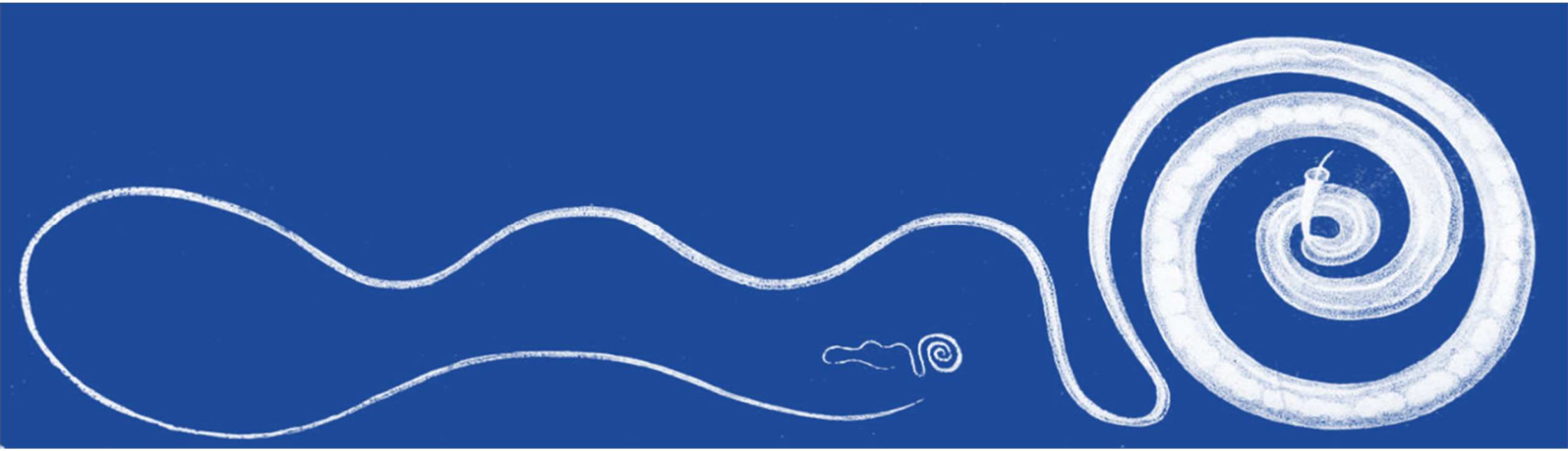

The shift from control to elimination: implications for diagnostics

Fabian Schär, PhD

January 31, 2017

LCNTDR

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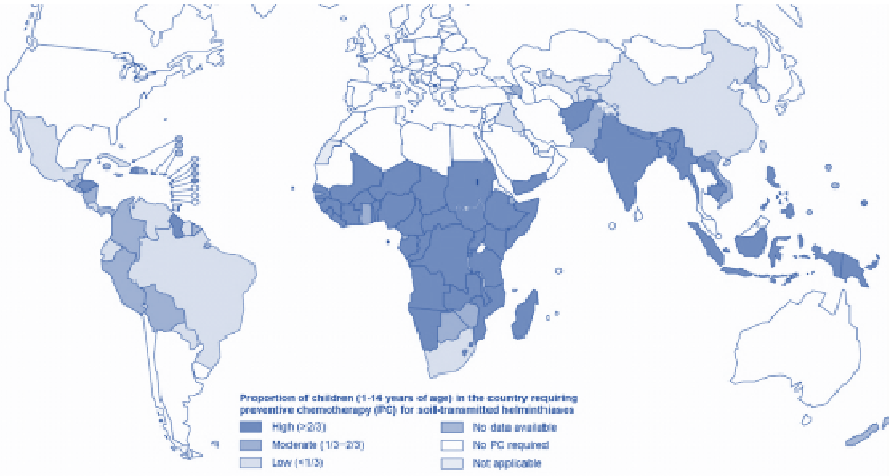
Introduction

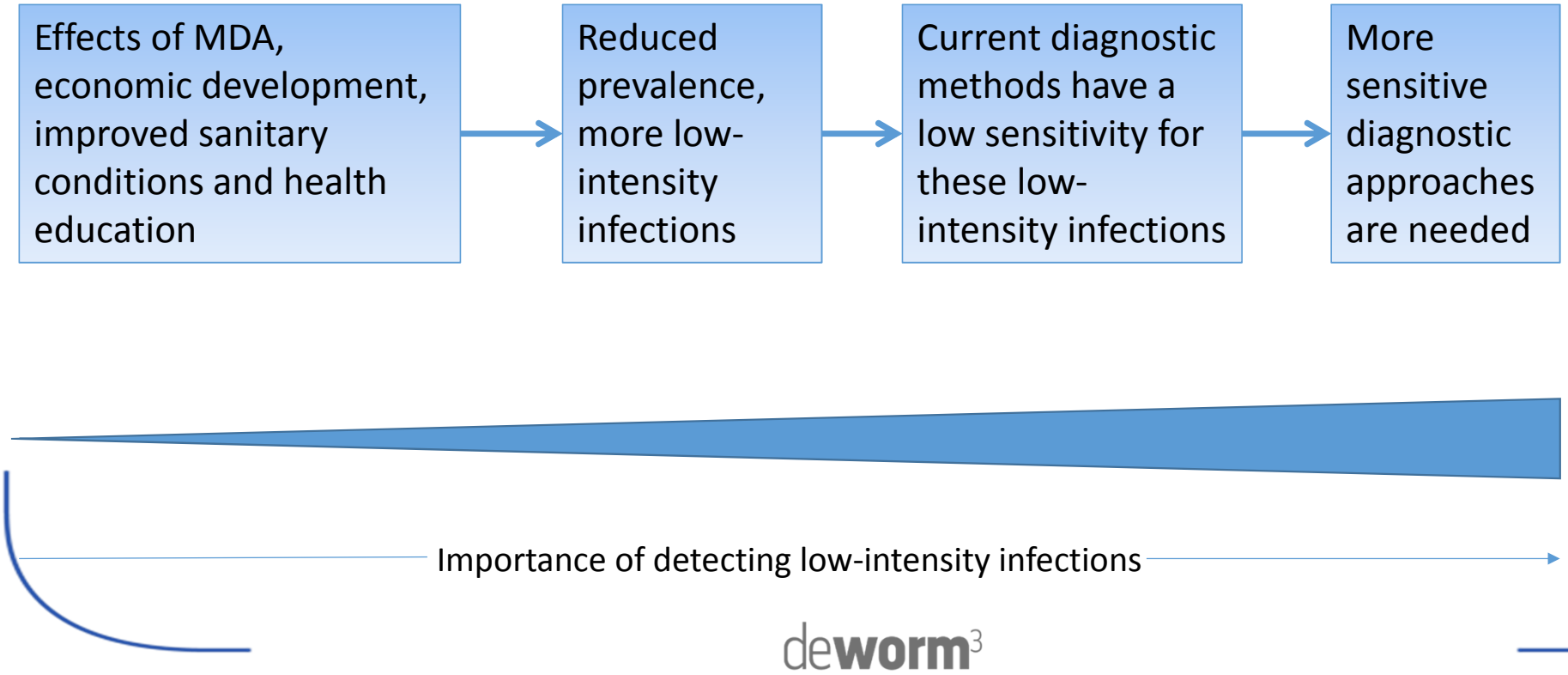
- Soil-transmitted helminths (STHs) are part of the NTDs and account for a high burden of disease
- Morbidity control with MDA is the current STH strategy
- Future strategies should aim at moving from control to elimination of STHs



World Health Organization (WHO) 2014

The challenge

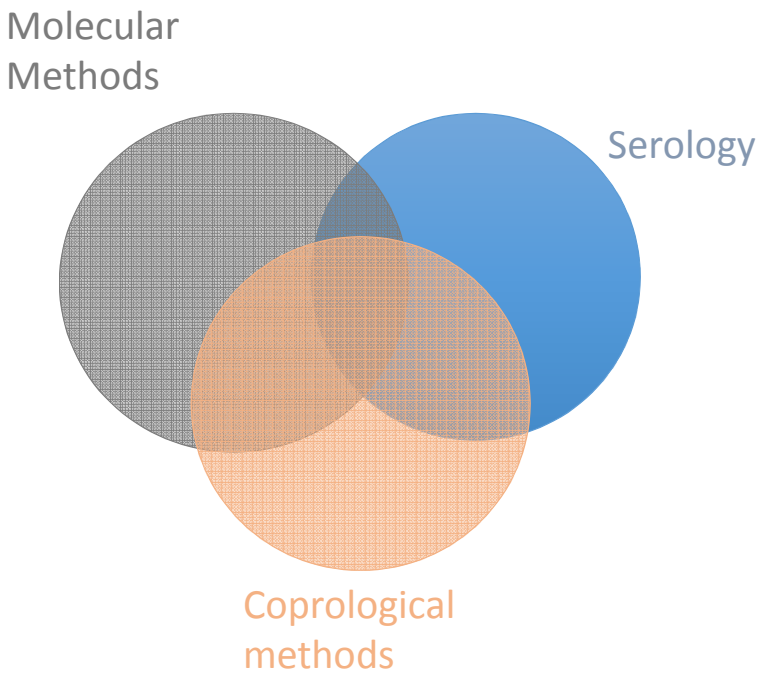
The switch from control to elimination from the diagnostic point of view



Current and new diagnostic methods

	Coprological stool methods	Molecular methods
Advantages	• Cheap • Readily available • Easy to apply in field settings	• Sensitivity drastically increased
Disadvantages	• Lower sensitivity • Risk of missing low intensity infections	• Higher costs • Difficult to implement in field settings • Risk of contamination

Validation of diagnostic methods

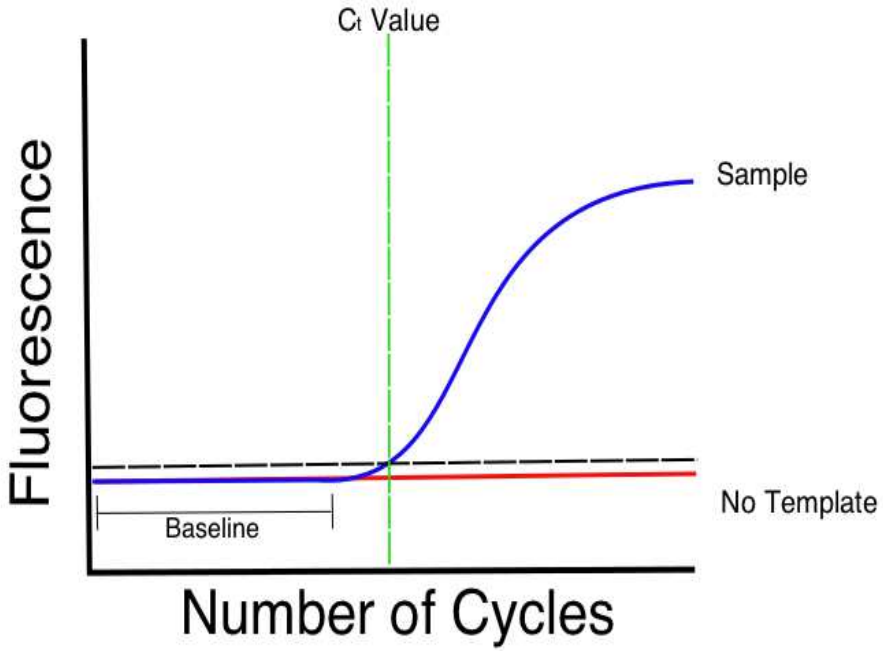


Adapted from Johansen; Acta Tropica 141 (2015) 161-169

The lack of gold standard diagnostic methods makes validation of new diagnostic approaches challenging

Advances in PCR methodology

- Ribosomal and mitochondrial targets in PCR may be sub-optimal for low-intensity infections and lack of species-specificity
- New PCR approaches have been developed that target species-specific repetitive non-coding repeat DNA
- The high repetition sequences have a rapid evolutionary divergence: ideal for distinguishing even closely related species (i.e. *A. duodenale* and *A. ceylanicum*)
- Molecular approaches are becoming cheaper, easier to conduct and field based methods are in development
- PCR enables to detect smallest volumes of parasite DNA, ideal for detecting low-intensity infections.



Pilotte et al (2016) PLoS Negl Trop Dis 10(3)

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Quantitative PCR (qPCR)

- qPCR allows to ***quantify*** the detected genetic material (DNA, RNA)
- qPCR is faster in detecting amplified DNA, no separate readout is needed
- Sensitivity is increased
- Lower amounts of material can be used
- Throughput is considerably higher than conventional PCR

- Possible challenges: qPCR is more expensive and more difficult to implement in field settings

- Todays possibility of multi-parallel assays helps to drastically reduce cost of the PCR
- Additionally, the assay can be optimized for the geographic location (i.e. what pathogens should be included) as the assays can run independently
- Pooling of samples can further reduce costs

Llewellyn et al (2016). PLoS Negl Trop Dis 10(1): Gordon et al (2015). Int Jnl for Parasitology 45 (2015) 477–483

qPCR in DeWorm3

- Define molecular cut-offs to define transmission interruption
- Optimize stool collection, processing and storage
- Identify optimal extraction and pooling methodologies
- Build capacity at multiple sites for a systematic and harmonized approach to molecular diagnosis of STHs
- Create a biobank of stored parasite genetic network for the NTD community

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