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Soil-transmitted helminthiasis in children – any role for veterinary parasitologists?

Bruno.Levecke@UGent.be
Laboratory of Parasitology

Wat wormen in een overloper vertellen over het leven in Noord-Korea

vrt NWS

Bij een Noord-Koreaanse soldaat die is overgelopen naar Zuid-Korea zijn tientallen parasitaire wormen gevonden. Er was er zelfs een van 27 centimter lang bij. Volgens experts zegt dat veel over het dieet en de slechte hygiëne in Noord-Korea.

Neglected Tropical Diseases - NTDs

Neglected Tropical Diseases - NTDs

Diseases	DALYs (x 1000)
HIV/AIDS	66 689
Malaria	55 769
Tuberculosis	40 302
NTDs	23 443

Global Health Metrics

Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016

GBD 2016 DALYs and HALE Collaborators*

Neglected Tropical Diseases - NTDs

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HIV/AIDS	66 689
Malaria	55 769
Tuberculosis	40 302
NTDs	23 443

Neglected Tropical Diseases - NTDs

Diseases	DALYs (x 1000)
Soil-transmitted helminthiasis	3 378
Schistosomiasis	2 613
Lymphatic filiariasis	2 075
Dengue	1 892
Onchocerciasis	1 356

Global Health Metrics

Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016

*GBD 2016 DALYs and HALE Collaborators**

Soil-Transmitted Helminths

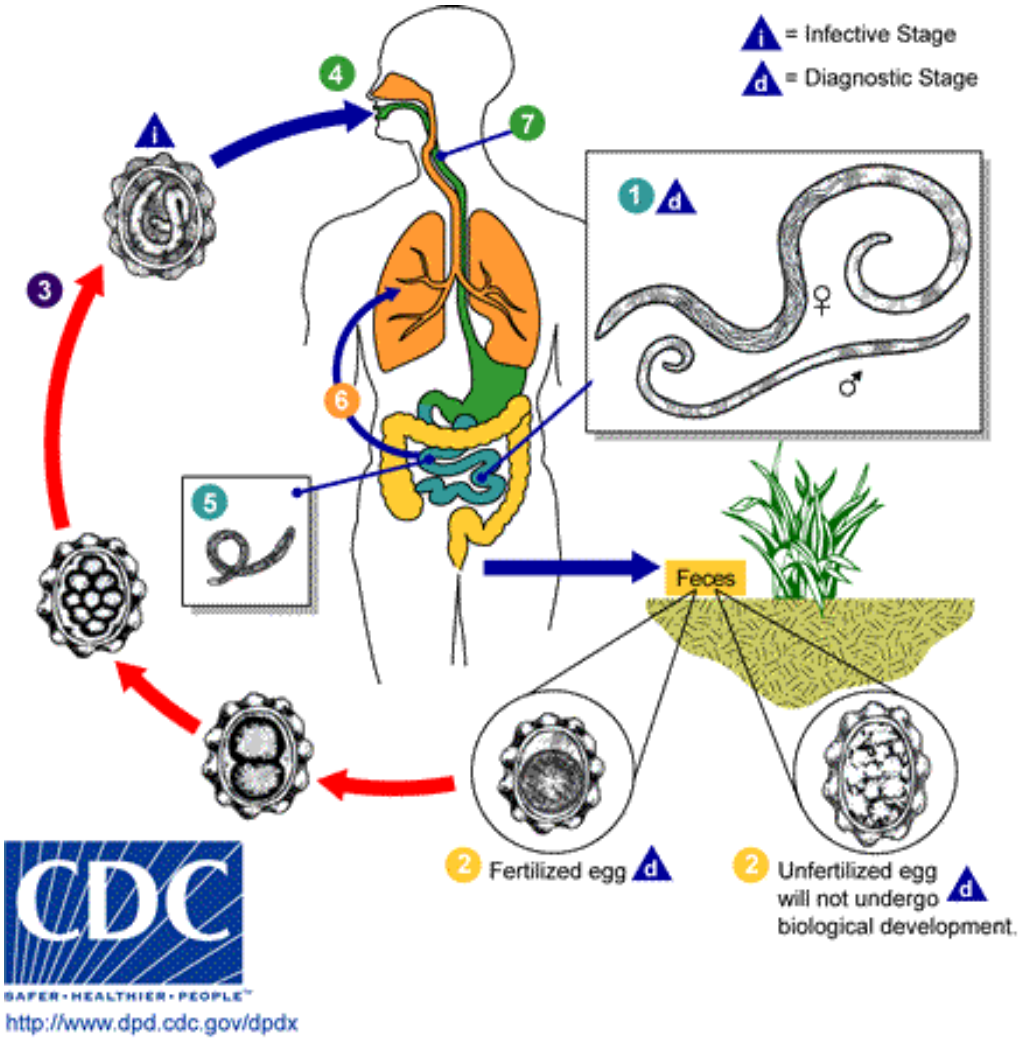
STH

Ascaris lumbricoides

Trichuris trichiura

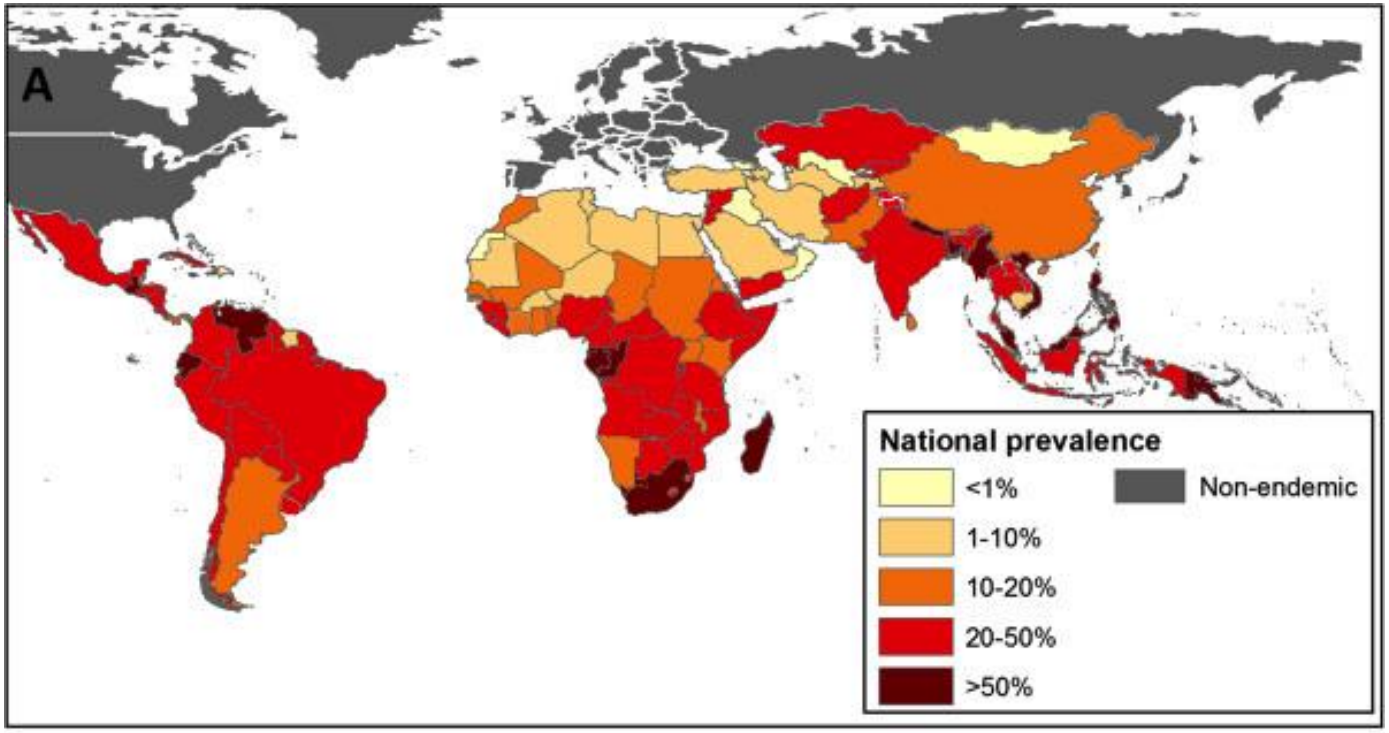
Ancylostoma duodenale
Necator americanus

Soil-Transmitted Helminths



Prevalence

- 20% of the world is infected



Pullan et al. Parasites & Vectors 2014, 7:37
http://www.parasitesandvectors.com/content/7/1/37

Parasites & Vectors

RESEARCH Open Access

Global numbers of infection and disease burden of soil transmitted helminth infections in 2010

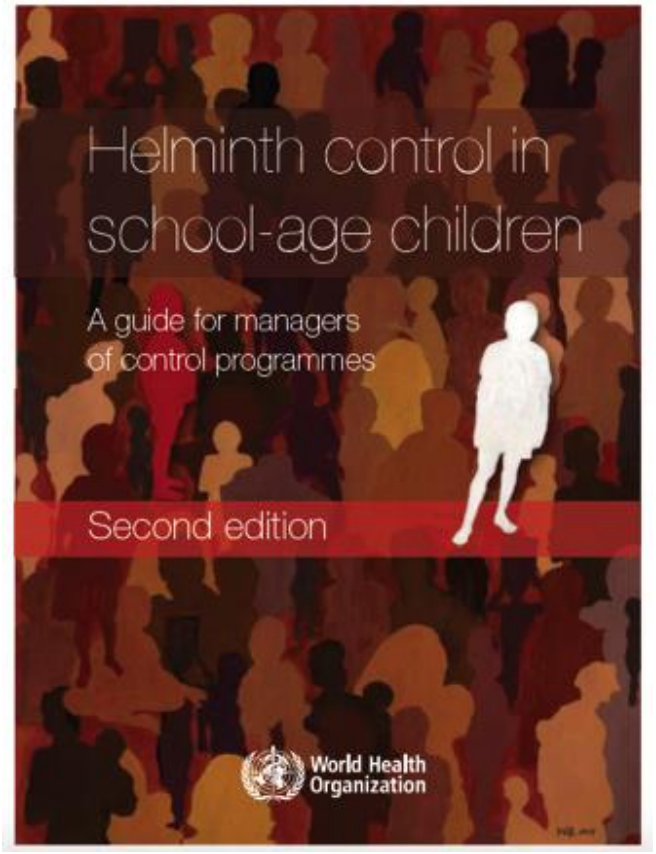
Rachel L Pullan[1*], Jennifer L Smith[1], Rashmi Jasrasaria[2,3] and Simon J Brooker[1]

Burden of disease

- 45% of the infected subjects have significant morbidity
  - Growth
  - Anemia
  - Cognitive development
  - (Death)
- Children and women of childbearing age

Control Strategy

- School-based MDA = cornerstone



Commonly used drugs

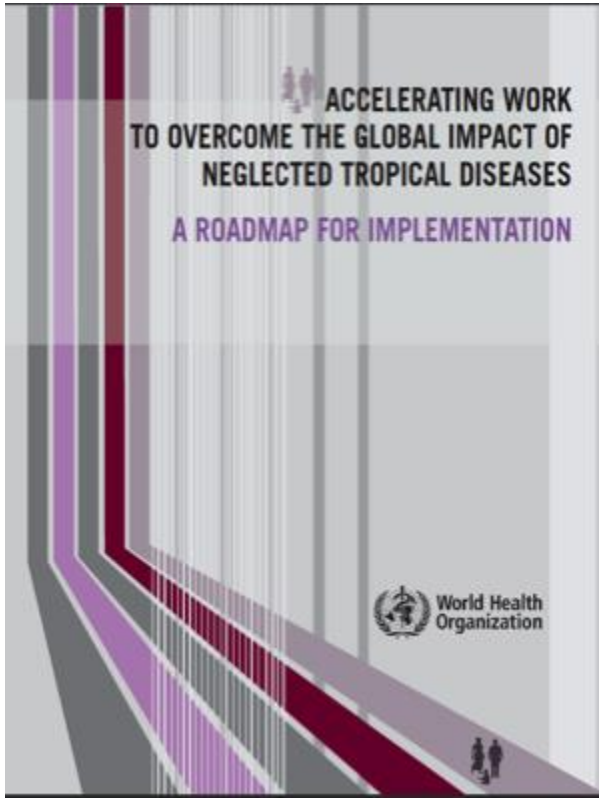
Albendazole (400 mg)

Mebendazole (500 mg)

Frequency

Prevalence	Frequency
≥ 50 %	2x year
≥ 20 % & < 50%	1x year
< 20%	Not recommended

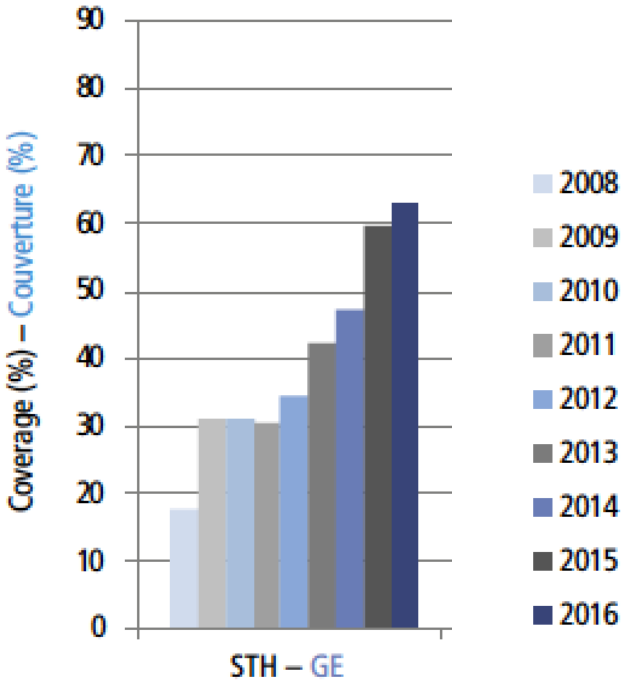
Milestones by 2020



- 100% of countries in need of MDA achieved 75% coverage
- 75-100% of children in need of MDA worldwide have been treated

Elimination as a public health problem
(<1% moderate or high intensity infections)

Progress made



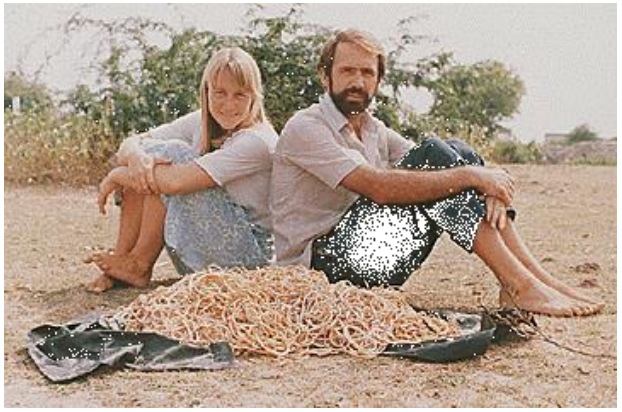
2017, 92, 589–608 No 40

World Health Organization
Organisation mondiale de la Santé

Weekly epidemiological record
Relevé épidémiologique hebdomadaire

6 OCTOBER 2017, 92th YEAR / 6 OCTOBRE 2017, 92e ANNÉE
No 40, 2017, 92, 589–608
http://www.who.int/wer

- Coverage increased with ≥300% between 2008 – 2016
- ≥30% of countries in need of MDA achieved 75% coverage
- ≥60% of children in need of MDA worldwide have been treated



Threats

Combat STH

Anthelminthic Resistance

Role of veterinary parasitologists

?

Role of veterinary parasitologists

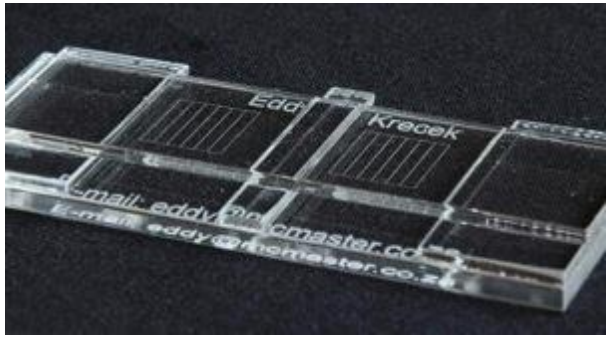
- We have years of experience (good & bad)

	Veterinary STH	Human STH
No. of STH	>100	4
Importance	Temperate & tropical regions	Tropical regions
Market of anthelmintics	>18% of all drugs Multiple compounds	<1% of all drugs 2 compounds (ALB & MEB)
Drug resistance	Major problem	No (?) to limited problem
New drugs in pipeline	Yes	No (?)

Role of veterinary parasitologists

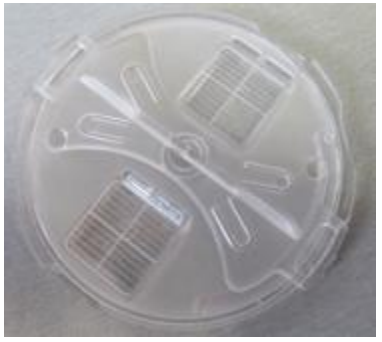
- Diagnosis
  - Application/evaluation of veterinary methods

McMaster



FLOTAC

Mini-FLOTAC



FECPAK^{G2}

OPEN ACCESS Freely available online PLoS NEGLECTED TROPICAL DISEASES

A Comparison of the Sensitivity and Fecal Egg Counts of the McMaster Egg Counting and Kato-Katz Thick Smear Methods for Soil-Transmitted Helminths

Bruno Levecke[1*], Jerzy M. Behnke[2], Sitara S. R. Ajjampur[3], Marco Albonico[4], Shaali M. Ame[5], Johannes Charlier[1], Stefan M. Geiger[5], Nguyen T. V. Hoa[6], Romuald I. Kamwa Ngassam[7], Andrew C. Kotze[8], James S. McCarthy[9], Antonio Montresor[10], Maria V. Periago[5], Sheela Roy[3], Louis-Albert Tchuem Tchuenté[7], D. T. C. Thach[6], Jozef Vercruysse[1]

OPEN ACCESS Freely available online PLoS NEGLECTED TROPICAL DISEASES

Field Validity and Feasibility of Four Techniques for the Detection of *Trichuris* in Simians: A Model for Monitoring Drug Efficacy in Public Health?

Bruno Levecke*, Nathalie De Wilde, Els Vandenhoute, Jozef Vercruysse

PROTOCOL EXTENSION

The Mini-FLOTAC technique for the diagnosis of helminth and protozoan infections in humans and animals

Giuseppe Cringoli[1], Maria P Maurelli[1], Bruno Levecke[2], Antonio Bosco[1], Jozef Vercruysse[2], Jürg Utzinger[3,4] & Laura Rinaldi[1]

Optimizing FECPAK^{G2} for the quantification of soil-transmitted helminth eggs in human stool.

Role of veterinary parasitologists

- Diagnosis
  - Pooling of stool samples

The use of age-clustered pooled faecal samples for monitoring worm control in horses

M. Eysker *, J. Bakker, M. van den Berg, D.C.K. van Doorn, H.W. Ploeger

Effects of aggregation and sample size on composite faecal egg counts in sheep

E.R. Morgan a,*, L. Cavill a, G.E. Curry a, R.M. Wood b, E.S.E. Mitchell c

Evaluation of a composite method for counting helminth eggs in cattle faeces

M.P. Ward *, M. Lyndal-Murphy, F.C. Baldock

OPEN ACCESS Freely available online

PLOS | NEGLECTED TROPICAL DISEASES

Comparison of Individual and Pooled Stool Samples for the Assessment of Soil-Transmitted Helminth Infection Intensity and Drug Efficacy

Zeleke Mekonnen[1,2], Selima Meka[1], Mio Ayana[1], Johannes Bogers[3], Jozef Vercruysse[2], Bruno Levecke[2]*

Kure et al. Parasites & Vectors
DOI 10.1186/s13071-015-1101-1

Parasites & Vectors

RESEARCH Open Access

Comparison of individual and pooled stool samples for the assessment of intensity of *Schistosoma mansoni* and soil-transmitted helminth infections using the Kato-Katz technique

Ashenafi Kure[1], Zeleke Mekonnen[2], Daniel Dana[2], Mitiku Bajiro[2], Mio Ayana[2], Jozef Vercruysse[3] and Bruno Levecke[2*]

Degarege et al. Parasites & Vectors (2015) 8:593
DOI 10.1186/s13071-015-1205-7

Parasites & Vectors

RESEARCH Open Access

Comparison of individual and pooled urine samples for estimating the presence and intensity of *Schistosoma haematobium* infections at the population level

Abraham Degarege[1,2*], Berhanu Erko[1], Zeleke Mekonnen[3], Mengistu Legesse[1], Yohannes Negash[1], Jozef Vercruysse[4] and Bruno Levecke[4]

Comparison of an individual and pooled diagnostic examination strategy during the national mapping of soil-transmitted helminths and *Schistosoma mansoni* in Ethiopia

GHENT UNIVERSITY

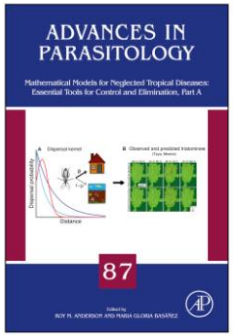
Gemechu Tadesse[1,2*], Michael French[3], Jozef Vercruysse J[2], Bruno Levecke[1]

[1] Ethiopian Public Health Institute, Ethiopia; [2]Ghent University, Belgium; [3]RTI International, USA
*gemechut_2006@yahoo.com

RTI INTERNATIONAL

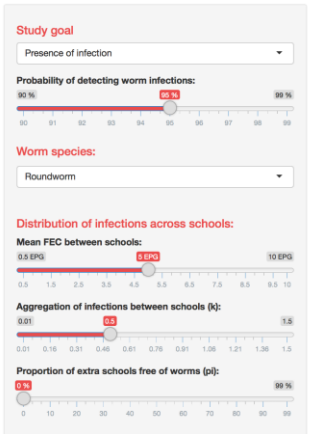
Role of veterinary parasitologists

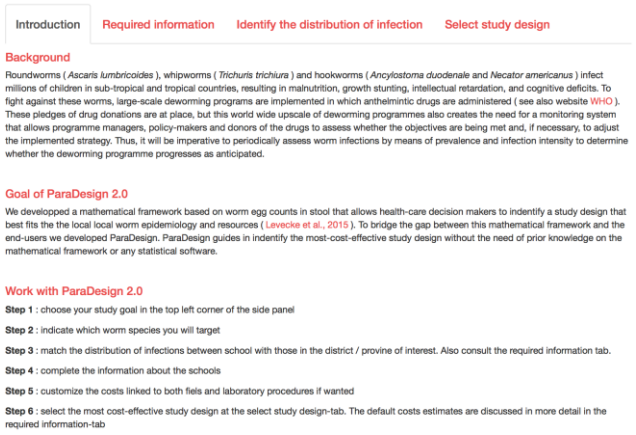
- Diagnosis
  - When to use which diagnostic tool?



Mathematical Inference on Helminth Egg Counts in Stool and Its Applications in Mass Drug Administration Programmes to Control Soil-Transmitted Helminthiasis in Public Health

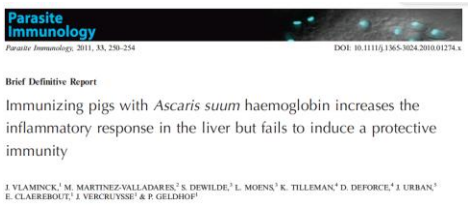
Bruno Levecke[a,1], Roy M. Anderson[i], Dirk Berkvens[¶], Johannes Charlier[a], Brecht Devleesschauwer[a,j], Niko Speybroeck[j], Jozef Vercruysse[a], Stefan Van Aelst[a,**]





Role of veterinary parasitologists

- Diagnosis
  - Serological based assays


Parasite Immunology

Parasite Immunology, 2011, 33, 250–254 DOI: 10.1111/j.1365-3024.2010.01274.x

Brief Definitive Report

Immunizing pigs with *Ascaris suum* haemoglobin increases the inflammatory response in the liver but fails to induce a protective immunity

J. VLAMINCK,[1] M. MARTINEZ-VALLADARES,[2] S. DEWILDE,[3] L. MOENS,[3] K. TILLEMAN,[4] D. DEFORCE,[4] J. URBAN,[5] E. CLAEREBOUT,[1] J. VERCRUYSSE[1] & P. GELDHOF[1]


Veterinary Parasitology 189 (2012) 267–273

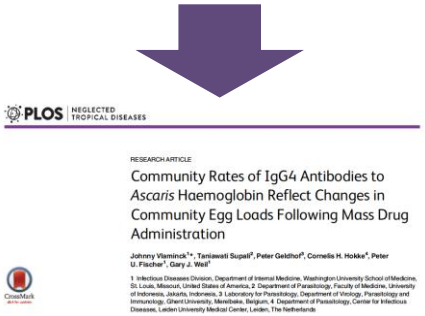
Contents lists available at SciVerse ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Evaluation of a serodiagnostic test using *Ascaris suum* haemoglobin for the detection of roundworm infections in pig populations

Johnny Vlaminck[a,*], Peter Nejsum[b], Frédéric Vangroenweghe[c,1], Stig Milan Thamsborg[b], Jozef Vercruysse[a], Peter Geldhof[a]


PLOS | NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Community Rates of IgG4 Antibodies to *Ascaris* Haemoglobin Reflect Changes in Community Egg Loads Following Mass Drug Administration

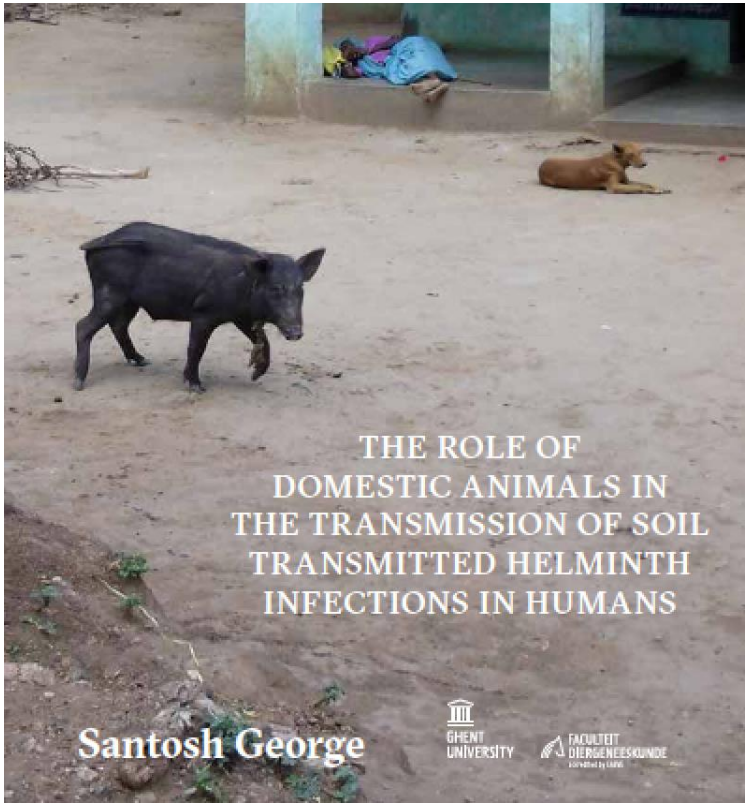
Johnny Vlaminck[1]*, Taniawati Supali[2], Peter Geldhof[3], Cornelis H. Hokke[4], Peter U. Fischer[1], Gary J. Weil[1]

1 Infectious Diseases Division, Department of Internal Medicine, Washington University School of Medicine, St. Louis, Missouri, United States of America, 2 Department of Parasitology, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia, 3 Laboratory for Parasitology, Department of Virology, Parasitology and Immunology, Ghent University, Merelbeke, Belgium, 4 Department of Parasitology, Center for Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands

Diagnosis of ***Ascaris lumbricoides*** infections in Ethiopian children and adults by three coprological techniques and two novel in-house serological tests

Role of veterinary parasitologists

- Optimizing STH control
  - Role of animals as a reservoir for STH



Trans R Soc Trop Med Hyg 2016; **110**: 657–663
doi:10.1093/trstmh/trw078 Advance Access publication 18 January 2017

The molecular speciation of soil-transmitted helminth eggs collected from school children across six endemic countries

Santosh George[a,b], Peter Geldhof[a], Marco Albonico[c,d], Shaali M. Ame[e], Jeffrey M. Bethony[f], Dirk Engels[g], Zeleke Mekonnen[h], Antonio Montresor[g], Sopheak Hem[i], Louis-Albert Tchuem-Tchuenté[j], Nguyen Thu Huong[k], Gagandeep Kang[b], Jozef Vercruysse[a] and Bruno Levecke[a,*]

Role of veterinary parasitologists

- Optimizing STH control
  - Sources of contamination

BMC Veterinary Research

BioMed Central

Research article

Open Access

Canine faecal contamination and parasitic risk in the city of Naples (southern Italy)

Laura Rinaldi[†1], Annibale Biggeri[†2], Sabrina Carbone[†1], Vincenzo Musella[†1], Dolores Catelan[†2], Vincenzo Veneziano[†1] and Giuseppe Cringoli*[1]

VECTOR-BORINE AND ZOONOTIC DISEASES
Volume 11, Number 2, 2011

DOI: 10.1089/vbz.2009.0244

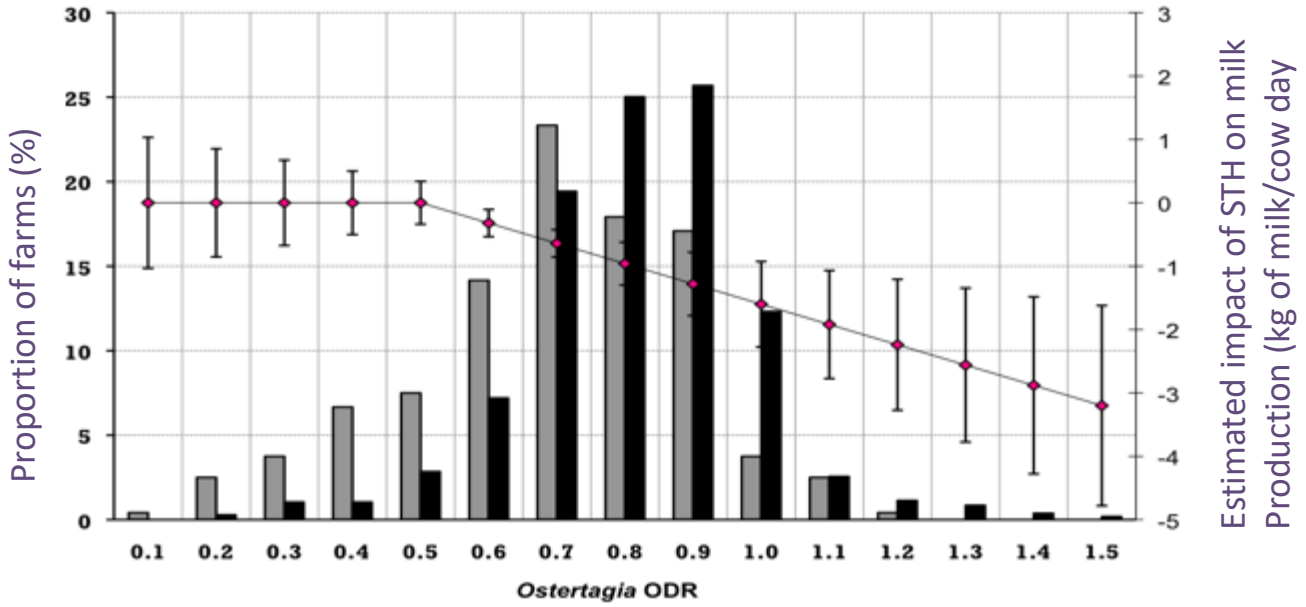
The Relationship of Public Park Accessibility to Dogs to the Presence of *Toxocara* Species Ova in the Soil

Hamza Avcioglu and İbrahim Balkaya

What about infection in the classroom?

Role of veterinary parasitologists

- Optimizing STH control
  - Impact of STH on milk
    - Antibody STH are –ive correlated with milk production
    - Treatment recovers milk losses



Role of veterinary parasitologists

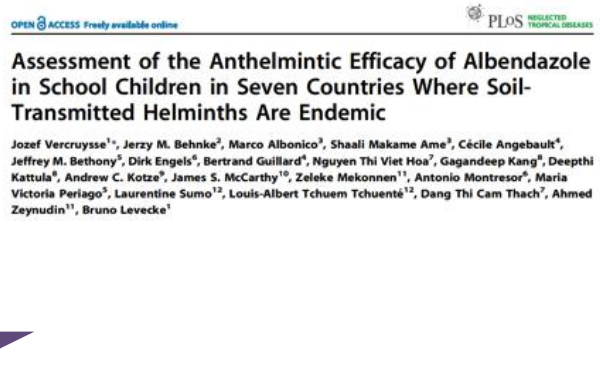
- Optimizing STH control
  - Impact of STH on milk
    - What is the impact of treatment at delivery?
    - Postpartum deworming: a novel war to improve breastfeeding and optimize infant growth

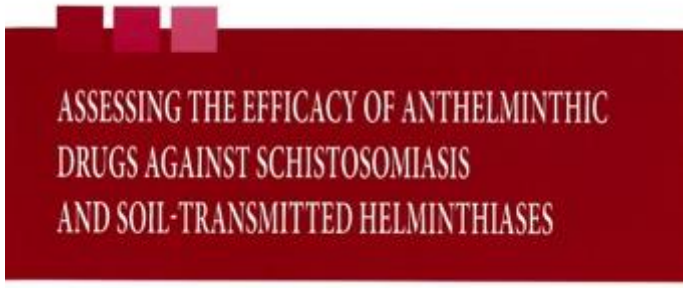
BILL & MELINDA GATES foundation

McGill

Role of veterinary parasitologists

- Monitoring drug efficacy
  - WHO Collaborating Centre since 2009





World Health Organization

Role of veterinary parasitologists

- Monitoring drug efficacy
  - Strengthening monitoring and surveillance of drug efficacy and drug resistance in STH programs

Conclusion

- Veterinary parasitologists have a complementary role
  - Good & bad experience
  - R&D for a variety of diagnostic tools
  - Pragmatic approach
  - Animal - parasite models
    - worm biology
    - bio-markers
    - drug compounds
    - markers for drug resistance

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Thank you

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