIFIÉS</th>
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<tbody>
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<td>Janvier</td>
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<tr>
<td>09</td>
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</table>

Number of Reported Dracunculiasis Cases by Year: 2005-2010

Number of Dracunculiasis Cases by Year, 1989-2010
Onchocerciasis-control strategy 1974-2012

- Vector control by weekly larviciding of rivers
- Ivermectin introduced in 1988 Merck & Co. Inc., donation for “as long as needed” plus vector control
- Ivermectin annually or twice a year (Americas) through Community Directed Treatment; creation of sustainable distribution systems - 60 million annual treatments
Programme drivers of programme success - Onchocerciasis

- Sustained donor support from 1974; 20 plus donors
- Donation of ivermectin in 1988 by Merck & Co. Inc., for “as long as needed”
- Rapid response to strategy change from research findings-fly migration, insecticide resistance, blinding versus non blinding disease
- NGDO commitment to long term financing
Programme drivers of programme success - Onchocerciasis

- Development of ecologically acceptable insecticides in OCP to stem resistance
- Epidemiology/molecular taxonomy to define forest/savanna vectors and type of disease
- Development of ivermectin as safe community deliverable drug and subsequent donation
- Recognition of value of community directed treatment
Achievements of Onchocerciasis Control Programme

- 30 million plus people in 10 host African countries free of Onchocerciasis as a blinding disease
- 500,000 cases of river blindness prevented
- Onchocerciasis no longer a public health problem; no children born since programme began at no risk of blindness
- Ministries of Health and associated systems strengthened
- Over 400 African scientists/doctors trained at post degree level
- Outstanding record in operational/applied research
- 25 million hectares of land available for settlement
- Added 5 million years of productive labour in 11 countries
Nigeria- Onchocerciasis elimination
Nigeria- Onchocerciasis elimination
Lymphatic Filariasis (elephantiasis)

- Damages the lymphatic system
- Causes permanent disability and disfigurement
- Fevers incapacitate patients
- Stigma, loss of opportunities, marriage, social involvement, education
- 81 Endemic Countries
- 1.34 billion people at risk
- 120 million people infected

Lymphatic Filariasis

China and Republic of Korea have been declared to have eliminated lymphatic filariasis as a public health problem.
The strategy

- Annual mass treatment with albendazole and ivermectin in Africa (onchocerciasis endemic countries)
- Outside oncho endemic countries DEC plus albendazole annually
- Morbidity control-hydrocoele surgery; limb hygiene (daily washing)
Lymphatic Filariasis

The progress (2000 – 2011)

- 52 Countries under MDA
- 2.7 billion treatments delivered
- 480 million annual treatments
- 1.4 billion Albendazole tablets donated
- 1.2 billion Ivermectin tablets donated
Decline in MF prevalence from baseline levels after number of rounds, baseline in 131 sentinel sites

<table>
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<th></th>
<th>Baseline</th>
<th>First round</th>
<th>Second round</th>
<th>Third round</th>
<th>Fourth round</th>
<th>Fifth round</th>
<th>Sixth round</th>
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</thead>
<tbody>
<tr>
<td>MF prevalence decline</td>
<td>100.00%</td>
<td>91.38%</td>
<td>73.27%</td>
<td>39.41%</td>
<td>12.06%</td>
<td>13.73%</td>
<td>5.15%</td>
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</tbody>
</table>
"GPELF is the most rapidly up-scaling global health programme in history of public health."

Circa 500 million treatments /year

Cost savings to date $24.2 billion (2000-2008)

- benefits accrue from protection from acquisition of LF
- halting progression of disease as life time economic benefit
- decreased need for patients services
Collateral Benefits of filarial MDA

- Anaemia \textit{prevalence reduced}
- Worm \textit{control}
- Growth \textit{enhanced}
- Nutritional \textit{status improved}
- Skin disease \textit{reduced}
- Blindness \textit{prevented}
- Community \textit{treatment}
- Transmission \textit{controlled}
- Improved \textit{educational and physical performance}
Impact of MDAs on Soil Transmitted Helminths and Scabies

Soil-Transmitted Helminths in Unguja (2000 - 2005)

Soil-Transmitted Helminths in Pemba (2000 - 2005)

Scabies in Unguja (2000 - 2005)

Scabies in Pemba (2000 - 2005)
Elimination of schistosomiasis

The Executive Board,

Having considered the report on elimination of schistosomiasis,1

RECOMMENDS to the Sixty-fifth World Health Assembly the adoption of the following resolution:

The Sixty-fifth World Health Assembly,

Having considered the report of the Secretariat on the elimination of schistosomiasis;

Recalling resolutions WHA3.26, WHA28.53, WHA29.58 and WHA54.19 on schistosomiasis;

Noting the resolution EM/C54/R.3 on neglected tropical diseases: an emerging public health problem in the Eastern Mediterranean Region, adopted by the Regional Committee for the Eastern Mediterranean, which called on Member States, inter alia, to sustain successful control activities in low-transmission areas in order to eliminate schistosomiasis;

Expressing concern that schistosomiasis remains a major public health problem in countries endemic for the disease, and that the goal set in resolution WHA54.19 of attaining a minimum target of regular administration of chemotherapy to at least 75% of school-age children at risk of morbidity was not achieved by 2010;

Noting the extension in coverage of treatment of schistosomiasis from 12 million in 2006 to 22.6 million people in 2010, and the greater access to praziquantel as a result of donations and increased support from partners to endemic countries for neglected tropical diseases control;

Congratulating Member States, the Secretariat and partners for increasing access to praziquantel and resources to scale up schistosomiasis control;

Encouraged that some countries endemic for schistosomiasis have interrupted its transmission:

2 See document EB138/R20 Add.1 for the financial and administrative implications for the Secretariat of adoption of the resolution.
Overall, 70% of treatments approved for estimated eligible population were reported as administered during a given treatment cycle.

Disparity between approved and administered largely explained by:
- Insufficient funds for MDA implementation
- Inability to implement MDA due to civil unrest
- Overly ambitious targets

*as of December 31, 2005
Inefficiency and waste in the supply of drugs from budget allocation to consumer

Inadequate buying practices
Quantification problems
Inefficient procurement
Inefficient distribution
Irrational prescription
Non-compliance by patients

U.S. Dollars

Remaining value
Cumulative losses

0 10 20 30 40 50 60 70 80 90 100

$90
$76
$49
$30
$15
$12

Value received by consumer
Efficacy

X Access

X Diagnostics

X Provider compliance

X Patient adherence

Effectiveness

98% * 60% * 95% * 95% * 70% = 37%

Health Systems Factors
• 14 land-locked countries
• plus DRC and Sudan, the two largest countries, with very limited access to the sea
• Total population of sub-Saharan Africa 770 million (2006)
• Total population of land-locked countries (including DRC and Sudan) 307 million (39.8%)
NTD Control: we know it works

- Economic rates of return - 15-30%
- Costs are around US$0.50/person/year - often much less
- Multiple impacts
- Sustainable, community based delivery, school based treatment
- Pro-poor, MDG relevant
- Donated drugs - high quality 70% reach target population
- Per DALYS averted amongst the best buys
- Many examples of success
## NTD chemotherapy

<table>
<thead>
<tr>
<th>NTD</th>
<th>Economic Rate of return</th>
<th>Unit cost per treatment $</th>
<th>Nº. Targeted/current estimated treated coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onchocerciasis (donated Mectizan)</td>
<td>17-20%</td>
<td>0.58</td>
<td>60 million (65% - 80%)</td>
</tr>
<tr>
<td>Lymphatic Filariasis (donated Mectizan &amp; albendazole)</td>
<td>&gt;20%</td>
<td>0.03 - 2.00</td>
<td>300 million (65% - 90%)</td>
</tr>
<tr>
<td>Guinea Worm</td>
<td>29%</td>
<td>N/A</td>
<td>All infected villages</td>
</tr>
<tr>
<td>Soil-transmitted Helminths</td>
<td></td>
<td>0.02 – 0.05</td>
<td>400 million</td>
</tr>
<tr>
<td>Trachoma (donated zithromax)</td>
<td>N/A</td>
<td>0.30</td>
<td>180 million</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td></td>
<td>0.20 – 0.30</td>
<td>10 million (2004)</td>
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<tr>
<td>Estimated annual cost</td>
<td></td>
<td>Circa 0.40</td>
<td>500 million treated per year at an estimated cost of circa $250 million</td>
</tr>
</tbody>
</table>
Range of treatment costs per person per year (US dollars)

- HIV/AIDS
- TB
- Malaria
- Rapid Impact Package

~0.40 for packaged intervention
Vietnam, STH control programme.

Number of children treated and cost per child (including drug and distribution) in three campaigns

- Cost (USD)
- Number of children treated
- Cost/child (USD)

Year: 2000-2001
- Cost: 1.42
- Number of children treated: 0.21

Year: 2002-2003
- Cost: 0.07

Year: 2004-2005
- Cost: 1.60
- Number of children treated: 0.12
Condition: intervention cost/DALY averted

**Parkinson’s disease**
levodopa or carbidopa with deep brain stimulation

**Trachoma**
Tetracycline or azithromycin treatments

**Traffic accidents**
Enforcement of seatbelt laws, promotion of child restraints, and random driver breath testing

**Stroke**
Secondary prevention with carotid endarterectomy

**Schistosomiasis**
Praziquantel

**Lymphatic filariasis**
Ivermectin & Albendazole

**Onchocerciasis**
Ivermectin

**Soil-transmitted helminths**
Albendazole

Cost-effectiveness ratio ($ per DALY averted)
Emergence and rapid dissemination
Drug and insecticide resistance
Rapid rate of reproduction
Biological processes faster than political

Slow rate of reproduction
Limited risk of drug resistance
Stable biology enables effective programme based on consistent strategy
Donated products
- Stigma and discrimination
- Physical and sexual abuse
- Restrictions on political and civil rights
- Unable to participate fully in society
- Unable to access essential health and social care
- Barriers to education and employment
- Experience disability and premature death
Reduced Performance in education
Children become carers
Reduced/no ability to access/afford education

Reduced agricultural productivity
Inability to harvest - Loss of cash crops fall back into staples
Reduced nutritional status

Complete dependence on community
Burden on carers and loss of carer income

Direct cost of medical care
Appropriate/inappropriate Medical poverty trap
Permanent poverty as no earned income

Reduced Performance in education
Educational Disruption - Children become carers
Reduced/no ability to access/afford education

Enablement
Deformity and stigma
Reduced social/Marital prospects

Blindness
Deformity
Disablement
Stigma

Complete dependence on community
Disablement
Deformity and stigma
Reduced social/Marital prospects

Stigma
Reduced longevity
Burden on carers and loss of carer income

Reduced nutritional status
Medical poverty trap
Permanent poverty
Reduced longevity
Burden on carers
Lost of carer income

Disablement
Deformity and stigma
Permanent poverty
No earned income

Deficiency
Deformity
Complete dependence
No earned income

Stigma
Reduced social/Marital prospects

Blindness
Reduced/No ability to access/afford education

Deformity
Reduced agricultural productivity
Inability to harvest - Loss of cash crops fall back into staples

Deformity
Reduced agricultural productivity
Inability to harvest - Loss of cash crops fall back into staples

Disablement
Deformity and stigma
Permanent poverty
No earned income
The current context

- MDG relevant
- True burden grossly underestimated eg zoonotic diseases
- The bottom billion-equity and human rights issues
- Long term pharma commitments
- Heightened international interest and G8 commitment = next step is translation
- Implementation pro poor policies
- Assist in strengthening health systems
- Equity versus inequity
- Invest in success versus unrealistic targets with no accountability for failure
- Achievable versus unachievable
- Public health transmission control model versus curative approaches—more people, more impact
- Cost effective with large populations targeted versus non-cost effective limited impact curative models
- Health systems strengthened versus vertical disease control—a fatuous yet continuing debate?
- Operational research versus basic research—magic bullets won’t emerge—unused tools which work are not applied
DISABLED by the belief that only three diseases matter
BLIND to opportunity and achievement