Potential impact of the poultry red mite on health and welfare of companion and livestock animals

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Mammalian mites: The usual suspects

Rodent mites: Mouse (*Liponyssoides sanguineus*); rat (*Laelaps echidnina*; *Ornithonyssus bacoti*)

Sarcoptic mange: *Sarcoptes scabiei* (numerous var.)

Psoroptic mange: *Psoroptes equi*

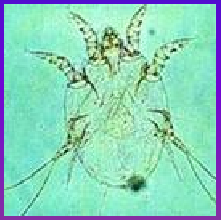
Chorioptic mange: *Chorioptes equi*

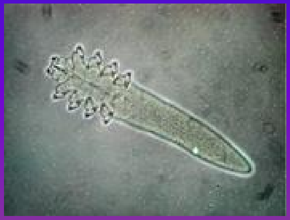
***Cheyletiella* spp:** Various spp on different hosts

Ear mites: *Otodectes cynotis*

Also: Chiggers, straw/harvest/*Demodex* mites





The not-so-usual suspects: bird mites

Probably familiar to most pigeon fanciers, poultry keepers and those with pet birds – esp. *Dermanyssus gallinae* (*Dg*)

Infests over 30 species of wild birds. Roy L, Chauve CM. 2007. Historical review of the genus Dermanyssus Duges, 1834 (Acari: Mesostigmata: Dermanyssidae). Parasite 14: 87-100

Bird mites are not usually associated with other hosts, but do increasing reports of attacks on non-avian animals suggest that host range and pest significance may be under-estimated or expanding?

Genetic diversity may aid host expansion in *Dg*

Several lineages of *Dg* have been proposed, some more specialised than others, with lower specificity in *Dg* associated with hens (Roy et al 2009)

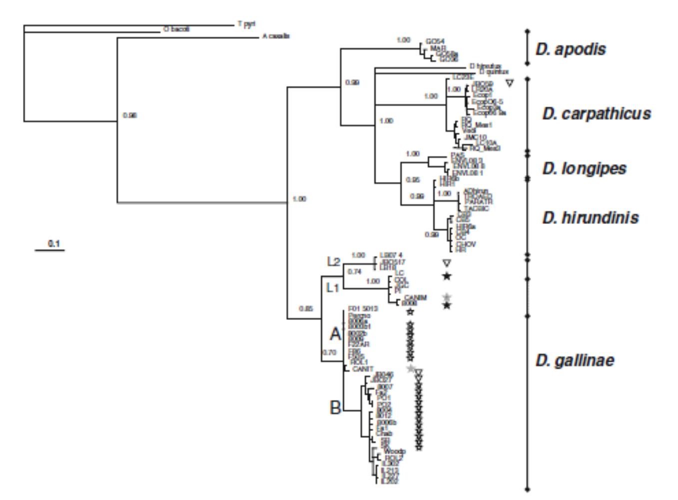


Fig. 3 Bayesian analysis. MrBayes v3.1.2, GTR + Γ+i model of evolution for 5×10^6 generations. Numbers at nodes refer to Bayesian Posterior Probabilities. Additional symbols indicate the type of anthropogenic ecosystem: "★" pigeons breeding facilities, "★" canary breeding facilities, "☆" layer hen or chicken houses, "▽" apple/pear orchards. Populations without any of these symbols have been collected in natura. Two lineages discussed in text are labeled L1 and L2. One clade discussed in text is labeled B. Group A corresponds to clade A in Fig. 2, and groups together populations sharing the same haplotype

Dg also more likely to accept novel avian hosts than other spp of *Dermanyssus*

Dg readily switched between bird spp, but *D. longipes* could not. *D. carpathicus* was able to switch, but only after high initial losses not seen with *Dg* (Roy et al 2009)

Host expansion seen in insect pests…

***Plutella xylostella*:**

A ‘specialist’ pest of cruciferous crops
1999: Found on Kenyan sugar snap and snow peas causing heavy crop losses (Löhr 2001)

Also reported in protozoan parasites…

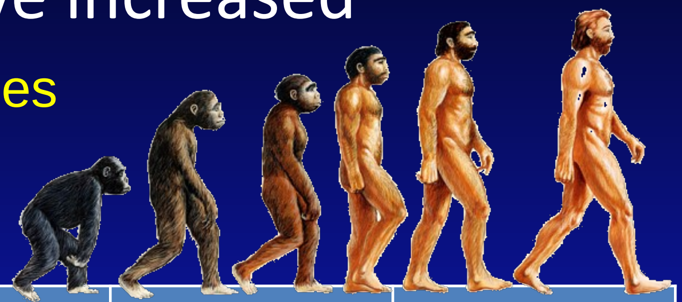
***Plasmodium falciparum*:**

Virulence as a malarial parasite may be the result of host-switching from birds to humans (Waters et al 1991)

Evidence of host expansion in *Dg*?

Reports of attacks on humans have increased

Cases of human attack by avian mite species documented in the scientific literature from 1936 to 2012 (George et al., in prep)



Mite species	Details	1936-1961	1962-1987	1988-2012
***Dermanyssus gallinae*/spp**	Residential	3	3	9
	Hospitals	-	5	1
	Office spaces	-	-	1
	Occupational	-	-	3
***Ornithonyssus sylviarum*/spp**	Residential	1	3	7
	Hospitals	-	1	-
	Occupational	-	-	1
Avian mite complex	Residential	3	-	2

BUT: Attacks mostly aventitious feeding only

Evidence of host expansion in *Dg* or just advantitious feeding?

Cats and dogs: "*Dg* will feed on cage birds, dogs, cats and man." Grant 1989 (see also Ramsay et al 1975, re: dogs)

Horses: "…dermatitis associated with the poultry mite in a horse… that was in contact with domestic hens." Mignon & Losson 2008

Goats: Detected during skin sampling for mange mites. Dorny et al 1994

Rabbits and rodents: Under experimental conditions [*Dg*] fed readily upon mice and rabbits… Sikes & Chamberlain 1954

Skin, rather than blood, seems to be limiting step for *Dg*

"*Dermanyssus gallinae* engorged *in vitro* on the blood of quail, chickens, sheep, calves, pigs, and rabbits but the mites fed satisfactorily only through the skin of birds." Kirkwood 1971

Advantitious feeding on mammals suggests this can be overcome

Published reports suggest that mammalian infestations may even be persistent. Pampiglione et al 2001 (9 months)

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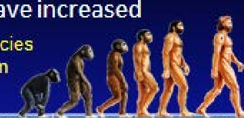

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BUT: Attacks mostly aventitious feeding only

Could differential diagnoses be masking a bigger issue?

Mites may be hard to find 'on-host' and presentation is as for other parasitoses, including that caused by the 'usual suspects'

Misdiagnosis is suspected as presenting a similar problem for the medical profession

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926

IMAGING IN TROPICAL DERMATOLOGY

Gamasoidosis illustrated - From the nest to dermoscopy *

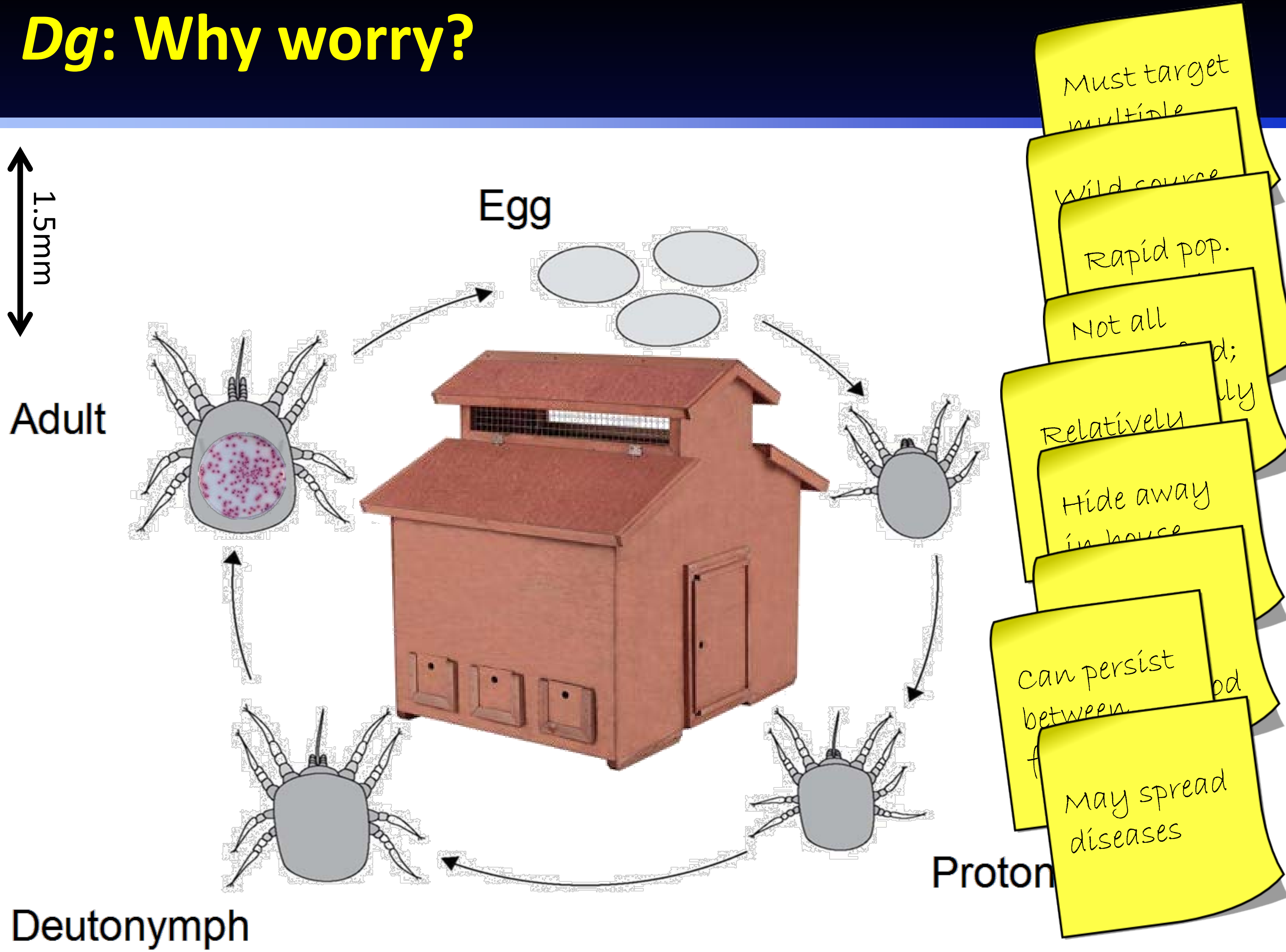
Gamasoidose ilustrada - Do ninho à dermatoscopia

Carlos Gustavo Wambier[1] Sarah Perillo de Farias Wambier[2]

Abstract: Gamasoidosis (acariasis, avian-mite dermatitis or bird-mite dermatitis) is a challenging diagnosis that is becoming more common because of the frequent use of window air conditioners in tropical countries. These devices may serve as shelters for nests of urban birds such as pigeons. Dermatologists should become familiar with this infestation to establish the correct diagnosis and treatment.
Keywords: Ectoparasitic infestations; Mite infestations; Mites

Resumo: Gamasoidose (acaríase, infestação por "piolhinho-de-pombo" ou dermatite por ácaros aviários) é um diagnóstico desafiador que está se tornando mais comum devido ao uso frequente de aparelhos de ar-condicionado de janela em países tropicais, que servem de abrigo para ninhos de pássaros urbanos tais como pombos. Dermatologistas devem se familiarizar com esta infestação para fazerem diagnóstico e tratamento adequados.
Palavras-chave: Ácaros; Ectoparasitoses; Infestações por ácaros

Dg: Why worry?


1.5mm
Egg
Adult
Deutonymph
Proton
Must target
Rapid pop.
Not all
Relatively
Hide away
Can persist
May spread
diseases

Bacterial and viral pathogens associated with *Dg*. Data obtained from review (R) or experimentation (E) by Valiente Moro *et al* 2009

	PATHOGEN	DETAILS
Bacteria	Salmonella gallinarum (R)	Isolated from mites
	Salmonella enteritidis (R)	Transmission demonstrated
	Pasteurella multocida (R)	Transmission demonstrated
	Erysipelothrix rhusiopathiae (R)	Isolated from mites
	Listeria monocytogenes (R)	Isolated from mites
	Coxiella burnetii (R)	Transmission demonstrated
	Escherichia coli (E)	Isolated from mites
	Staphylococcus spp. (E)	Isolated from mites
	Streptomyces spp. (E)	Isolated from mites
	Spirochetes (R)	Transmission demonstrated
Viruses	Newcastle disease (R)	Isolated from mites
	Fowl poxvirus (R)	Transmission demonstrated
	St. Louis encephalitis (R)	Transmission not demonstrated
	Tick borne encephalitis (R)	Transmission not demonstrated
	Eastern equine encephalitis (R)	Transmission demonstrated
	Western equine encephalitis (R)	Transmission demonstrated
	Venezuelan equine encephalitis (R)	Transmission demonstrated

Increasing threat to man may extend to mammalian hosts *per se*

Question	Criteria	Response	N
Has infestation been confirmed?	Confirmation required by a third party (healthcare professional, PCO or entomologist)	69% of respondents confirmed infestation	13
Duration of infestation	From onset of symptoms to present day (if on-going) or point of successful treatment	Average duration of infestation = 39 months (± 14.6 months SE)	13
Number of conflicting diagnoses	Diagnosis of condition other than gamasoidosis by a healthcare professional or PCO	Average number of conflicting diagnoses = 2.8 (± 0.3 SE)	12*
Treatments recommended and attempted	Only treatments prescribed by a healthcare professional or PCO	Pyrethroids (topical and premise) = 72%; DE = 27%; ivermectin = 27% IGR = 27%; esfenvalerate = 9%; cedar = 9%	11**
Treatment failure observed	Persistent symptoms post-treatment	100% of respondents reported treatment failure	12***
Suspected secondary health issues	Conditions arising post-infestation	Lyme confirmed in 3 respondents and suspected in 1 respondent Bartonella confirmed in 3 respondents and suspected in 1 respondent Babesia confirmed in 1 respondent General morbidity reported in most respondents	13

*info. not extractable from 1 respondent.
**Treatment type unknown in 1 respondent; treatment not yet attempted in 1 respondent.
***Treatment not yet attempted in 1 respondent. SE = standard error

Disease threat perhaps of most concern?

Gamasoidosis has been linked to transmission of spirochetes, rickettsiae, Salmonellae, Bartonellae, Pasteurellae, Sporozoa, hemogregarines, flagellates, and filariae (Litwin, 1961)

More recent evidence supports acquisition of *Bartonella* via *Dermanyssus* (Melter et al 2012)

Unpublished survey of an internet group also suggest transmission of Lyme Disease, *Bartonella* and *Babesia*

This is an issue even if host-switching is unlikely and mammalian attacks are adventitious feeding only

Control of non-avian outbreaks

Method	Examples	Pros	Cons
Synthetic acaricides	Pyrethroids; OPs; ivermectin	Widely available	Non-target toxicity; resistance
Available biocides	Spinosad	Widely available; good safety data	Variable efficacy; expense; likelihood of prescription
Vaccination	NA	Preventative; efficacy	Not currently available for *Dg*; cost:benefit low in non-poultry
Silicas	DEs	Widely available	Variable efficacy; silicosis
PBAs	Essential oils; terpenes	Fumigant toxicity; multiple target sites	Non target toxicity (esp. cats); variable efficacy of whole oils
Detergents	Poultry Shield	Widely available; good safety data	Limited efficacy; repeat treatment

Our lab is currently focusing on novel natural products as well as terpenes and combining detergents and PBAs

Summary

RISK	**Likelihood of harm**		
Severity of harm	**High**	**Medium**	**Low**
Severe	High	High	**Medium**
Moderate	High	Medium	Med/low
Minor	Med/low	Low	Low

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