WORLD'S POULTRY SCIENCE JOURNAL

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 Ir Piet C.M. Simons, Centre for Applied Poultry Research, "Het Spelderholt", Postbus 31, 7360 AA Beekbergen, The Netherlands (Tel: +31 55 506 65 34 or Fax: +31 55 506 48 58).

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.

Production and distribution: Acting as agents of the **World's Poultry Science Association**, the Journal is printed and distributed by Koninklijke drukkerij G. J. Thieme, P.O. Box 30, 6500 AA Nijmegen, The Netherlands. **Contact:** Mr Henk Terwal. Telephone: +31 24 37 21 748. Telefax: +31 24 37 21 700.

Composition and layout: Genesis Typesetting, Laser Quay, Culpeper Close, Medway City Estate, Rochester, Kent ME2 4HU, UK. Telephone: +44 (0)1634 720011. Telefax: +44 (0)1634 720016.

Address for submissions and all editorial correspondence: D. G. Martin, Dundry Lodge, France Lynch, Stroud, Gloucestershire GL6 8LP, UK. Telephone: +44 (0)1453 886063. Telefax: +44 (0)1453 731214. E-mail: martin@franlyn.fsnet.co.uk.

Annual Subscription (4 issues): US\$130.00.

Subscription enquiries and orders: Linda Orsted, WATT Publishing Co., 122 S. Wesley Avenue, Mount Morris, ILLINOIS 61054-1497, USA. Telephone: +18157344171. Telefax: +18157344201. E-mail: orstedla@wattmm.com. Please state clearly the title of the journal and the year of the subscription.

Back issues: Dr Ir Piet C.M. Simons, Centre for Applied Poultry Research, "Het Spelderholt", Postbus 31, 7360 AA Beekbergen, The Netherlands.

Advertising enquiries (USA): Dr Charles Olentine, WATT Publishing Co., 122 S. Wesley Avenue, Mount Morris, ILLINOIS 61054-1497, USA. Telephone: +1 815 734 4171. Telefax: +1 815 734 4201. (Europe and the rest of the world): WATT Publishing Co., Regulierenring 2-C, P.O. Box 176, 3980 CD Bunnik, The Netherlands. Telephone: +31 3405 70944. Telefax: +31 3405 70452.

Change of address: Please notify the Secretary of the Association of any change of address for receipt of the journal.

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-fee Code for this publication indicates that authorization is to make single copies only for internal or personal use. Serial-fee Code: ISSN 0043-9339, \$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.

Notes for Contributors

The World's Poultry Science Journal publishes: review articles on all aspects of poultry science, reports on the development of poultry production from around the world, reports from constituent scientific working groups, book reviews, Association and Branch news, together with a listing of forthcoming events. Summaries of the review articles are published in French, German, Russian and Spanish. The journal does not publish the results of original research unless these form a minor part of an article that mainly reviews published work, or where they are contained in reports given at branch meetings or arise from the activities of Federation Working Groups. Among the characteristics considered important in a review paper are that it should be comprehensive within the area defined by its title, the structure should be logical and the citations should be subjected to critical appraisal - which should extend to the methodology and statistical significance of results. In preparing a review, sound deductive and constructive processes should be used to produce valid, useful and clearly presented conclusions. The appropriate use of figures, tables, formulae and illustrations is encouraged. The object must always be to produce a worthwhile addition to the body of available literature.

Typescripts

Typescripts should be in English and should be sent in duplicate, to the Editor, World's Poultry Science Journal, D. G. Martin, Dundry Lodge, France Lynch, Stroud, Gloucestershire GL6 8LP, UK. Contributions, which will be subject to scrutiny by independent referees and editorial revision, should normally not be longer than the equivalent of 8–10 pages of the journal (or approximately 6000 words) including tables, illustrations and references. Longer reviews are accepted from time to time, but it is advisable for authors to contact the Editor before submission. Papers should be typewritten on one side of the paper only and the typing should be double-spaced between lines with ample margins on each side of the sheet. The automatic numbering of lines in the margin is a great advantage. Pages should be assembled in the order: title; name and postal address(es) of author(s); where applicable, name and address of institution where the work was done; summary of between 100 and 300 words; keywords (up to 8); text of paper; references; tables; figures; figure legends (on separate page); abbreviated title (for use as a running headline). The pages of the paper itself should be numbered in the upper right-hand corner and should only be fastened by means of a paperclip. To enable summaries to be translated into French, German, Russian and Spanish, contributions should be accompanied by an additional copy of the summary (in English) of 100-300 words, typed on a separate sheet of paper.

References

References to previous work should be cited in the text with the author's name and the year of publication in parentheses, e.g. 'Brown (1957) showed that . . .'. At the end of the paper, the references should be listed in alphabetical order of the surnames of the first author with all authors included, e.g. 'BROWN, A.B., SMITH, C.D. and JACK, E.F. . . .'. The titles of journals should be given in full and should include the first and last page numbers of the papers concerned.

Tables, line drawings and photographs

Tables and line drawings should be typed or drawn on separate sheets and their approximate location in the text indicated in pencil; they should not be enclosed by lines. Tables should be typed with adequate spacing, keeping column headings as brief as possible, and they should include a self-explanatory legend. Line drawings should be clearly drawn in black on white paper. Computer produced figures must be from high quality printers, e.g. laser or bubble jet. Photographs of line drawings may be submitted. Black and white photographs (half-tones) submitted, preferably not smaller than 110mm × 150mm, should be glossy prints of good contrast and, where necessary, should carry a scale mark of magnification. Lettering may be placed on the print or on a tracing paper overlay, which should be fixed securely to the print along one edge only. Legends for line drawings and half-tones should be typed on a separate sheet. The author's name and figure number should be written on the back of each line drawing or photograph.

Footnotes

Footnotes should be avoided wherever possible. Where essential they should be indicated by asterisks (*), daggers (†) and double daggers (‡) in that order. In the manuscript, a footnote should be placed at the bottom of the page on which it is referred to and separated from the main text by a horizontal line above the footnote. Footnotes to tables should be placed underneath the table to which they refer.

Proofs

Page proofs will be supplied to the senior author, whose responsibility it is to liaise with co-authors in checking the proofs, but only errors in typesetting may be corrected at this stage. Additional matter or extensive alterations can be accepted only at the discretion of the Editor, and, if they are accepted, a charge may be made. Consequently, the author(s) should ensure that the paper is submitted in its final form. Proofs must be corrected and returned within 10 days of receipt.

Offprints

A total of 50 offprints will be sent free of charge to the senior author of each paper published. Additional offprints can be ordered at the prices shown on the offprint order form which will be sent with the proofs.

Submission of papers

Typescripts and matters relating to the content of the journal should be addressed to the Editor, D. G. Martin, Dundry Lodge, France Lynch, Stroud, Gloucestershire GL6 8LP, UK.

Back numbers

Requests for back numbers should be addressed to the Secretary of the World's Poultry Science Association, Dr Ir Piet C.M. Simons, Centre for Applied Poultry Research, "Het Spelderholt", Postbus 31, 7360 AA Beekbergen, The Netherlands (Tel. +31 55 506 65 34, Fax: +31 55 506 48 58).

11th European Poultry Conference

Bremen, Germany

6 - 10 September, 2002

Contact:

Prof Dr F. Ellendorff
Inst. für Tierzucht und Tierverhalten Mariensee
Höltystrasse 10
31535 Neustadt, Germany
Tel.: +49 5034/871-135/-136

Fax: +49 5034/871-143 E-mail: ellendorff@tzv.fal.de Website: www.epc2002.de



The Aviagen Group

The Aviagen Group is the world's leading poultry breeding company, developing products to meet the needs of the commercial broiler industry. The business is based upon the sale of day-old parent and grand-parent chicks to over 85 countries worldwide.

The Group's chicken breeding arm consists of three geographical trading companies servicing customers on a regional basis: Aviagen Limited covering European, Middle Eastern, African, Australian and New Zealand markets; Aviagen Incorporated covering Latin America and Asia; and Aviagen North America which is responsible for the United States and Canada.

These three companies are committed to providing first class customer service across all global markets for all Group Products. These include Arbor Acres and Ross.





Aviagen Limited

Newbridge Midlothian EH28 8SZ Scotland UK

tel +44 (0) 131 333 1056 fax +44 (0) 131 333 3296 email infoworldwide@aviagen.com

Aviagen Incorporated

439 Marlborough Road Glastonbury CT06033 USA

tel +1 860 633 4681 fax +1 860 657 9193 email aviageninc@aviagen.com

website www.aviagen.com

Aviagen North America

Cummings Research Park 5015 Bradford Drive Huntsville, Alabama 35805 USA

tel +1 256 890 3835 fax +1 256 890 3919 email info@aviagen.com

14th European Symposium on Poultry Nutrition Lillehammer, Norway

10 - 14 August, 2003

Contact:

The Norwegian Branch of WPSA C/o Centre for Poultry Science Box 4377 Torshov N-0402 Oslo Norway

Tel.: +47 22 79 87 73 Fax: +47 22 79 87 71

E-mail: marlene.furnes-bagley@fjorfe.org

XVI th European Symposium on the Quality Of Poultry Meat

and

X th European Symposium on the Quality Of Eggs and Egg Products

Saint-Brieuc - Ploufragan, France

23 – 26 September, 2003

Contact:

Geneviève CLEMENT
ISPAIA – ZOOPOLE développement
BP 7
22440 Ploufragan
France

Tel.: +33 2 96 78 61 30 Fax: +33 2 96 78 61 31

E-mail: wpsa2003@zoopole.asso.fr

Website: www.zoopole.com/ispaia/wpsa2003.htm



WPC 2004 XXII WORLD'S POULTRY CONGRESS

June 08 – 13, 2004 ISTANBUL - TURKEY



TURKISH BRANCH of WPSA



Official Congress Organizer

ITU Joint Venture

Cumhuriyet Cad. 18/5 80230 Elmada Istanbul, Turkey

Tel: +90 212 231 30 21 Fax: +90 212 232 15 22

E-mail: wpc2004@wpc-2004.org
https://doi.org/10.1017/S0043933901000204 Published online by Site in www.wpc-2004.org