

POULTRY SCIENCE JOURNAL

education
organization
research



www.wpsa.com

volume 67, june 2011 number 2



PUT THE BEST IN,
GET THE MOST OUT

WWW.NUTREX.BE

Nutrex is a research-driven company, specialized in development, production and marketing of additives for feed and food. It is our aim to engage in a sustainable partnership as your most reliable supplier of optimal solutions for better nutrition.

Nutrase Xyla

ENDO-1,4- β -XYLANASE

DESCRIPTION

- Unique bacterial endo-1,4- β -xylanase
- Break-down of both soluble and insoluble arabinoxylans increases nutrient availability
- Optimal activity at neutral pH ensures maximum duration of enzymatic activity
- Low sensitivity to xylanase inhibitors
- Highly stable during pelleting and digestion

EFFECTS

- Improves growth and FCR
- Promotes higher breast meat yield
- Ensures dry litter

BENEFITS

- One enzyme preparation for all species
- Proven economical return
- Effective in all rations containing arabinoxylans, including wheat-, corn-, barley-, sorghum-, rye- and cereal by-products



nutrex^{NV}
the finishing touch for nutrition

Achterstenhoek 5 • 2275 Lille • Belgium • Tel: +32 14 88 31 11 • sales@nutrex.be • www.nutrex.be

Reach the
summit of quality



with Shellbiotic

Trials have shown that with **Shellbiotic**® added to your feed your hens will produce better albumen quality resulting in stronger eggshells and healthier day-old chicks. Another innovation that keeps **Vitamex at the heart of feed.**

If you'd like to get more from your feed,
call +32 (0) 9 280 2900.

Or go to www.shellbiotic.com



shellbiotic



VIV Worldwide Calendar 2011 - 2014

VIV Turkey 2011

June 9 - 11, 2011
Istanbul, Turkey

VIV/Ildex India 2012

February 22 - 24, 2012
Bangalore, India

VIV China 2012

September 23 - 25, 2012
Beijing, China

FIGAP/VIV
América Latina 2012

October 17 - 19, 2012
Guadalajara, Mexico

VIV Asia 2013

March 13 - 15, 2013
Bangkok, Thailand

VIV Russia 2013

May 28 - 30, 2013
Moscow, Russia

VIV Europe 2014

May 20 - 23, 2014
Utrecht, the Netherlands

www.viv.net

WORLD'S
POULTRY SCIENCE
JOURNAL

Volume 67 June 2011 Number 2

203 **Editorial**

204 **Sponsorship**

Reviews

- 207 The gizzard: function, influence of diet structure and effects on nutrient availability
B. Svihus
- 225 Super-dosing effects of phytase in poultry and other monogastrics
A.J. Cowieson, P. Wilcock and M.R. Bedford
- 237 The importance of national chicken meat origin in Central and South-Eastern Europe
T. Vukasovič
- 243 Manipulating tissue metabolism by amino acids
S. Tesseraud, N. Everaert, S. Boussaid-Om Ezzine, A. Collin, S. Métayer-Coustard and C. Berri
- 253 Review: feed withdrawal and non feed withdrawal moult
D. Patwardhan and A. King
- 269 Consumer perception of poultry meat in Greece
A. Sismanoglou and I. Tzimitra-Kalogianni
- 277 L-carnitine and its functional effects in poultry nutrition
Sh. Golzar Adabi, R.G. Cooper, N. Ceylan and M. Corduk
- 297 Antioxidants and poultry semen quality
R.U. Khan
- 309 Broiler breeding strategies over the decades: an overview
A.K. Thiruvankadan, R. Prabakaran and S. Panneerselvam
- 337 Anticoccidial drug resistance in fowl coccidia: the state of play revisited
R.Z. Abbas, Z. Iqbal, D. Blake, M.N. Khan and M.K. Saleemi
- 351 International approaches to the welfare of meat chickens
A. Robins and C.J.C. Phillips

Summaries

370 Chinese, French, German, Russian, Spanish

World's Poultry Science Association

390 Information and Officers

395 **Constitution and By-Laws**

407 **Association News**

416 **Book Review**

417 **Erratum**

419 **Calendar**

422 **Education and Training**

424 **Notes for Contributors**

Editor

Dr L.A. Waldron (previously
Tucker)
LWT Animal Nutrition Ltd
PO Box 119, Feilding 4740
New Zealand
Phone: +64 6328 9026,
Mobile +64 21743374
Fax: +64 6328 9027
E-mail: lucy@animalnutrition.co.nz

Assistant Editor

Mrs D.M. Kleverwal
World's Poultry Science Association
PO Box 31, 7360 AA Beekbergen
The Netherlands
Phone: +31 570 541948
Fax: +31 207 508941
E-mail: wpsa@xs4all.nl

Associate Editors

Prof J.A. Castelló, Spain
Dr S. Cherepanov, Russia
Prof D.K. Flock, Germany
Dr D. Grastilleur, France
Prof N. Yang, China

International Editorial Board

Prof W. Bessei, Germany
Prof I.J. H Duncan, Canada
Prof D.J. Farrell, Australia
Prof R.M. Gous, South Africa
Dr. E.F. Guéye, Mali
Prof P. Horn, Hungary
Dr P. Hunton, Canada

Dr M. Lilburn, USA
Dr R.W.A.W. Mulder, Netherlands
Dr D. Narahari, India
Prof. Y. Nys, France
Prof Jun-ichi Okumura, Japan
Prof H. Pingel, Germany
Dr R.A.E. Pym, Australia

Prof J.R. Roberts, Australia
Prof G.D. Rosen, UK
Prof P.J. Sharp, UK
Prof P.B. Siegel, USA
Prof S.E. Solomon, France
Dr M. Tixier-Boichard, France
Prof S. Yahav, Israel

The **World's Poultry Science Journal** is published in March, June, September and December by the World's Poultry Science Association. The Secretary of the Association is Dr Roel W.A.W. Mulder, PO Box 31, 7360 AA Beekbergen, The Netherlands (phone: +31 6 51519584, fax: +31 55 506 4858, e-mail: roel.mulder@wpsa.com, website: www.wpsa.com).

Disclaimer: The Editors of the World's Poultry Science Journal take all reasonable steps to ensure the accuracy of material published. However, all statements, conclusions and opinions expressed in it are those of the authors and contributors; the Editors, Associate Editors, Members of the Editorial Board and the Publishers accept no responsibility or liability for them.

2011 subscription rates: £174/\$312 for organisational online & print; £134/\$248 for organisational online only; £90/\$164 for individuals online & print; £79/\$142 for individuals online only.

Subscription enquiries and orders: Orders, which must be accompanied by payment, may be sent to a bookseller, subscription agent or to the Publisher: Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK; or in the USA, Canada and Mexico: Cambridge University Press, Journals Fulfillment Department, 100 Brook Hill Drive, West Nyack, New York 10994-2133. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country rate. VAT registered subscribers should provide their VAT registration number. Japanese prices for institutions are available from: Kinokuniya Company Ltd, PO Box 55, Chitose, Tokyo 156, Japan.

Periodicals postage pending at New York, NY, and at additional mailing offices. Postmaster: send address changes in USA, Canada and Mexico to: World's Poultry Science Journal, Cambridge University Press, 100 Brook Hill Drive, West Nyack, New York 10994-2133. Claims for missing issues should be made immediately on receipt of the subsequent issue.

Back issues: Dr Roel Mulder, PO Box 31, 7360 AA Beekbergen, The Netherlands.

Advertising enquiries: Dr Roel Mulder, PO Box 31, 7360 AA Beekbergen, The Netherlands (phone: +31 6 51519584, fax: +31 55 506 4858, e-mail: roel.mulder@wpsa.com).

Copyright: All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, optical, mechanical, photocopying, recording or otherwise without the written permission of the copyright holder. © World's Poultry Science Association.

Reprints and Photocopying: Readers who require multiple copies of papers published in this journal may either purchase reprints (minimum order 100) or obtain permission to copy from the Editor. However, permission is granted for the making of single copies of articles for internal or personal use. In North America, this permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center Inc. (CCC) to make single copies of any article herein for the flat fee of \$3 per article. Payment should be sent directly to CCC, 2 Congress Street, Salem, MA 01970, USA. The item-free Code for this publication indicates that authorization is to make single copies only for internal or personal use. Serial-free Code: ISSN 0043-9449, \$3. In the UK, the Copyright Licensing Agency (CLA), 90 Tottenham Court Road, London W1P 9HE is mandated to grant permission to make single copies.