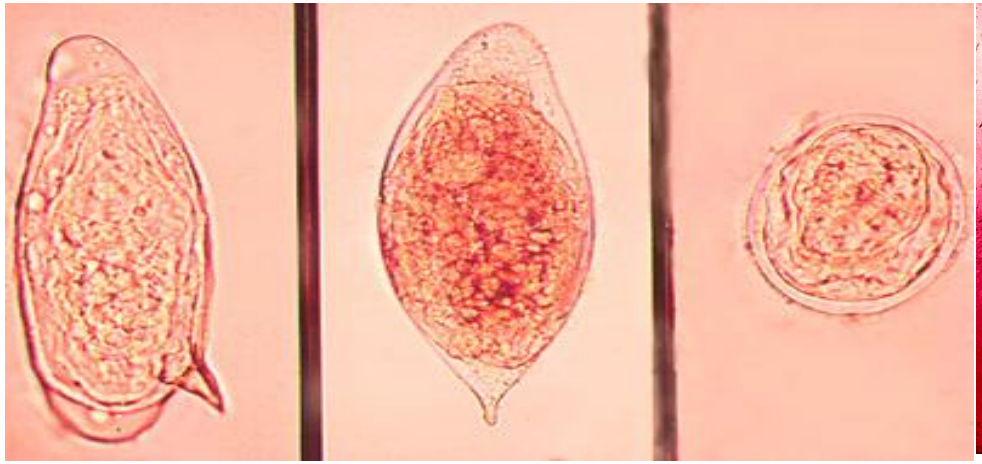
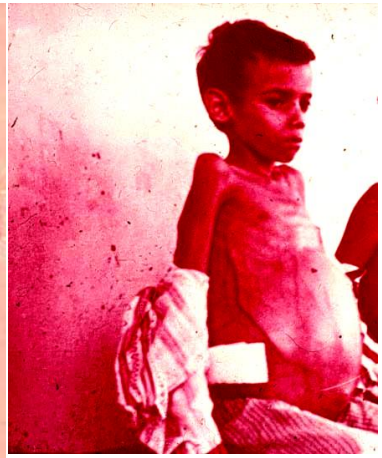
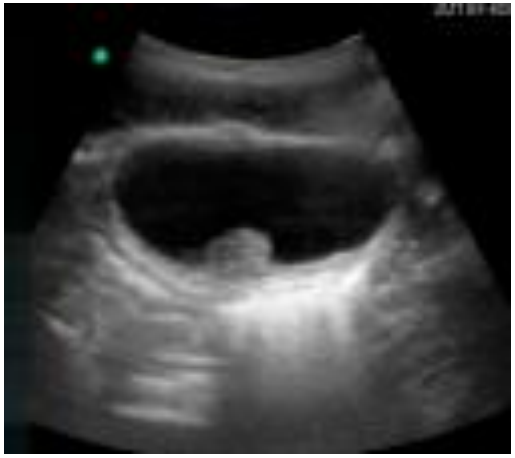
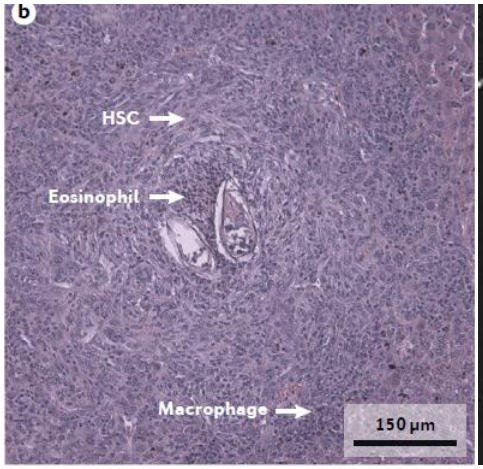
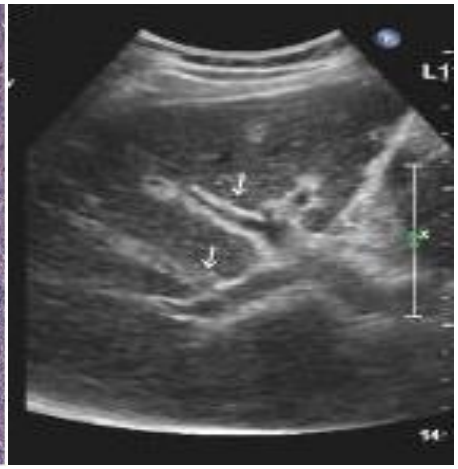




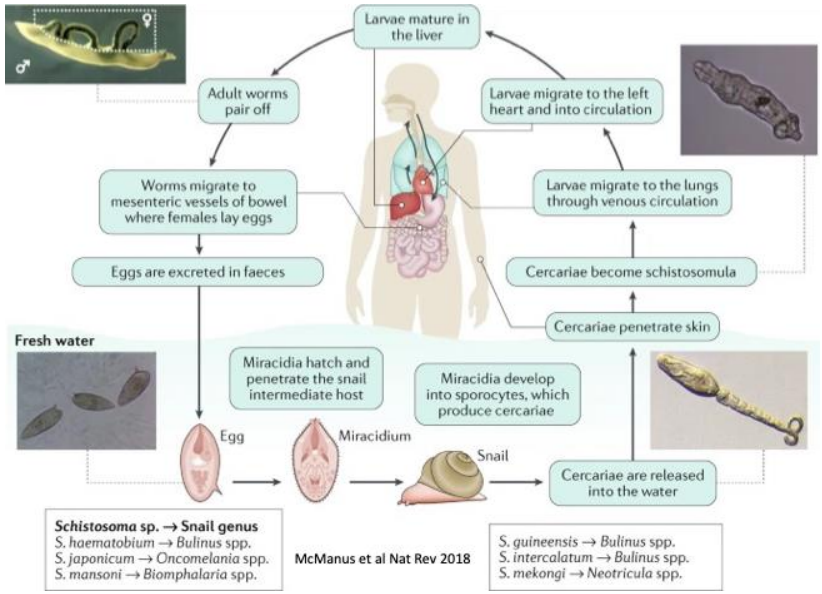
Schistosomiasi: novità in tema di diagnosi e classificazione

Francesca Tamarozzi

DVM MD MSc PhD
Staff Research Physician
Co-head, WHO Collaborating Centre on Stromgyloidiasis and other NTDs
Department of Infectious and Tropical Diseases and Microbiology
IRCCS Sacro Cuore Don Calabria Hospital
Negrar di Valpolicella, Verona, Italy
francesca.tamarozzi@sacrocuore.it







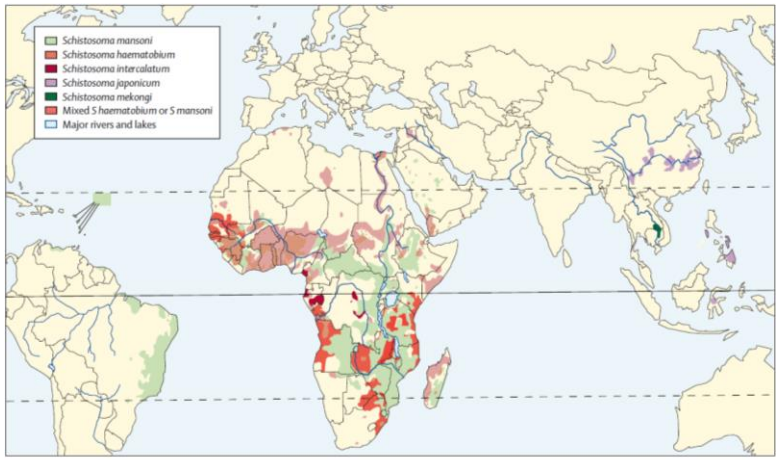


Figure 2: Global distribution of countries where human schistosomiasis is transmitted.
Adapted from Gryseels and colleagues.[1]

- 250 milioni infetti → circa il doppio soffrono delle conseguenze croniche anche se non più infette
- Circa 2/3 infette da *S. haematobium* e 1/3 da *S. mansoni*
- 2-3 million DALYs

Eur J Epidemiol
DOI 10.1007/s10654-017-0259-6

LETTER TO THE EDITOR

The hidden epidemic of schistosomiasis in recent African immigrants and asylum seekers to Italy

Anna Beltrame[1] · Dora Buonfrate[1] · Federico Gobbi[1] · Andrea Angheben[1] · Valentina Marchese[1] · Geraldo Badona Monteiro[1] · Zeno Bisoffi[1]

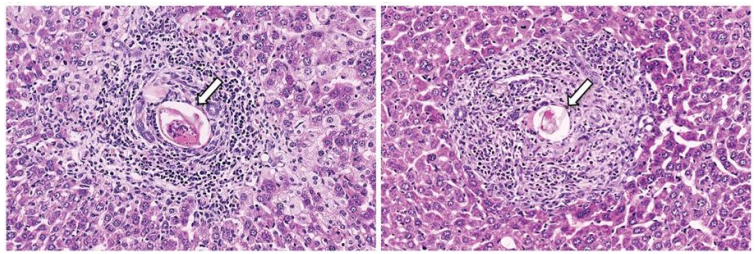
- Ritardo di mesi/anni (media 31 mesi) nella diagnosi (spesso occasionale)

JTM Journal of Travel Medicine
International Society of Travel Medicine
Promoting healthy travel worldwide
Journal of Travel Medicine, 2019, 1–7
doi: 10.1093/jtm/taz075
Original Article

Original Article

Delay in schistosomiasis diagnosis and treatment: a multicenter cohort study in Italy

Agnese Comelli, MD[1,*], Niccolò Riccardi, MD[2], Diana Canetti, MD, DTM&H (LSTM)[2], Michele Spinicci, MD[3], Giovanni Cenderello, MD[4,5], Paola Magro, MD[1], Laura Ambra Nicolini, MD, PhD[6], Valentina Marchese, MD, PhD[1], Lorenzo Zammarchi, MD[3], Francesco Castelli, MD[1], Alessandro Bartoloni, MD, DTM[3], Antonio Di Biagio, MD[6], Silvio Caligaris, MD[1], Giovanni Gaiera, MD[2]



https://doi.org/10.3389/fimmu.2013.00089

SACRO CUORE DON CALABRIA
IRCCS

What's "new"?

1

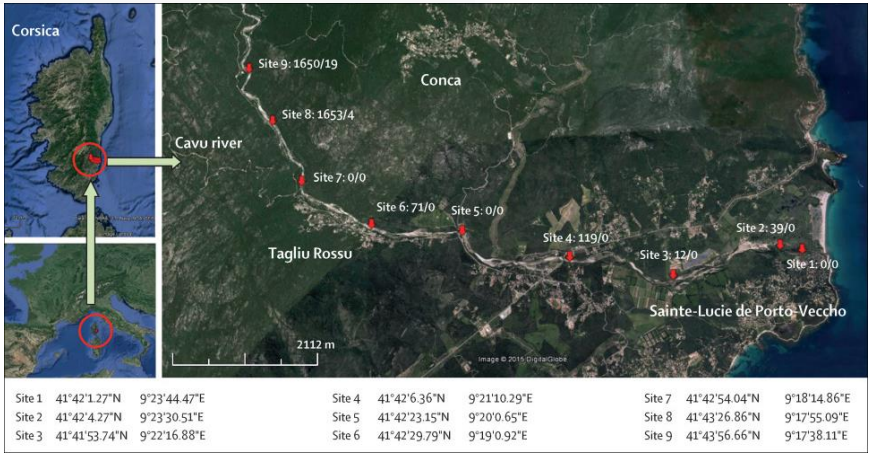
https://www.londonntd.org

F Tamarozzi, Tanzania, 2012

Figure 2. Distribution of Schistosoma hybrids across Africa. Notes: *S.h.* = *S. haematobium*; *S.m.* = *S. mansoni*; *S.g.* = *S. guineensis*; *S.i.* = *S. intercalatum*; *S.b.* = *S. bovis*; *S.c.* = *S. curassoni*; *S.r.* = *S. rodhaini*; *S.ma.* = *S.* mattheei; adapted primarily from Leger et al. [5].

Hybridizations within the Genus *Schistosoma*: implications for evolution, epidemiology and control

ELSA LEGER* *and* JOANNE P. WEBSTER*

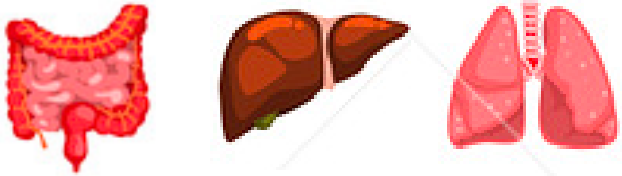


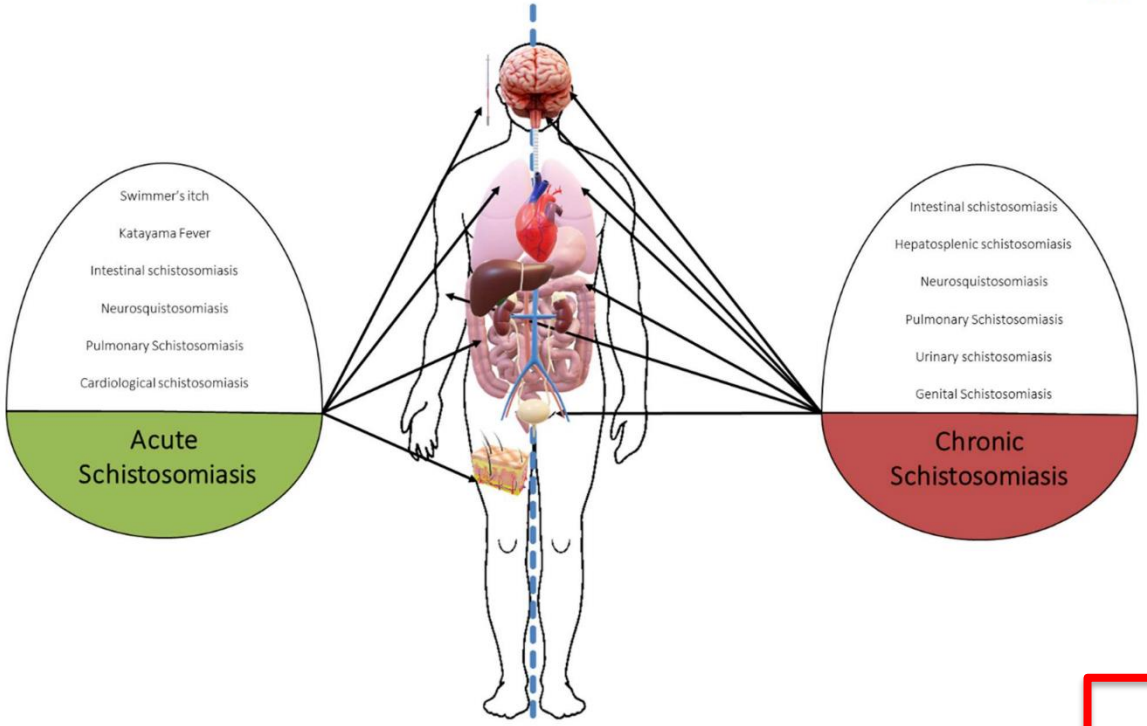
Site 1	41°42'1.27"N	9°23'44.47"E	Site 4	41°42'6.36"N	9°21'10.29"E	Site 7	41°42'54.04"N	9°18'14.86"E
Site 2	41°42'4.27"N	9°23'30.51"E	Site 5	41°42'23.15"N	9°20'0.65"E	Site 8	41°43'26.86"N	9°17'55.09"E
Site 3	41°41'53.74"N	9°22'16.88"E	Site 6	41°42'29.79"N	9°19'0.92"E	Site 9	41°43'56.66"N	9°17'38.11"E

Boissier et al 2016 lancet Infect Dis

What's "new"? 2

S. mansoni, S. japonicum, S. mekongi S. intercalatum
Schistosomiasi intestinale e epatosplenica



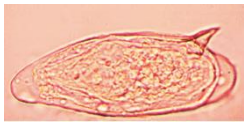


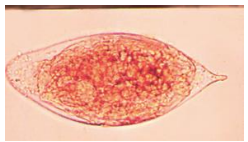
Carbonell et al J Clin Med 2021

S. haematobium
Schistosomiasi genitourinaria

Diagnosi di schistosomiasis…
ma di QUALE aspetto?

- **Microscopia (uova in feci e urine)**





Periodo prepatente circa 3 mesi
Sensibilità variabile (40-97%)
Non correla con coinvolgimento genitale
Infezione attiva (?)

SACRO CUORE DON CALABRIA
I R C C S

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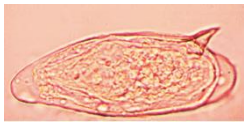

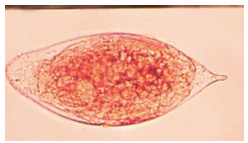

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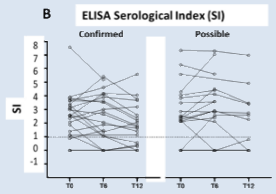

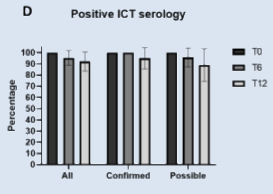

Tamarozzi et al Parasit Vectors 2021

Molti test disponibili con performance ≠
Sieroconversione prima delle uova
Se <50-99%; Sp <20-99%
Positiva anni dopo eliminazione parassita

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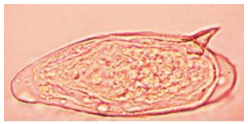

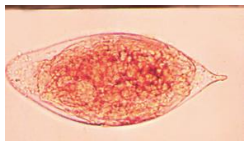

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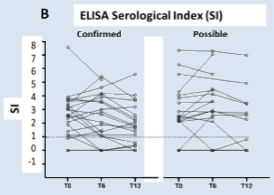

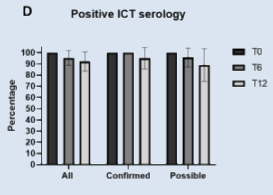

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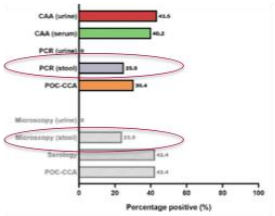

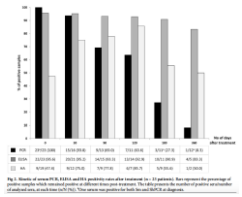

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SACRO CUORE DON CALABRIA IRCCS

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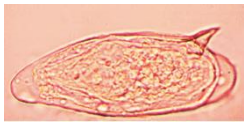

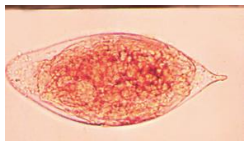

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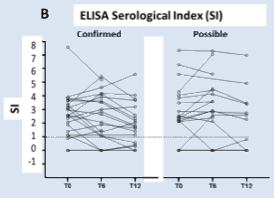

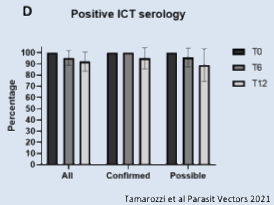

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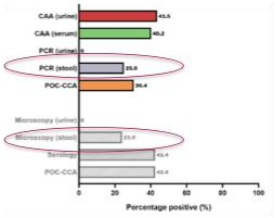

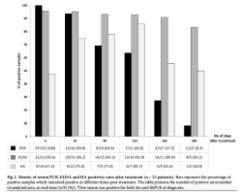

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Van Dam et al 2013
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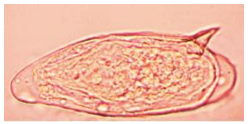
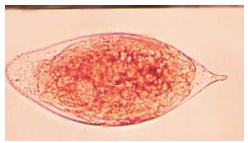

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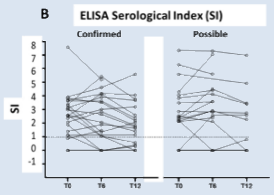

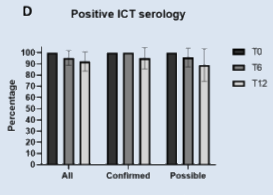

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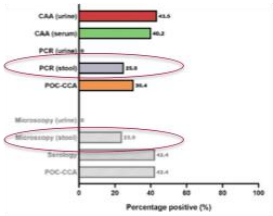

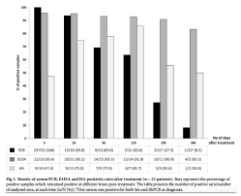

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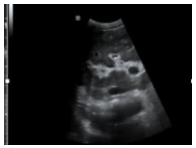
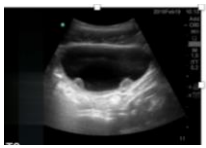
- **Imaging (ecografia)**

Morbidità
Follow-up

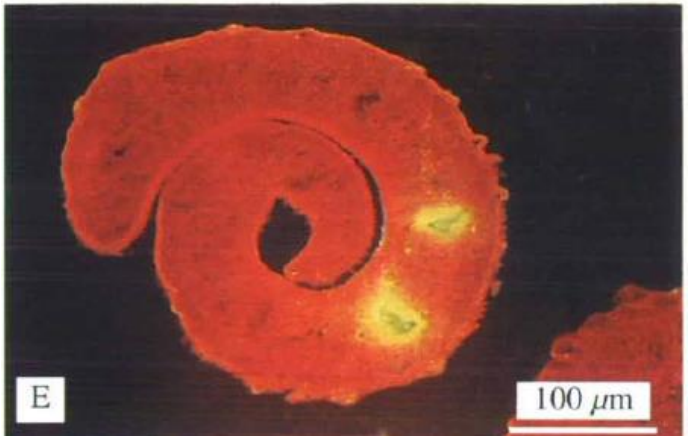
SACRO CUORE DON CALABRIA
I R C C S

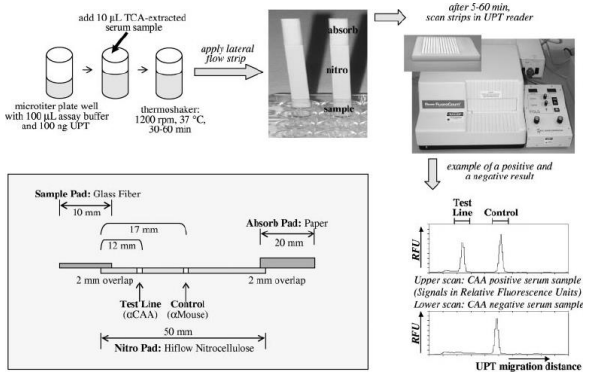
Ag circolanti

UCP-LF CAA

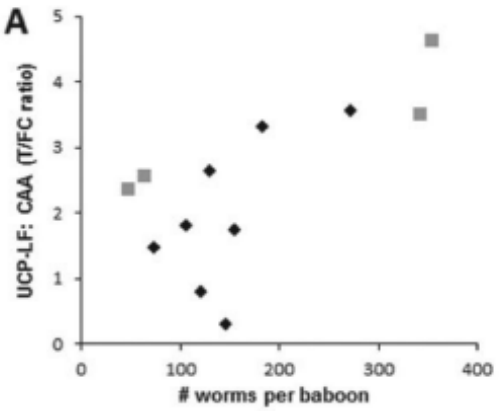
Migliore performance quando testato in area endemica per Sm, Sh, Sj, Smek e fuori da area endemica

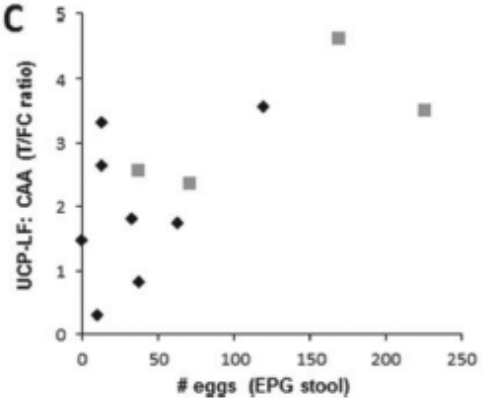
- Van Grootveld et al 2018 **Se 100%**
- Tamarozzi et al 2021 **Se 87%-96%**
- Hoekstra et al 2022 **Se 92%**





UCP-LF technology Corstjens et al 2008

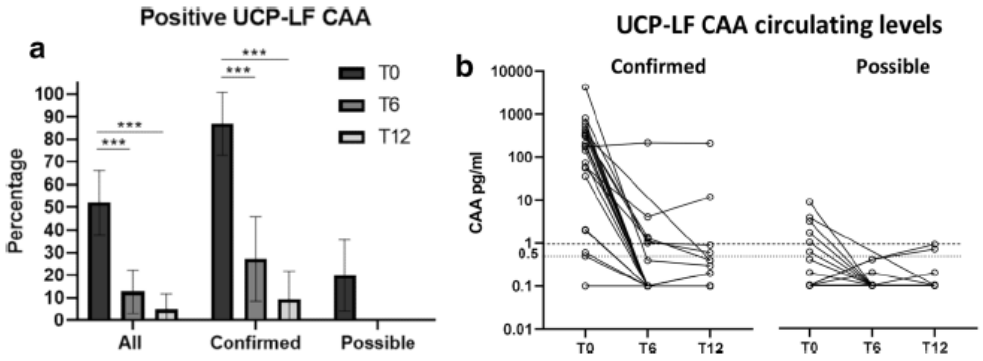




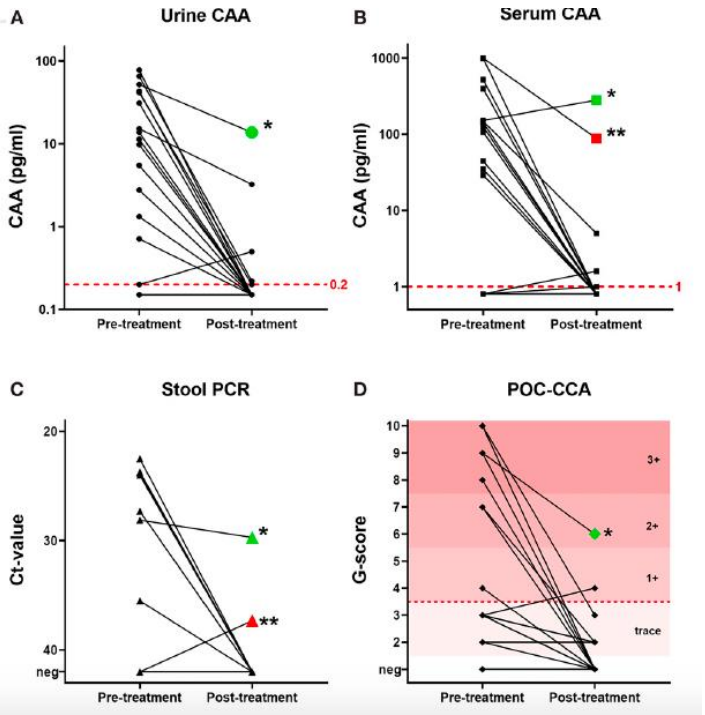
- Livelli correlano con il numero di vermi adulti piuttosto che con il numero di uova (modello baboon)

- Picco di escrezione 6w dopo infezione → diagnosi precoce

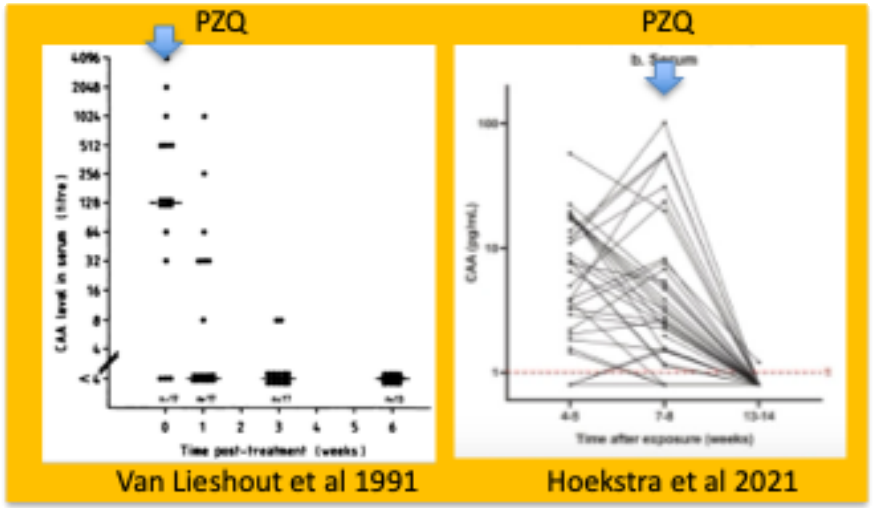
Corstjens et al 2014; Langenberg et al 2019; Casacuberta-Partal et al 2022



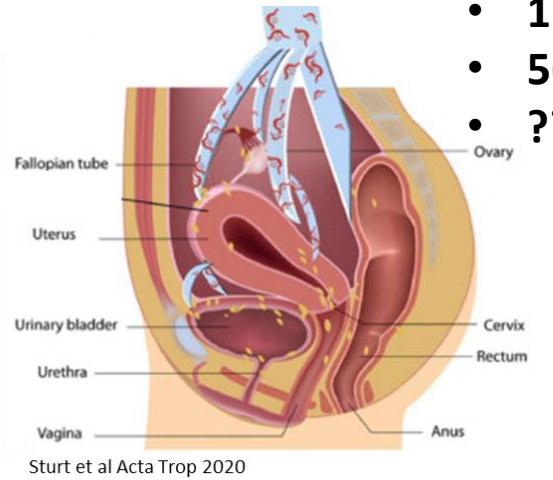
Tamarozzi et al 2021



Hoekstra et al 2022

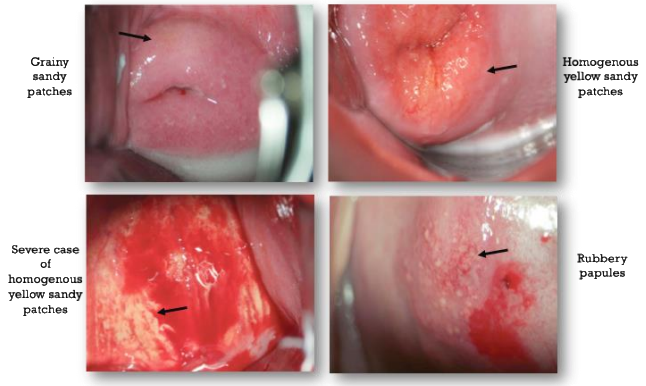


Diagnosi di FGS



Sturt et al Acta Trop 2020

- **110 milioni infetti con *S haematobium***
- **56 milioni FGS**
- **?? milioni MGS**



- **Manifestazioni cliniche** → Non specifiche; misdiagnosi (STI, tumori)
- **Miscroscopia su urine** → Bassa sensibiltà e non correla con FGS
- **Citologia cervicale (PAP)** → Bassa sensibilità
- **Biopsia su lesioni** → Invasiva; bassa sensibilità
- **Colposcopia** → Necessaria strumentazione e expertise
  Lesioni non patognomoniche

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› Am J Trop Med Hyg. 2009 Dec;81(6):1050-5. doi: 10.4269/ajtmh.2009.09-0081.

Schistosomiasis PCR in vaginal lavage as an indicator of genital Schistosoma haematobium infection in rural Zimbabwean women

Eyrun Floerecke Kjetland [1], Robert Jan Ten Hove, Exenevia Gomo, Nicholas Midzi, Lovemore Gwanzura, Peter Mason, Henrik Friis, Jaco J Verweij, Svein Gunnar Gundersen, Patricia D Ndhlovu, Takafira Mduluza, Lisette Van Lieshout

Wellcome Open Research

Wellcome Open Research 2020, 5:61 Last updated: 15 OCT 2020

Check for updates

RESEARCH ARTICLE

REVISED **Acceptability and feasibility of genital self-sampling for the diagnosis of female genital schistosomiasis: a cross-sectional study in Zambia [version 2; peer review: 2 approved]**

Comfort Rutty Phiri[1], Amy S. Sturt[2], Emily L. Webb[3], Namakau Chola[1], Richard Hayes[3], Kwame Shanaube[1], Helen Ayles[2], Isaiah Hansingo[4], Amaya L. Bustinduy[2], BILHIV study team

PLOS NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Validation of the isothermal *Schistosoma haematobium* Recombinase Polymerase Amplification (RPA) assay, coupled with simplified sample preparation, for diagnosing female genital schistosomiasis using cervicovaginal lavage and vaginal self-swab samples

John Archer[1,2]*, Farhan K. Patwary[3], Amy S. Sturt[3], Emily L. Webb[4], Comfort Rutty Phiri[5], Tobias Mweene[5], Richard J. Hayes[4], Helen Ayles[3,5], Eric A. T. Brienen[6], Lisette van Lieshout[6], Bonnie L. Webster[1‡], Amaya L. Bustinduy[3‡]

Check for updates

RESEARCH

Association between cervical dysplasia and female genital schistosomiasis diagnosed by genital PCR in Zambian women

H. Rafferty[1], A. S. Sturt[1], C. R. Phiri[2], E. L. Webb[3], M. Mudenda[4], J. Mapani[4], P. L. A. M. Corstjens[5], G. J. van Dam[5], A. Schaap[2], H. Ayles[1,2], R. J. Hayes[3], L. van Lieshout[6], I. Hansingo[4] and A. L. Bustinduy[1]*

PLOS NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Genital self-sampling compared with cervicovaginal lavage for the diagnosis of female genital schistosomiasis in Zambian women: The BILHIV study

Amy S. Sturt[1]*, Emily L. Webb[2], Comfort R. Phiri[3], Tobias Mweene[3], Namakau Chola[3], Govert J. van Dam[4], Paul L. A. M. Corstjens[5], Els Wessels[6], J. Russell Stothard[7], Richard Hayes[2], Helen Ayles[1,3], Isaiah Hansingo[8], Lisette van Lieshout[4], Amaya L. Bustinduy[1]

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PLOS NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Assessing the prevalence of Female Genital Schistosomiasis and comparing the acceptability and performance of health worker-collected and self-collected cervical-vaginal swabs using PCR testing among women in North-Western Tanzania: The ShWAB study

Tamara Ursini[1]*, Salvatore Scarso[1]*, Stella Mugassa[2], Jeffer Bhuko Othman[3], Amina Jumanne Yussuph[4], Edgar Ndaboine[4], Gladys Mbwanji[3], Cristina Mazzi[1], Martina Leonardi[1], Marco Prato[1], Elena Pomari[1], Humphrey Deogratias Mazigo[5], Francesca Tamarozzi[1]

S.h.

(urinary schistosomiasis, FGS, active urogenital schistosomiasis, microscopy, self-collected swab, self-collected swab + pre-amplification, operator-collected swab)

8.5% (95%CI 5.1–13.1) **urinary schistosomiasis** (eggs in urine)

4.7% (95%CI 2.3–8.5) **FGS** (at least one genital swab PCR positive)

10.0% (95% CI 6.3–14.8) **active urogenital schistosomiasis** (eggs in urine and/or FGS)

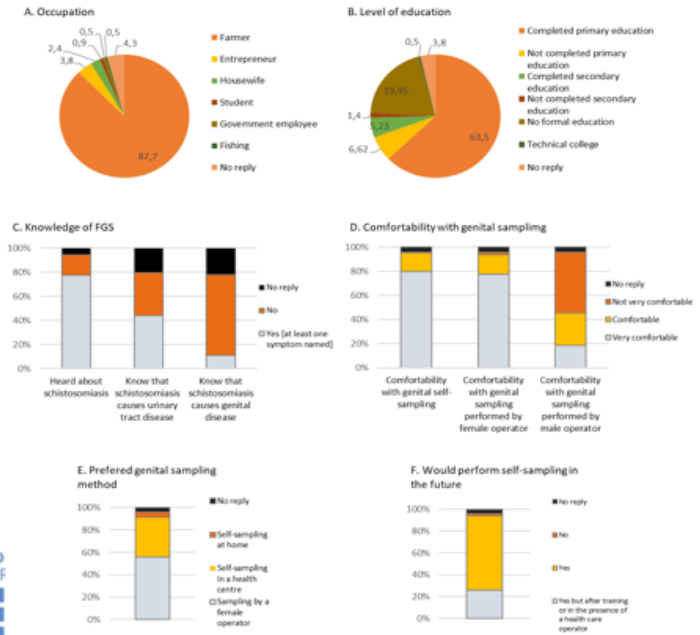
self-collected **SWAB**

operator-collected **SWAB**

After pre-amplification step →

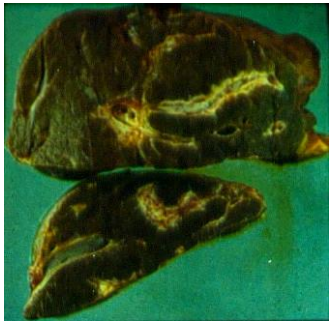
5.2% FGS

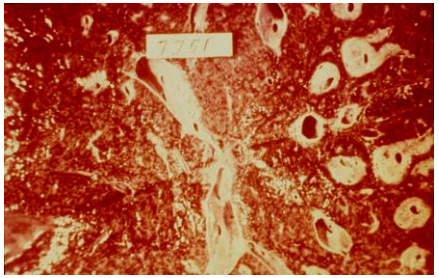
10.4% active urogenital schistosomiasis

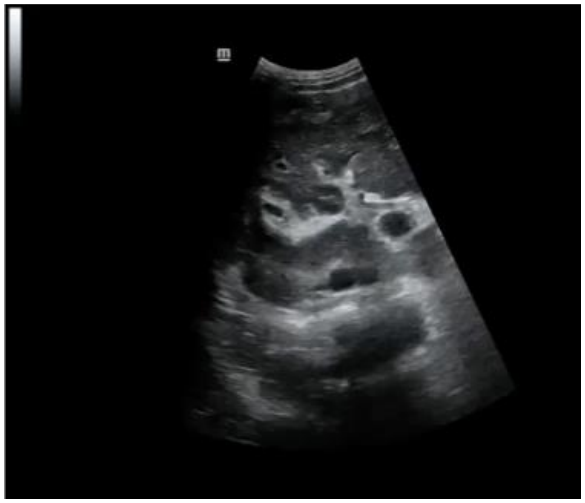


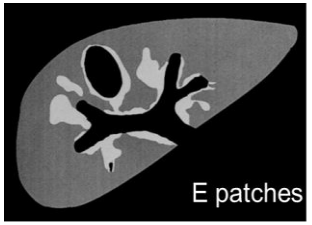
95,3% comfortable/very comfortable about self-sampling

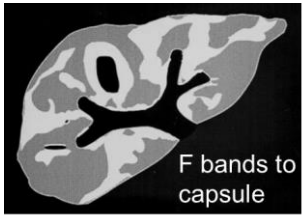
Morbosità



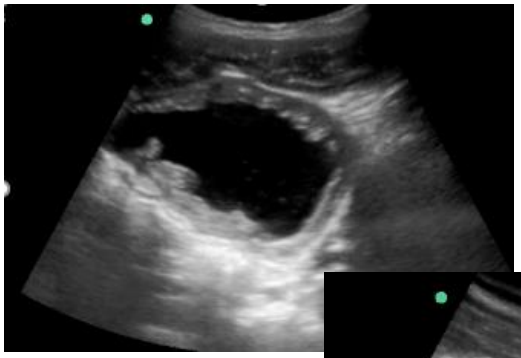


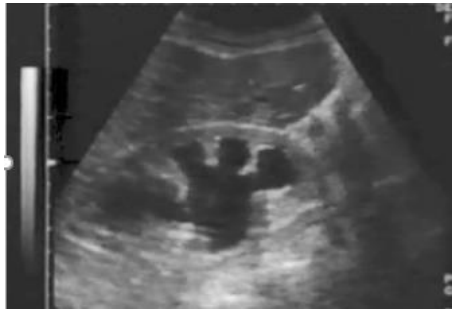


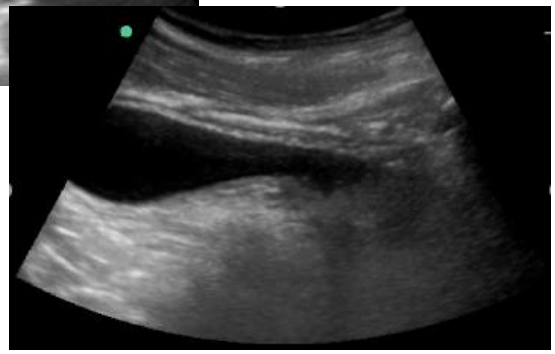




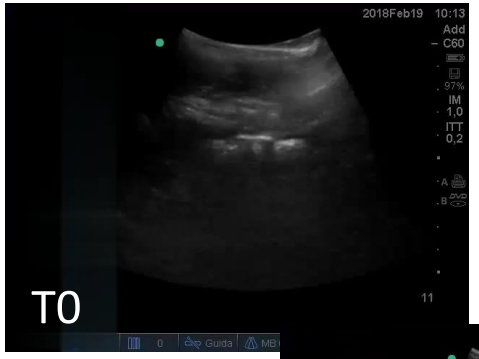
Schistosomiasi epatosplenica

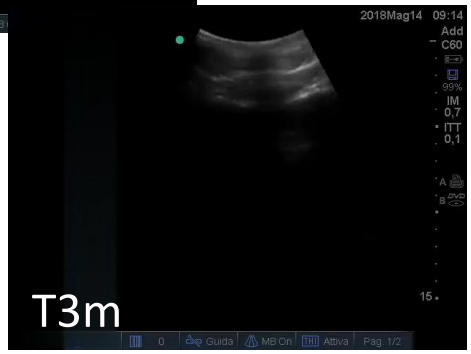






Schistosomiasi urinaria





F Tamarozzi, Negrar

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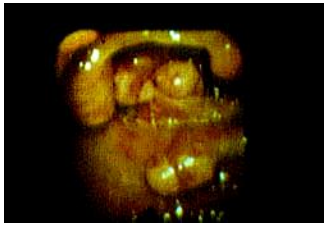
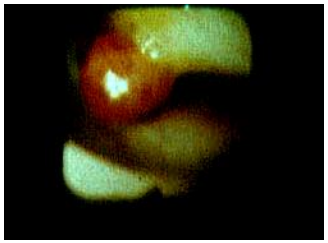
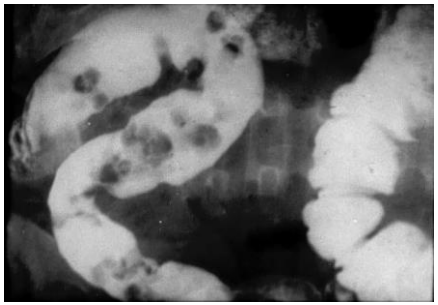
IRCCS



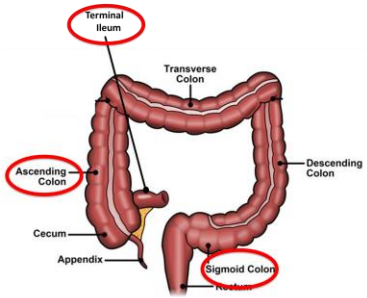


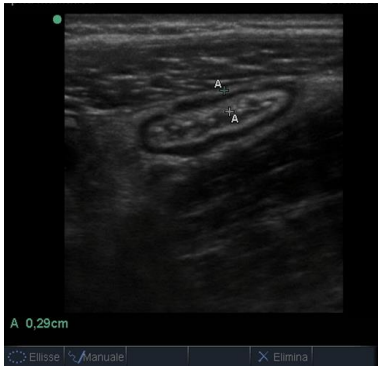
Ultrasound and intestinal lesions in *Schistosoma mansoni* infection: A case-control pilot study outside endemic areas

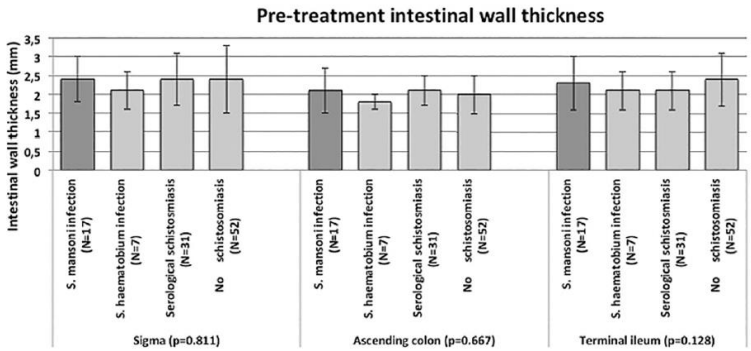
Francesca Tamarozzi[1]*, Dora Buonfrate[1], Geraldo Badona Monteiro[1], Joachim Richter[2], Federico Giovanni Gobbi[1], Zeno Bisoffi[1,3]

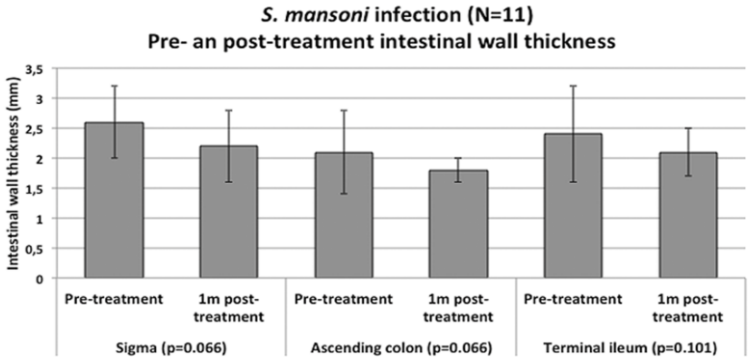


Courtesy J Richter, Berlin









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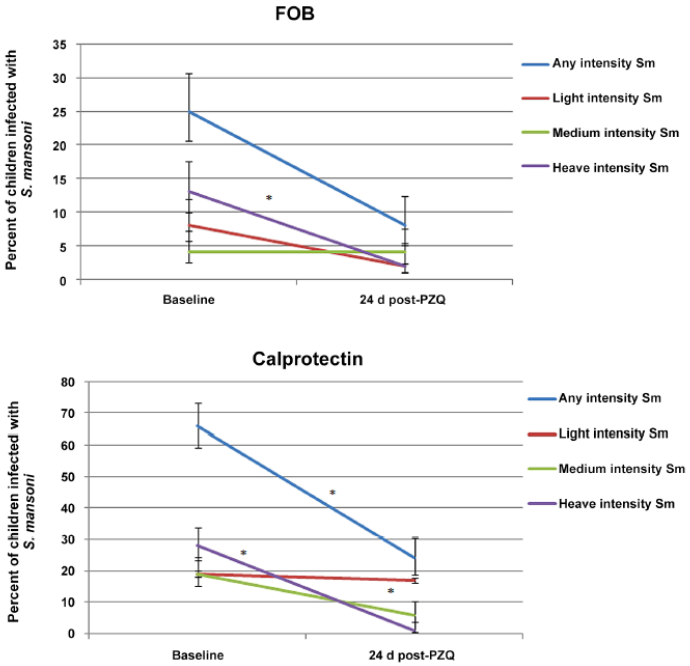
OPEN ACCESS Freely available online

PLOS | NEGLECTED TROPICAL DISEASES

Fecal Occult Blood and Fecal Calprotectin as Point-of-Care Markers of Intestinal Morbidity in Ugandan Children with *Schistosoma mansoni* Infection

Amaya L. Bustinduy[1]*, José C. Sousa-Figueiredo[1,2], Moses Adriko[3], Martha Betson[4], Alan Fenwick[5], Narcis Kabatereine[3], J. Russell Stothard[1]



- Calprotectina
- Fecal Occult Blood
- 216 bambini in Uganda

PLOS NEGLECTED TROPICAL DISEASES

REVIEW

Diagnosis and clinical management of hepatosplenic schistosomiasis: A scoping review of the literature

Francesca Tamarozzi[1]*, Veronica A. Fittipaldo[1], Hans Martin Orth[2], Joachim Richter[3], Dora Buonfrate[1], Niccolò Riccardi[1], Federico G. Gobbi[1]

- Agha et al 2010 (Sm)
  PLT/diametro splenico <855
  Se 100% Sp 92% per presenza varici esofagee

- Xu et al 2016 (Sj)
  PLT/diametro splenico < 1004
  Se 85% Sp 83% per presenza di varici esofagge

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I R C C S

ULTRASOUND IN SCHISTOSOMIASIS

A Practical Guide to the Standardized Use of Ultrasonography for the Assessment of Schistosomiasis-related Morbidity

Second International Workshop
October 22 - 26, 1996, Niamey, Niger

This report includes the views of an expert group, Satellite Symposium on Ultrasound Methodology in *Schistosoma mansoni* infection which met October 19-24, 1997, Belo Horizonte, Brazil

Editors: J. Richter, C. Hatz, G. Campagne, N. R. Bergquist, J. M. Jenkins

The WHO ultrasonography protocol for assessing hepatic morbidity due to *Schistosoma mansoni*. Acceptance and evolution over 12 years

Tarik el Scheich · Martha C. Holtfreter · Hendrik Ekamp · Daman D. Singh · Rodrigo Mota · Christoph Hatz · Joachim Richter

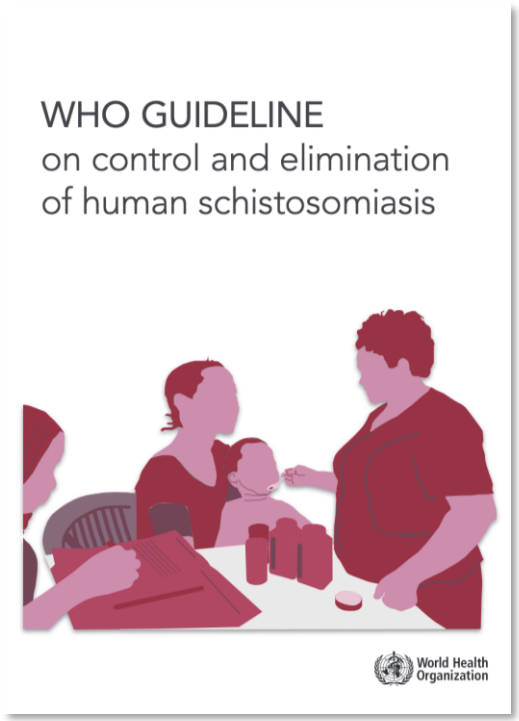
The WHO ultrasonography protocol for assessing morbidity due to *Schistosoma haematobium*. Acceptance and evolution over 14 years. Systematic review

Robert Akpata · Andreas Neumayr · Martha C. Holtfreter · Ingela Krantz · Daman D. Singh · Rodrigo Mota · Susanne Walter · Christoph Hatz · Joachim Richter

Ultrasound in Schistosomiasis

A practical guide to the standardized use of focused point-of-care ultrasonography for schistosomiasis-related pathology

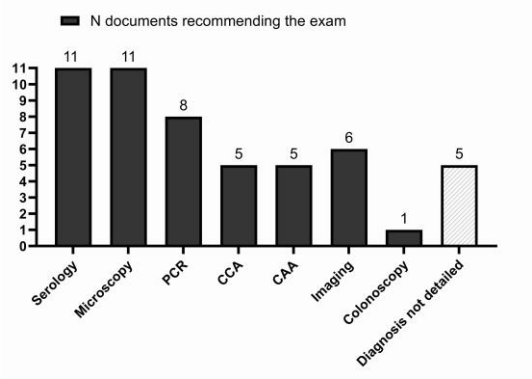
Definizione di caso



Travel Medicine and Infectious Disease

Landscape of guidance documents used at TropNet and GeoSentinel centres for the clinical management of schistosomiasis outside endemic areas: a systematic appraisal

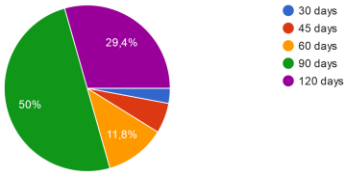
--Manuscript Draft--



SUBMITTED
CONFIDENTIAL

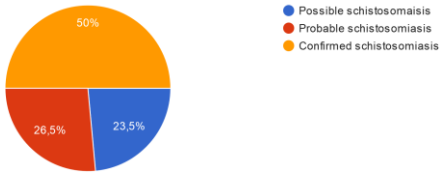
How long after being infected do you consider schistosomiasis to be chronic?

34 risposte



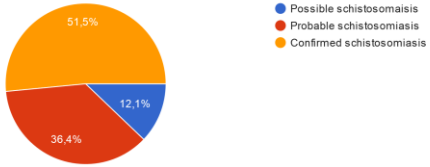
How do you define a migrant from Mali with positive ELISA serology only?

34 risposte

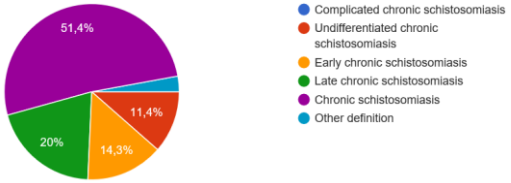


How do you define a migrant from Mali with positive urine CCA test in urine and negative ELISA serology ?

33 risposte



Type of chronic schistosomiasis



Sondaggio TropNet

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	Definitions	Criteria required	Agreement, N=19	Likert score
Confirmed acute schistosomiasis	Can be defined in a person with relevant epidemiological history (generally a traveller in an endemic area with no previous history of infection) and possible infective contact from 3 weeks to 3 months before, with or without* history of swimmer's itch or presence of symptoms or signs of Katayama syndrome, and with presence of eggs in biological material, positive PCR on biological material, positive CAA antigen test, or documented seroconversion	Epidemiological plus laboratory (ie, microscopy, PCR, CAA, or seroconversion)	84% (16)	5 (0)
Probable acute schistosomiasis	Can be defined in a person with relevant epidemiological history (generally a traveller in an endemic area with no previous history of infection) and possible infective contact 3 weeks to 3 months before, with or without* history of swimmer's itch or presence of signs or symptoms of Katayama syndrome and with: positive serology; or positive CCA test	Epidemiological plus clinical plus laboratory (serology or CCA)	With positive serology: 84% (16); with positive CCA test: 83% (15/18)	With positive serology: 5 (0); with positive CCA test: 5 (0)
Confirmed or probable acute schistosomiasis	Results of laboratory tests alone, as specified in acute schistosomiasis definitions, can define a diagnosis of probable and confirmed acute schistosomiasis even in the absence of a history of swimmer's itch or presence of symptoms or signs of Katayama syndrome, if there is absolutely no evidence of previous exposure	Epidemiology plus laboratory	79% (15)	5 (1)
Possible acute schistosomiasis	Can be defined in a person with relevant epidemiological history (generally a traveller in an endemic area with no previous history of infection) and possible infective contact 3 weeks to 3 months before, with signs or symptoms of Katayama syndrome, alone (ie, no laboratory test carried out or not positive)	Epidemiological plus clinical	79% (15)	5 (0)
Confirmed chronic schistosomiasis	Can be defined in a person with relevant epidemiological history, possible infection >3 months beforehand, no history of curative treatment† after possible infection, and presence of eggs in any biological material, positive PCR on any biological material, positive CAA antigen test, or documented seroconversion—independent of the presence of signs or symptoms	Epidemiological plus laboratory (microscopy, or PCR or CAA or seroconversion)	100% (19)	5 (0)
Probable chronic schistosomiasis	Can be defined in a person with relevant epidemiological history, possible infection >3 months beforehand, no history of curative treatment† after possible infection, and: the presence of compatible signs or symptoms and positive serology; the presence of evocative signs or symptoms and positive serology; the presence of compatible signs or symptoms and positive CCA; the presence of evocative signs or symptoms and positive CCA; or regression of reversible signs or symptoms after praziquantel treatment	Epidemiological plus clinical plus laboratory (ie, serology or CCA)	Presence of compatible signs and positive serology 84% (16); presence of evocative signs and positive serology 100% (19); presence of compatible signs and positive CCA 79% (15); presence of evocative signs and positive CCA 84% (16); regression of reversible signs after praziquantel treatment 84% (16)	Presence of compatible signs and positive serology 5 (1); presence of evocative signs and positive serology 5 (0); presence of compatible signs and positive CCA 5 (0); presence of evocative signs and positive CCA 5 (0); regression of reversible signs after praziquantel treatment 4·5 (1)
Possible chronic schistosomiasis	Can be defined in an asymptomatic person with relevant epidemiological history, possible infection >3 months beforehand, no history of curative treatment† after possible infection, and positive serology	Epidemiological plus laboratory (ie, serology)	79% (15)	5 (1)
Active schistosomiasis	Can be defined in a person with confirmed acute or chronic schistosomiasis and no history of curative treatment† with praziquantel (or long enough after treatment—where long enough depends on the test applied and the possibility of re-infection) and: presence of viable eggs; positive CAA test; or positive PCR on any biological materials.	Laboratory (microscopy for egg viability, CAA, or PCR)	Viable eggs 100% (19); positive CAA antigen test 84% (16); positive PCR on any biological materials 79% (15)	Viable eggs 5 (0); positive CAA antigen test 5 (0); positive PCR on any biological materials 5 (1)
Complicated schistosomiasis	Can be defined in a person with active acute or chronic infection: in all cases of symptomatic involvement of a non-typical‡ organ; or in case of organ involvement requiring interventions other than praziquantel (or corticosteroids, or both, in the case of acute schistosomiasis)	Clinical	All cases of symptomatic involvement of a non-typical organ 89% (17); in case of organ involvement requiring interventions other than praziquantel or corticosteroids 84% (16)	All cases of symptomatic involvement of a non-typical organ 5 (0·75); in case of organ involvement requiring interventions other than praziquantel or corticosteroids 5 (0)
Sequelae	In the absence of active acute or chronic schistosomiasis (ie, after parasitological cure), residual permanent organ alterations can be defined as sequelae	Clinical and laboratory (absence of criteria for active infection)	89% (17)	5 (0)
Complicated sequelae	Sequelae can also be complicated if requiring further interventions	Clinical and laboratory (absence of criteria for active infection)	95% (18)	5 (0)

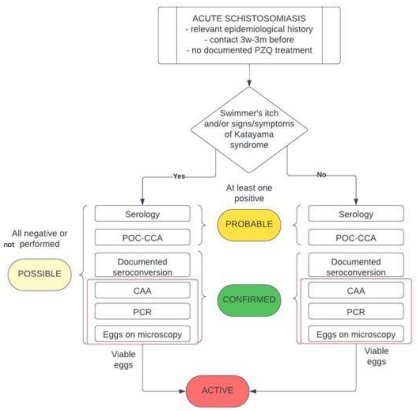
Data are % (n) or median (IQR). Within each definition, the way diagnostic or clinical items are listed does not reflect their prioritisation. Agreement percentage is shown as the number of replies showing agreement (scores 4 + 5 on the Likert scale) / total panel giving feedback on the statement. CAA=circulating anodic antigen. CCA=circulating cathodic antigen. *If there is absolutely no evidence of previous exposure. †No record of previous treatment with curative intent after last at-risk exposure. ‡Non-typical=involving organs different than gastrointestinal tract, liver, urogenital tract, or lung.

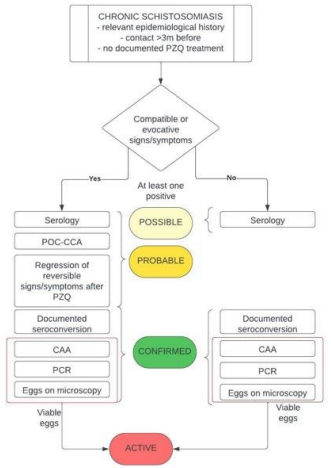
Table 3: Case definition as agreed by the panel of experts

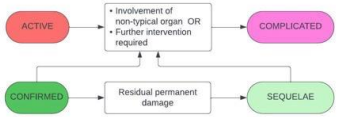
Review

Consensus definitions in imported human schistosomiasis: a GeoSentinel and TropNet Delphi study

Francesca Tamarozzi, Cristina Mazzi, Spinello Antinori, Marta Arsuaga, Sören L Becker, Emmanuel Bottieau, Daniel Camprubí-Ferrer, Eric Caumes, Alexandre Duvignaud, Martin P Grobusch, Stephane Jaureguiberry, Sabine Jordan, Andreas Mueller, Andreas Neumayr, Jose A Perez-Molina, Joaquin Salas-Coronas, Fernando Salvador, Lina R Tomasoni, Jaap J van Hellemond, Stephen D Vaughan, Linda J Wammes, Lorenzo Zammarchi, Dora Buonfrate, Ralph Huits, Lisette van Lieshout, Federico Gobbi







SACRO CUORE DON CALABRIA
I R C C S

Grazie per l’attenzione