

CAMBRIDGE

JOURNALS

# Animal Health Research Reviews

Published in collaboration with the Conference of Research  
Workers in Animal Diseases

## Editor-in-Chief

C. Gyles, *University of Guelph, Canada*

*Animal Health Research Reviews* provides an international forum for the publication of reviews and commentaries on all aspects of animal health. Papers include in-depth analyses and broader overviews of all facets of health and science in both domestic and wild animals. Major subject areas include physiology and pharmacology, parasitology, bacteriology, food and environmental safety, epidemiology and virology. The journal will be of interest to researchers involved in animal health, parasitologists, food safety experts and academics interested in all aspects of animal production and welfare.

---

**For free online content visit:**  
<http://journals.cambridge.org/ahrsample>

## Free email alerts

Keep up-to-date with new content

<http://journals.cambridge.org/ahr-alerts>



***Animal Health Research Reviews***  
is available online at:  
<http://journals.cambridge.org/ahr>

## To subscribe contact Customer Services

### Americas:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

### Rest of world:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email [journals@cambridge.org](mailto:journals@cambridge.org)

## Price Information

is available at:

<http://journals.cambridge.org/ahr>



CAMBRIDGE  
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

# Journal of Dairy Research

Published for the Institute of Food Research and the Hannah Research Institute

## Executive Editors

D. G. Chamberlain, *Hannah Research Institute, UK*

E. C. Needs, *Hannah Research Institute, UK*

*Journal of Dairy Research* publishes original scientific research on all aspects of mammary biology and dairy science including: the physiology, biochemistry, cell biology and endocrinology of lactation; animal husbandry, milk production, composition, preservation, processing and separation; biotechnology and food science; properties of milk proteins and other components; dairy products such as cheese, fermented milks and spreads; relevant studies in bacteriology, enzymology and immunology, the use of milk products in other foods; and the development of methods relevant to these subjects.

---

## Price information

is available at: <http://journals.cambridge.org/dar>

## Free email alerts

Keep up-to-date with new material – sign up at <http://journals.cambridge.org/dar-alerts>



## Journal of Dairy Research

is available online at:

<http://journals.cambridge.org/dar>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)



CAMBRIDGE  
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

# Epidemiology and Infection

## Editor-in-Chief

Norman Noah, London School of Hygiene and Tropical Medicine, UK

*Epidemiology and Infection* publishes original reports and reviews on all aspects of infection in humans and animals. Particular emphasis is given to the epidemiology, prevention and control of infectious diseases. The field covered is broad and includes the zoonoses, tropical infections, food hygiene, vaccine studies, statistics and the clinical, social and public health aspects of infectious disease. Papers covering microbiology and immunology, which have an epidemiological relevance, are part of this broad field. Papers come from medical and veterinary scientists worldwide. It has become the key periodical in which to find the latest reports on recently discovered infections and new technology. For those concerned with policy and planning for the control of infections, the papers on mathematical modelling of epidemics caused by historical, current and emergent infections, will be of particular value.

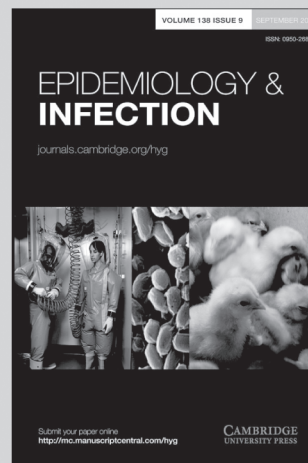
## Price information

is available at: <http://journals.cambridge.org/hyg>

## Free email alerts

Keep up-to-date with new material – sign up at  
<http://journals.cambridge.org/alerts>

For free online content visit:  
<http://journals.cambridge.org/hyg>



## *Epidemiology and Infection*

is available online at:  
<http://journals.cambridge.org/hyg>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070  
Fax +44 (0)1223 325150  
Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500  
Fax +1 (845) 353 4141  
Email  
[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)



CAMBRIDGE  
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

# Journal of Helminthology

## Editor

John Lewis, Royal Holloway, University of London, UK

*Journal of Helminthology* publishes original papers and review articles on all aspects of pure and applied helminthology, particularly those helminth parasites of environmental health, medical or veterinary importance. Research papers on helminths in wildlife hosts, including plant and insect parasites, are also published along with taxonomic papers contributing to the systematics of a group. The journal will be of interest to academics and researchers involved in the fields of human and veterinary parasitology, public health, microbiology, ecology, epidemiology and biochemistry.

## Price information

is available at: <http://journals.cambridge.org/jhl>

## Free email alerts

Keep up-to-date with new material – sign up at  
<http://journals.cambridge.org/jhl-alerts>



*Journal of Helminthology*  
is available online at:  
<http://journals.cambridge.org/jhl>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

For free online content visit:  
<http://journals.cambridge.org/jhl>



CAMBRIDGE  
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

# The Lichenologist

Published on behalf of The British Lichen Society

## Senior Editor

Peter D. Crittenden, University of Nottingham, UK

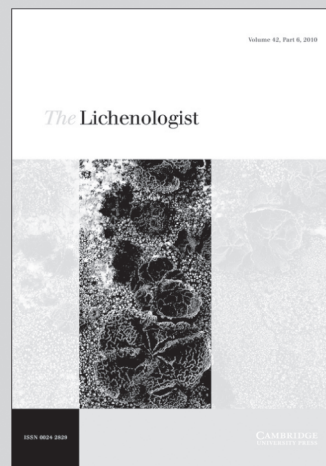
*The Lichenologist* is the premier scientific journal devoted exclusively to the study of lichens worldwide. As the leading forum for the dissemination of new concepts and topical reviews, *The Lichenologist* reaches more scientists concerned with the study of lichens and lichen symbionts than any other single journal. All aspects of lichenology are considered including systematics and phylogenetics; molecular biology; ultrastructure, anatomy and morphology; secondary chemistry, effects of pollutants and use as bioindicators; biogeography.

## Price information

is available at: <http://journals.cambridge.org/lic>

## Free email alerts

Keep up-to-date with new material – sign up at  
<http://journals.cambridge.org/lic-alerts>



## *The Lichenologist*

is available online at:  
<http://journals.cambridge.org/lic>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070  
Fax +44 (0)1223 325150  
Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500  
Fax +1 (845) 353 4141  
Email  
[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

For free online content visit:  
<http://journals.cambridge.org/lic>



CAMBRIDGE  
UNIVERSITY PRESS



CAMBRIDGE

JOURNALS

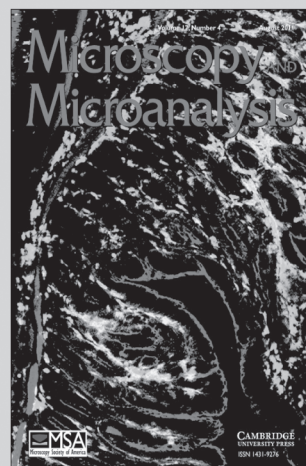
# Microscopy and Microanalysis

Published for the Microscopy Society of America

## Editor

Robert L. Price, *University of South Carolina, USA*

*Microscopy and Microanalysis*, a peer-reviewed bi-monthly, publishes original research papers in the fields of microscopy, imaging, and compositional analysis. This distinguished international forum is intended for microscopists in both biology and materials science. The journal provides significant articles that describe new and existing techniques and instrumentation, as well as the applications of these to the imaging and analysis of microstructure. *Microscopy and Microanalysis* also includes review articles, short communications, letters to the editor, and book reviews.



**Microscopy and Microanalysis**  
is available online at:  
<http://journals.cambridge.org/mam>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

## Free email alerts

Keep up-to-date with new  
material – sign up at

[journals.cambridge.org/register](http://journals.cambridge.org/register)

For free online content visit:  
<http://journals.cambridge.org/mam>



**CAMBRIDGE**  
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

# Journal of Tropical Ecology

## Editor

Ian Turner, Winchelsea, UK

*Journal of Tropical Ecology* publishes papers in the important and now established field of the ecology of tropical regions, either arising from original research (experimental or descriptive) or forming significant reviews. First published in 1985, *Journal of Tropical Ecology* has become a major international ecological journal. With clear, stimulating and readable reports of recent research findings, the journal provides a platform for the dissemination of information on all aspects of tropical communities and ecosystems

---

## Price information

is available at: <http://journals.cambridge.org/tro>

## Free email alerts

Keep up-to-date with new material – sign up at  
<http://journals.cambridge.org/tro-alerts>



*Journal of Tropical Ecology*  
is available online at:  
<http://journals.cambridge.org/tro>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070  
Fax +44 (0)1223 325150  
Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500  
Fax +1 (845) 353 4141  
Email  
[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

For free online content visit:  
<http://journals.cambridge.org/tro>



CAMBRIDGE  
UNIVERSITY PRESS

## Parasitology

**Back volumes.** Vols. 1–71: Inquiries should be addressed to Wm. Dawson & Sons Ltd, Cannon House, Folkestone, Kent. Vols. 72 onwards: quotations for parts still in print may be obtained from Cambridge or the American Branch of Cambridge University Press.

**Copying.** This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA. Organizations in the USA who are also registered with C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per-copy fee of \$16.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0031–1820/2012 \$16.00.

Organizations authorized by the Copyright Licensing Agency may also copy material subject to the usual conditions.

**ISI Tear Sheet Service.** 3501 Market Street, Philadelphia, Pennsylvania 19104, USA, is authorized to supply single copies of separate articles for private use only.

**For all other use,** permission should be sought from Cambridge or the American Branch of Cambridge University Press.

**Claims** for missing issues can only be considered if made immediately after receipt of the subsequent issue.

**Advertising.** Details of advertising in Parasitology may be obtained from the publisher.

**Online submission.** Authors are encouraged to submit their manuscripts online. Go to <http://mc.manuscriptcentral.com/par/> to open an author's account for Parasitology. Manuscript Central is helping to improve the speed of the publication process for the journal.

**Front Cover illustration:** Red-stained *Toxoplasma gondii* tachyzoites in the lamina propria of mouse ileum (left) and at higher power in a villus (right). (Photography by Dr El Bissati.) From Dubey *et al.* Vol. 139 (1) pp. 1–13.

© Cambridge University Press 2012

The Edinburgh Building, Cambridge CB2 8RU, United Kingdom  
32 Avenue of The Americas, New York, NY 10013-2473, USA  
477 Williamstown Road, Port Melbourne, VIC 3207, Australia  
C/ Orense, 4, Planta 13 28020 Madrid, Spain  
Lower Ground Floor, Nautica Building, The Water Club, Beach Road,  
Granger Bay, 8005 Cape Town, South Africa

*Printed in the United Kingdom at the University Press, Cambridge*



# PARASITOLOGY

## CONTENTS

### REVIEW ARTICLES

***Toxoplasma gondii* infection in pregnant women in China**

X.-J. Gao, Z.-J. Zhao, Z.-H. He, T. Wang, T.-B. Yang, X.-G. Chen, J.-L. Shen, Y. Wang, F.-L. Lv, G. Hide and Z.-R. Lun

139

**An assessment of the use of drug and non-drug interventions in the treatment of *Ichthyophthirius multifiliis* Fouquet, 1876, a protozoan parasite of freshwater fish**

S. M. Picón-Camacho, M. Marcos-Lopez, J. E. Bron and A. P. Shinn

149

### RESEARCH ARTICLES

***In vitro* and *in vivo* behaviour of sympatric *Leishmania (V.) braziliensis*, *L. (V.) peruviana* and their hybrids**

Sofia Cortes, Carina Esteves, Isabel Maurício, Carla Maia, José Manuel Cristovão, Michael Miles and Lenea Campino

191

***Leishmania (Viannia) braziliensis*: insights on subcellular distribution and biochemical properties of heparin-binding proteins**

Luzia Monteiro De Castro Côrtes, Mirian Claudia De Souza Pereira, Francisco Odéncio Rodrigues De Oliveira Junior, Suzana Corte-Real, Franklin Souza Da Silva, Bernardo Acácio Santini Pereira, Maria De Fátima Madeira, Marcia Terezinha Baroni De Moraes, Reginaldo Peçanha Brazil and Carlos Roberto Alves

200

**The adaptive potential of a survival artist: characterization of the *in vitro* interactions of *Toxoplasma gondii* tachyzoites with di-cationic compounds in human fibroblast cell cultures**

Christian Kropf, Karim Debache, Christoph Rampa, Fabienne Barna, Michelle Schorer, Chad E. Stephens, Mohamed A. Ismail, David W. Boykin and Andrew Hemphill

208

**Diversity and distribution of avian haematzoan parasites in the western Indian Ocean region: a molecular survey**

Farah Ishtiaq, Jon S. Beadell, Ben H. Warren and Robert C. Fleischer

221

**NTPDase activity in lymphocytes of rats infected by *Trypanosoma evansi***

Camila B. Oliveira, Aleksandro S. Da Silva, Viviane C. G. Souza, Marcio M. Costa, Jeandre A. S. Jaques, Daniela B.R Leal, Sonia T. A. Lopes and Silvia G. Monteiro

232

**Anticoccidial activity of herbal complex in broiler chickens challenged with *Eimeria tenella***

Muhammad A. Zaman, Zafar Iqbal, Rao Z. Abbas and Muhammad N. Khan

237

**Delayed tail loss during the invasion of mouse skin by cercariae of *Schistosoma japonicum***

Ting Wang, Zheng-Ming Fang, Jia-Hui Lei, Fei Guan, Wen-Qi Liu, Ann Bartlett, Phil Whitfield and Yong-Long Li

244

**Identification of field-caught *Culicoides* biting midges using matrix-assisted laser desorption/ionization time of flight mass spectrometry**

Christian Kaufmann, Francis Schaffner, Dominik Ziegler, Valentin Pflüger and Alexander Mathis

248

**Natural occurrence of lethal aspergillosis in the cattle tick *Rhipicephalus (Boophilus) microplus* (Acari: Ixodidae)**

E. Miranda-Miranda, R. Cossio-Bayugar, F. Martínez-Ibañez, R. Casasanero-Orduña and J. Folch-Mallol

259

**Adaptive timing of detachment in a tick parasitizing hole-nesting birds**

J. White, D. J. A. Heylen and E. Matthysen

264

**Phagocyte-specific S100 proteins in the local response to the *Echinococcus granulosus* larva**

Tatiana Basika, Natalia Muñoz, Cecilia Casaravilla, Florencia Irigoín, Carlos Batthyány, Mariana Bonilla, Gustavo Salinas, José Pedro Pacheco, Johanness Roth, Rosario Durán and Alvaro Díaz

271