INTERNATIONAL NETWORK FOR FAMILY POULTRY DEVELOPMENT

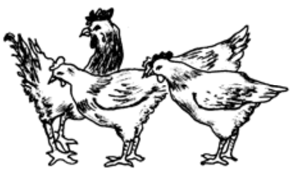
RÉSEAU INTERNATIONAL POUR LE DÉVELOPPEMENT DE L'AVICULTURE FAMILIALE

RED INTERNACIONAL PARA EL DESARROLLO DE LA AVICULTURA FAMILIAR

www.fao.org/ag/againfo/subjects/en/infpd/home.html

INFPD Newsletter Vol. 16 No. 2, July – December 2006

- INFPD is a Global Working Group of the World's Poultry Science Association (WPSA, www.wpsa.com).
- Annual membership dues: US$15 per person from a developing country & US$25 per person from a developed country.



CONTENTS

Is the message getting through?

A.M. GIBBINS

President, Asian Pacific Federation of the World's Poultry Science Association, 386 Tarata Road RD 7, Inglewood 4387, New Zealand, Tel: (+64) 6 756 7611, Fax: (+64) 6 756 7012; E-mail: <avianag@infogen.net.nz>

[Alan M. Gibbins has been involved in the poultry industry for more than 30 years. He obtained a M.Agr.Sc. degree at Massey University in Palmerston North, studying poultry nutrition and physiology after which he worked for the New Zealand Ministry of Agriculture and Fisheries as a Poultry Farm Advisory Officer. Beginning in the commercial side of the industry in 1978 he has been a part of the production, research and education scene and has served the industry in several key roles. He was instrumental in setting-up new Poultry Learning and Development courses for the Agriculture Industry Training Organisation. Alan has been Vice President for 4 years and President of the New Zealand Branch of World's Poultry Science Association (WPSA) for 8 years. He now concentrates more on his position as President of the Asian Pacific Federation of WPSA branches. He sits on the World Board of WPSA. Alan is very keen to see the Asian Pacific Federation become more active, to attract more membership amongst the WPSA branches of the region and to strengthen the ties between kindred organisations.]

Received for publication 30 November 2006; accepted 30 November 2006

Think of a message, any message. In the transmission of the message, there are important steps. First there is the generation of the message. Second is the sending of the message. Third is the receiving of the message. Fourth is the acknowledgment that the message is understood. This is a part that is often left out. If any one of these steps is missing, then the transfer of information is incomplete which is as unsatisfactory as not having the message sent at all. Who is responsible for these steps? Obviously the generator, the sender and the receiver must all perform their function but even more, they each have some responsibility to ensure that the steps that are not their primary responsibility are performed as well. For generator we could read researcher, for sender we could read extension worker and for receiver we could read small-scale farmer. So let us ask ourselves: are all three playing their parts effectively?

The role of the researcher is to do the research. We must not downplay the importance of science and research. Certainly, it is important to discover new things, but what is the use unless we can apply scientific discoveries in order to change current practice, hopefully to make progress or improvement. Remember that progress arises from change, but not all change brings about progress. So any change put in place must be based on well-researched principles that have a strong likelihood of making progress. But there is so much knowledge out there already, which is either not being applied, or applied in a haphazard way.

The role of the farmer is to use whatever information is available from whatever source to improve the performance of his livestock operation. Of course for this to be effected, the farmer must be prepared to listen to and learn about new ideas, even to seek them out. He must be prepared to adopt and implement advice.

In the middle we have the extension worker. It is possible for researchers and farmers to become involved in extension, but this would be unusual. Extension workers come in a multitude of guises. They can be government department employees, NGO employees, commercial company employees, private consultants or volunteers for example. Their role is to facilitate the transfer of knowledge from discovery to the user. This, I believe, is the area where there is a breakdown. More of our attention needs to be focussed on this area. We need to determine if this is in fact a barrier to the message getting through.

If it is, what ideas are out there to remove this barrier? One idea that may have some merit is the development of a regional resource kit that can be used in the villages of Africa, Asia and the Pacific. Such a kit should be flexible to allow for regional variation. It could take a multi level approach to small-scale poultry development. The kit could be made available to local agencies that can then pass them on to village communities.

Resources contained in the kit could be educational through husbandry guides, enterprise guides, design of poultry facilities and equipment, and disease prevention and biosecurity information. It could also use other extension techniques like video. It could contain vouchers to redeem vaccines, medicines, vitamins and minerals, replacement chicks or replacement pullets, and finance from lending organisations. Such vouchers might be redeemable only when knowledge has been demonstrated by attainment of skills. Vouchers for building materials from the government could operate on the same basis. A sequential voucher system depending on skills' level and the demonstration of that skill through learning could provide a real incentive for farmers. This would need the agreement of government agencies, but might be a valuable use of their funds.

A requirement of the resource kit could be that farmers in the same localised area must get together from time to time to discuss issues of importance such as biosecurity. Working together in a village unit for the greater good of the community would be beneficial. Education is a vital part of the whole process of promoting small-scale poultry farming. Information can be passed on in resource kits, but a more in depth system needs to be put in place to teach farmers the basic principles of poultry husbandry. The emphasis in an education system should be to develop skills in the people who will be taking care of the poultry.

To put something in place, like what I have described, would be a huge undertaking. But it would make a lot of sense to bring all the organisations working in the field of small-scale family poultry farming together to work as a team. Can INFPD, WPSA, FAO and other groups collaborate, using local expertise? After all if we use the analogy of a canoe, we could say we are all in the same boat, but if we could all paddle together, we could really get somewhere.

~~~~~~
~~~~~~

RESEARCH REPORT No 1:

A survey on biosecurity measures on layer farms around Afyonkarahisar region in Turkey

E.H. ŞAHİN[1]* E. ŞENGÖR[1] and A.B. AKKAYA[2]

[1]Department of Animal Husbandry; [2]Department of Animal Nutrition and Nutrional Diseases, Faculty of Veterinary Medicine, Afyonkarahisar Kocatepe University, Afyonkarahisar, Turkey

***Corresponding author: <hesahin@aku.edu.tr>**

Submitted for publication 20 October 2006; received in revised form 21 November 2006; accepted 28 November 2006

[From a paper first presented at the 14th World Veterinary Poultry Congress, 22-26 August 2005, Istanbul, Turkey]

Summary

This study was carried out to investigate the biosecurity measures of layer farms in Afyonkarahisar region. Biosecurity is the intentional avoidance of the introduction and dissemination of diseases through a planned program of risk reduction. Such disease control measures are collectively termed as 'biosecurity'. A questionnaire for farm managers was designed, to obtain information regarding biosecurity measures on 76 egg farms around Afyonkarahisar region in Turkey. The survey was carried out by interviewing technical personnel and general managers and whose statements were supported by farm records. In conclusion, it was determined that biosecurity measures were not sufficient on the layer farms around Afyonkarahisar region. In addition, most of the farmers are not aware of the importance of biosecurity.

Keywords: biosecurity; layer farm; survey; Afyonkarahisar; Turkey

Introduction

There are nearly 5 million layer hens in Afyonkarahisar province according to the official statistical figures. The region therefore is one of the most important areas for egg production. The aim of this investigation was to survey the current status of biosecurity application in the area which accounts for 15% of the nation's egg production on a total of 76 commercial farms. Biosecurity can be defined as a set of programmes and procedures that will prevent or limit the build-up and spread of harmful microorganisms and pests in poultry houses, poultry farms and poultry production areas and the biosecurity programme as the implementation of procedures to inhibit the movement of infectious agents harmful to poultry into, within or out of a facility containing poultry susceptible to those agents (Grimes and Jackson, 2001; Clark, 2002). The most effective form of protection against disease, especially for livestock farmed under modern production techniques is biosecurity. Diseases can cause problems and effect poultry by impediments such as: delayed growth, decreased egg production rates, reduced product quality, and lower customer satisfaction (Antec International, 2005). Productivity and profitability are enhanced by application of sound principles of biosecurity, vaccination and management (Shane, 1997; Hofacre, 2002).

Material and methods

A questionnaire for farm managers (available on request from the corresponding author) was designed to obtain information regarding biosecurity on layer flocks in Afyonkarahisar region. A total of 76 farms agreed to answer the questionnaire among the 115 egg producers registered in the region. These 76 farms are considered as 100%. The questionnaire consisted of 30 questions and the interview was performed by asking the questions to either the owner of the farm or the responsible manager.

The key factors being analyzed are:

1. Awareness of the farm manager about biosecurity;
2. If they investigate the source of the day-old chick or pullet supply;
3. Suitability of the distance between the houses;
4. 'All-in all-out' system;
5. Natural water reservoirs in close proximity;
6. Peripheral fence or wall around the farm;
7. Visitor books and protective clothing for visitors;
8. Close relationship among the workers working on different poultry farms;
9. Protective clean work clothing and shower as well as change facilities for workers;
10. Disinfection of the vehicles at the farm entrance and foot dips at the entrances of the poultry houses;
11. Equipment transfer between the farms;
12. Existence of pests at the premises and pest control program;
13. Fly control program;
14. Water treatment to be used and feed analyses;
15. Dead bird disposal;
16. Regular vaccination program and coordination between the farms regarding the time of vaccination as well as the type of vaccine and its strain to be used;
17. Cleanout, disinfection and rest period between the replacements.

Results and discussion

A sound biosecurity is an important determinant for the health of a flock. This is the least costly and most effective means of disease control available. No disease prevention program will work without good biosecurity understanding and application (Jeffrey, 1997). Nearly half of the managers (49%) of the farms around Afyonkarahisar region were not knowledgeable about biosecurity. This is because the managers are keen on solving the problems temporarily instead of permanently because of the necessary investment costs.

All of the egg producers (100%) around Afyonkarahisar region are very sensitive about the source of day-old chicks or replacement pullet supplies because of the high initial cost of the live material (day-old chicks or replacement pullets). They monitor the immunity level and check for the uniformity and live weight before making a purchase decision. Tracking infection requires information about the sources of the chicks (Nespeca *et al*., 1997).

Optimally, facilities should be located at least 1.5 to 3 km from other commercial or private poultry facilities (Carey *et al*., 2005). But unfortunately the distances between the majorities of farms (74%) were less than 500 m. The insufficient distance between the farms makes the application of biosecurity measures difficult. This unfavourable situation of the farms was thought to be due to the rapid development of the layer industry in the region.

Since all the farmers in Afyonkarahisar region prefer to produce eggs continuously all year round in their 3 or 4 house farms, none of them practice the 'all-in/all-out' system. This is another unfavourable situation for implementing biosecurity measures. 'All-in/all-out' policy helps prevent disease transmission from older birds to new birds by creating breaks for cleaning and disinfection (Carey *et al*., 2005; Nelson and Tablante, 2004).

None of the layer establishments are in the close proximity to any natural water reservoir in Afyonkarahisar area presenting a favourable situation regarding the biosecurity. Wild waterfowls have been known to act as reservoirs and mechanical vectors of infectious disease and could contribute to poor flock performance (Tablante *et al*., 2003). However from time to time sparrows can not be prevented from entering the houses which creates a major disease hazard.

Forty-seven % of the farms are surrounded by a fence or wall, and unauthorized entry to the establishments is under control; however the remaining 53% are still under great risk due to the free access of strangers. Carey *et al*. (2005) mentioned that free access to poultry operations must be restricted in order to prevent unauthorized entries.

Tablante (2000) mentioned that a record of visitors must be kept indicating their names, company or affiliation, address, telephone, and place last visited. Very few of the establishments (3%) in Afyonkarahisar region were keeping a visitors book. In general, visitors were strictly prohibited from entering the houses thus reducing the risk of unauthorized entry. Two farms, representing the 3%, had gained an institutional structure and therefore they were recording all entries in the visitor books. Again, very few of the establishments (4%) were allocating the visitors with protective clothing. This must be attributed as lack of practice rather than ignorance.

At around 49 % of the establishments, the close relationships among the workers working on different farms presented a major risk for biosecurity. Nelson and Tablante (2004) and Butcher and Miles (2003) reported that microbes and disease organisms can be found and transported by people's hands, in their hair, on clothing and on shoes.

Clean work clothing was supplied to the workers in 88% of the establishments in the area. However, only half (53%) of the surveyed establishments provided facilities to shower and change. In general, workers were accommodated on the farm together with their families; therefore it was assumed that they were showering at home.

The proportion of the establishments disinfecting vehicles on entry was very limited (8%). The percentage of establishments with foot dips at the entrances of the houses was 37.

It was reported that disease agents may be transferred from place to place by live poultry transport crates, egg-trays, wheels of the trucks, and other equipment and people. Equipment used on farms should be cleaned, washed and disinfected before being used on another farm (Nespeca *et al*., 1997; Tablante *et al*., 2003; Butcher and Miles, 2003). Fortunately, there has been no equipment transfer between the egg-producing farms in Afyonkarahisar region. This was carried out in order to prevent disease transmission.

Pests pose a major problem in the area. They were found in the feed storage area of the houses (80%) and in the poultry houses (95%) which are not surprising since pest control were carried out regularly only in 49% of the establishments. This was emerging as a major potential risk factor for the biosecurity of the egg farmers. Pests can introduce disease organisms into a poultry operation by mechanical transmission or by being directly infected and shedding the organisms (Nelson and Tablante, 2004). Efforts must be made to control pests in and around the poultry farms (Hickle, 1999; Butcher and Miles, 2003).

Fly control was generally practiced (47%) by supplying the feed with larvicide's. However 5% of the farms reported that they were not bothering with fly control at all.

The number of establishments using uncontrolled well water was quite high (76%). Well water was used by establishments which were far from the municipality water system. The ratio of establishments chlorinating the water regularly was 29%. Butcher and Miles (2003) reported that maintaining high quality feed and water supply is an integral part of any disease prevention program. The researchers also mentioned that seeds and grains are long lasting when stored properly. However, if they become damp or humidity is high, they can support the growth of massive amounts of yeasts and bacteria. Some of the farmers were producing the feed in their own feed mixing units (63%). This is the method widely used in Turkey in order to reduce the cost of feed. The number of establishments getting the feeds regularly analyzed was 22 (29%). This practice reduces the reliability of the feed and, on the other hand, involves another potential risk for biosecurity.

Most of the establishments (93%) in the area preferred to send dead birds away together with the manure. Carey and Thornberry (1998) reported that dead poultry on farms can cause nuisance, odour and aesthetic problems. Surface and groundwater can directly be polluted by the dead birds on a farm. If the dead birds are not disposed on a daily basis, this can increase the number of rodents, insects and other predators in the periphery and therefore increase the risk of disease. The situation in Afyonkarahisar therefore represents a great risk from biosecurity point of view.

Farmers are very conscientious about vaccinating the flocks (100%). No coordination was observed between the farms regarding the strain and the type of vaccine used as well as the timing of the vaccination. Yet, this service was given professionally by some worker teams. However, since the team members were not particularly enthusiastic regarding personal hygiene, showering and changing when moving from one flock to another, this created an obvious risk for disease transmission.

The ratio of establishments applying the programmed clean out procedure and disinfection was 67%. However the ratio of establishments applying a two-week rest period between depletion and restocking the houses was 42%. The clean downtime period was mainly dependent on the commercial situation. Nespeca *et al.* (1997) reported that sufficient clean downtime between flocks (ideally 2 weeks) is necessary to reduce (if not eliminate) the bacterial and viral contamination load in a poultry house.

Conclusion

In conclusion, it was determined that biosecurity measures applied on the layer hen farms around Afyon region were inadequate, as they are in many places around the world. In addition, most of the farmers aren't aware of the importance of biosecurity. However, many diseases like avian influenza have threatened human and animal health during recent years. Protection from these diseases is possible with biosecurity applications. It is necessary that farmers be introduced to and educated about biosecurity.

References

ANTEC INTERNATIONAL (2005) Economic Benefits of Biosecurity in Poultry Farming. ThePoultrySite.com, Thursday, March 03, 2005.

BUTCHER, G.D. and MILES, R.D. (2003) Disease Prevention in Commercial Aviaries. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, VM83.

CAREY J.B. and THORNBERRY F.D. (1998) Dead Poultry Disposal, Texas Agricultural Ext. Service, L-5217.

CAREY, J.B., PROCHASKA, J.F. and JEFFREY, J.S. (2005) Poultry Facility Biosecurity, Texas Agricultural Ext. Service L-5182.

CLARK F. D. (2002) Biosecurity Practices for Arkansas Livestock Farms. *Avian Advice*, Winter 2002, Vol. 4, No. 4, p.14-15.

GRIMES, T. and JACKSON, C. (2001) Code of Practice for Biosecurity in the Egg Industry, Rural Industries Research and Development Corporation, Printed by Union Ofset. RIRDC Publication No. 01/102, Project No. MS001-02.

HICKLE, L.A. (1999) Rodent Management on Poultry Farms, CPIF Quality Assurance Seminar, Sept. 14, 1999, Modesto, CA.

HOFACRE C.L. (2002) The Health and Management of Poultry Production, Review, *Int. J. Infect. Dis.*, 6: 353-357.

JEFFREY J. S. (1997) Biosecurity For Poultry Flocks, Poultry Fact Sheet No. 26, Cooperative Ext. Univ. of California, March 1997.

NELSON T. M. and TABLANTE, N. (2004) Biosecurity For Poultry, UNN-966, The University of Maryland.

NESPECA, R., VAILLANCOURT, J. and MORROW, W.E.M. (1997) Validation of a Poultry Biosecurity Survey. *Preventive Veterinary Medicine* 31(1): 73-86.

SHANE, S. (1997) The Poultry Disease Handbook, American Soybean Association Mita (P) No. 044/11/96 (Vol. Po36-1997).

TABLANTE, N.L. (2000) Biosecurity: A Vital Key to Poultry Disease Prevention, Newsletter Poultry Perspectives, Spring 2000, vol. 2;1

TABLANTE, N.L., MYINT, M.,JOHNSON, Y.J., RHODES, K., COLBY, M. and HONENHAUS, G. (2003) A Survey of Biosecurity Practices as Risk Factors Affecting Broiler Performance on the Delmarva Penninsula, Maryland Agri. Experiment Station, University of Maryland.

~~~~~~
~~~~~~

Bacteriological study of drinking water in the rearing of exotic chickens in the Zou Department in Benin: a case study of the districts of Abomey, Bohicon and Zogbodomey

J.T. DOUGNON[1]*, T.M. KPODEKON[1], A.P. EDORH[2], E. KOCHONI[3] and M. GBEASSOR[4]

[1]Ecole Polytechnique d'Abomey-Calavi (EPAC), Département de Productions Animales, Laboratoire de Recherches en Biologie Appliquée (LARBA), Université d'Abomey-Calavi (UAC), 01 BP 2009 Cotonou, Bénin; [2]Département de Biochimie et de Biologie Cellulaire, UAC, 01 BP 526 Cotonou, Bénin; [3]Laboratoire de Biochimie des Protéines, Département de Biochimie et de Biologie Cellulaire, UAC, 01 BP 526 Cotonou, Bénin; [4]Faculté des Sciences, Université de Lomé, BP 1515 Lomé, Togo

***Corresponding author: <dougnonj@yahoo.fr>**

Submitted for publication 22 February 2006; received in revised form 5 October 2006; accepted 29 November 2006

Summary

A study was carried out in the Veterinary Laboratory of Bohicon in the Republic of Benin to investigate the presence of bacteria in the Districts of Abomey, Bohicon and Zogbodomey in the Zou Department, Republic of Benin. A total of one hundred and twenty (120) water samples collected from water tanks, wells, and drillings were studied and analysed. The fourteen following germs were identified: *Klebsiella spp., Escherichia coli, Lysteria monocitogenes, Arizona spp., Salmonella spp., Proteus spp., Providencia spp., Levinea spp., Serratia spp., Staphylococcus epidermidis, Staphylococcus aureus, Citrobacter spp., Actinomyces piogenes, Shigella spp.* We noticed that out of the fourteen (14) germs, ten (10) namely *Klebsiella spp., Staphylococcus epidermidis, Actinomyces piogenes, Shigella spp., Listeria monocytogenes, Arizona spp., Salmonella spp., Proteus spp., Providencia spp.* and *Citrobacter spp.,* were found in wells; the thirteen following *Klebsiella spp., Escherichia coli, Listeria monocitogenes, Arizona spp., Salmonella spp, Proteus spp., Levinea spp, Serratia spp., Staphylococcus epidermidis, Staphylococcus aureus, Citrobacter spp., Actinomyces piogenes* and *Shigella spp.* were isolated from water; and seven (7) namely *Klebsiella spp., Actinomyces piogenes, Proteus spp., Salmonella spp., Listeria monocitogene, Staphylococcus epidermidis* and *Citrobacter spp.* from drillings. The study revealed that the germs of *Klebsiella spp.* and *Staphyococcus epidermidis* were present in the different water sources studied. Apart from water tanks in which all the germs were present, there was a variation in their distribution in the other water sources (wells and drillings). It turned out to be necessary to take preventive purification and protection measures on the water sources used in rearing, and to put emphasis on the hygienic rules on the surveyed farms.

Keywords: bacteriology; watering source; exotic chicken; Benin

Introduction

Modern poultry farming is in steady expansion in the Republic of Benin. Despite its potentialities, the poultry sector faces several constraints, including the often dubious quality of water supplies used to water exotic chickens. Water represents the pathological hyphen in the breeding industry. Indeed, it is almost impossible to have good and hygienic water sources in developing countries (Villate, 1997). In the same way, Lhoste (1993) reported that the lack of hygienic water supplies for poultry farming is the main cause of microbe propagation, and, therefore, a source of dissemination of infectious diseases. Thus, in the Zou Department, precisely in the Districts of Abomey, Bohicon and Zogbodomey, the network of water supplies set up on different poultry farms is composed of, in most cases, open wells whose depth varies between 60 to 80 m depending on the areas, protected or non-protected water tanks, badly constructed drillings, and badly maintained watering materials and barrels.

The present study aims at revealing the different bacteria found in the water sources in the surveyed Districts. This will help to find better therapeutic approaches to face high mortality rates in the flocks of exotic chicken in the different poultry rearing systems.

Materials and methods

Materials

The study was carried out on poultry farms and covered at least a population of 200 broilers, breeders or layers. A total of fifteen (15) poultry farms were surveyed. Ninety-seven (97) water samples were collected in Abomey, Bohicon and Zogbodomey. The samples were collected from open wells, drillings and water tanks.

Methods

Water samples were collected in sterilized tubes for the purpose of laboratory analysis. The sampling technique depended on the source to be sampled. Laboratory studies were conducted at the *Laboratoire Vétérinaire de Bohicon* (LABOVET, BP 2069, Abomey, Benin). The media culture used was mostly dehydrated (Institut Pasteur Production 3, Bd. Raymond Poincaré, 92430 Marnes-La-Conquête, France). The bacteriological analysis of water focused on the search for germs on selective medium and the identification of *Micrococcaceae* Gram+ and Gram–. A pre-enrichment on a nutritive medium was obtained as follows: peptoned water then dilution of the sample at 1/10 in the case of the *Enterobacteriaceae* precisely the *Salmonella.* The samples were incubated at 37°C as follows: ambient temperature +5 to 70°C; natural convection with preheating by thermosiphon; interface RS232; software “CELSIUS” for programming and graphic monitoring; verification report at 37°C; accredited by the *Comité Français d’Accréditation* (COFRAC). The incubation lasts 24 hours in the identification of Gram+ germs. Then, an enrichment on selenite culture medium was done in the search of Gram– enterobacteria. After study in fresh form and then Gram coloration, the germs were grown on agar-agar Chapman (gelosed medium made of meat extracts, peptone, D-mannitol sodium chloride, carbolic acid). It is a selective medium that helps to detect and identify the *Micrococcaceae*, including *Staphylococcus aureus.* The germs were also bred on nutritive agar-agar (medium of culture favouring the multiplication of all the Gram+ and Gram– micro-organisms). Finally, the bacteria were identified with the help of biochemical characteristics (catalase, hemolyse, urease, indol, DNase, fermentation of glucose, lactose, mannitol) and of mobility.

Statistical studies

The Z-Test of Fischer were used to compare proportions (2 by 2). It helps to compare two proportions or percentages from two independent flocks, in order to determine the one that is statistically superior (or inferior) or equal to the other. The null hypothesis tested is $H_{0:}\ p_1 = p_2$ or $H_{0:}\ p_1 - p_2 = 0$; (alternative $H_{1:}\ p_1 \neq p_2$ or $H_{1:}\ p_1 - p_2 \neq 0$).

Results

The results are shown in *Tables 1* and *2*, and then in the *Diagram 1*.

The germs *Shigella spp., Serratia spp.,Escherichia coli, Listeria monocitogenes, Providencia spp.* and *Staphylococcus aureus* are very rare in the three towns. The germs *Staphylococcus epidermidis*, *Arizona spp.* and *Klebsiella spp.* are more abundant in Bohicon than in the other towns. The germ *Actinomyces pyogenes* is found in an equivalent proportion (25%) at Zogbodomey and also in Bohicon. In Abomey, this germ is found in all the samples. The germs *Citrobacter spp., Salmonella spp.* and *Proteus spp.* are found in a proportion inferior to 60% in the different surveyed towns. In general, the proportion of germs identified in Bohicon (48.46%) is statistically more important than that of germs identified in the other two towns.

Table 1 Frequency of isolated germs found in water supplies for exotic chicken per town and the Z-Test of comparison of proportion (2 by 2): comparison of the three towns for each isolated germ.

Towns	**Isolated germs (%)**						
	Staphylococcus épi.	*Klebsiella*	*Shigella*	*Arizona*	*Serratia*	*Actinomyces piogenes*	*Citrobacter*
Zogbodomey	6 (23)a	7 (20.5)a	0	1 (12.5)	0	3 (25)	3 (20)
Bohicon	15 (58)b	20 (59)b	2 (100)	5 (62.5)	0	3 (25)	5 (33)
Abomey	5 (19)a	7 (20.5)a	0	2 (25)	1 (100)	6 (100)	7 (47)

Frequencies followed by the same letter are not significantly different at the threshold of probability 5% (Z-Test of Fischer).

Table 1 (Continued) Frequency of isolated germs found in water supplies for exotic chicken per town and the Z-Test of comparison of proportion (2 by 2): comparison of the three towns for each isolated germ.

Towns	**Isolated germs (%)**						
	E. Coli	*Proteus*	*Listeria mono.*	*Levinea*	*Salmonella*	*Providencia*	*Staphylococcus au.*
Zogbodomey	0	5 (56)	2 (50)	0	3 (37.5)	0	0
Bohicon	2 (67)	1 (11)	2 (50)	1 (50)	3 (37.5)	2 (67)	2 (66.67)
Abomey	1 (33)	3 (33)	0	1 (50)	2 (25)	1 (33)	1 (33.33)

Frequencies followed by the same letter are not significantly different at the threshold of probability 5% (Z-Test of Fischer).

Table 2 Frequencies of isolated germs from water supplies in exotic chicken farming according to their sources and the Z-Test of comparison of proportions (2 by 2): comparison of the three sources of water for each isolated germ.

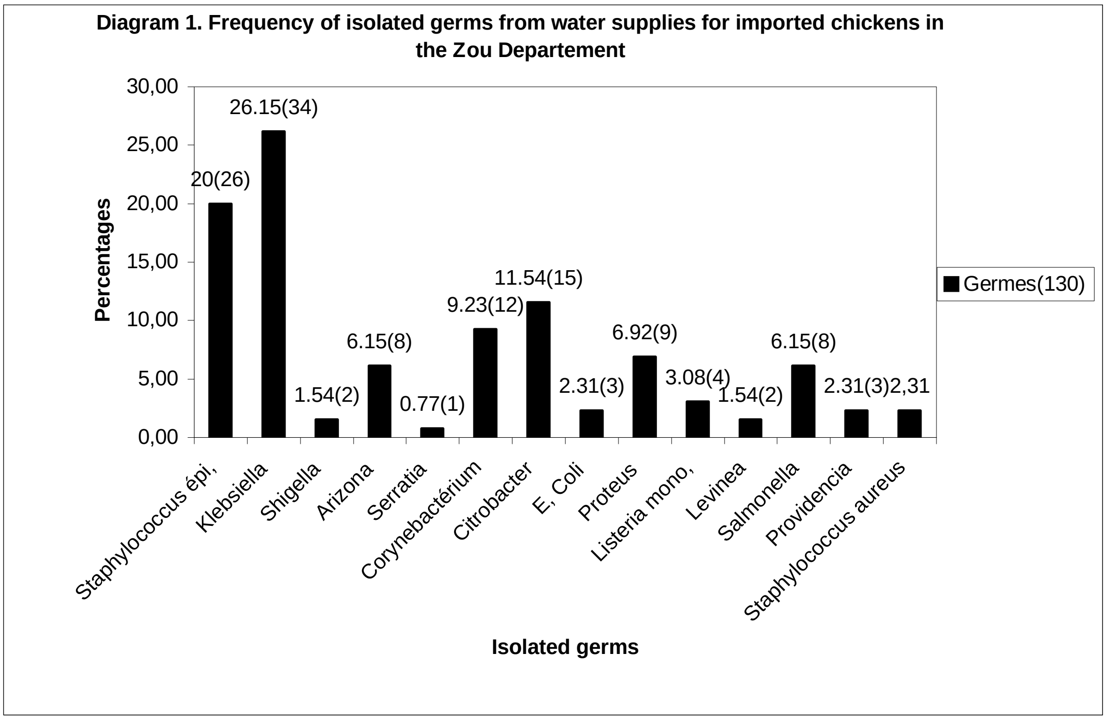
Water sources	Isolated germs (%)						
	Staphylococcus épi.	*Klebsiella*	*Shigella*	*Arizona*	*Serratia*	*Actinomyces pio-genes*	*Citrobacter*
Water tanks	14 (53.85)b	22 (64.71)b	1 (50)	5 (62.5)	1 (100)	6 (50)	12 (80)
Drilling	4 (15.38)a	7 (20.59)a	0	0	0	3 (25)	1 (6.67)
Wells	8 (30.77)ab	5 (14.71)a	1 (50)	3 (37.5)	0	3 (25)	2 (13.33)

Frequencies followed by the same letter are not significantly different at the threshold of probability 5% (Z-Test of Fischer).

Table 2 (Continued) Frequencies of isolated germs from water supplies in exotic chicken farming according to their sources and the Test Z of comparison of proportions (2 by 2): comparison of the three sources of water for each isolated germ.

Water sources	Isolated germs (%)						
	E. Coli	*Proteus*	*Listeria mono.*	*Levinea*	*Salmonella*	*Providencia*	*Staphylococcus au.*
Water tanks	3 (100)	4 (44.44)	2 (50)	2 (100)	2 (25)	0	3 (100)
Drilling	0	2 (22.22)	1 (25)	0	2 (25)	0	0
Wells	0	3 (33.33)	1 (25)	0	4 (50)	3 (100)	0

Frequencies followed by the same letter are not significantly different at the threshold of probability 5% (Test Z of Fischer).



After analysing the three water sources for each isolated germ, it is observed that the germs *Shigella spp., Serratia spp., Escherichia coli, Listeria monocytogenes, Levinea spp., Providencia spp.* and *Staphylococcus aureus* are very rare in the drinking waters of the surveyed towns. For the whole of the studied *Staphylococcus epidermidis* and *Klebsiella spp.*, more than the half of each of these germs comes from the water tanks. The other germs are of a relative importance in the three water sources (*Table 2*). In the Zou Department, it is generally observed that *Klebsiella spp.* and *Staphylococcus epidermidis* are the most frequent in the germs identified in the waters surveyed (*Diagram 1*). A total of fourteen (14) germs are identified in the samples. These are: *Arizona spp., Escherichia coli, Salmonella spp., Citrobacter spp., Staphylococcus epidermidis, Actinomyces piogenes, Shigella spp., Listeria monocytogenes, Klebsiella spp., Staphylococcus aureus, Providencia spp., Proteus spp., Serratia spp.* and *Levinea spp*. Water tanks are the most infected sources, because at the exception of the *Providencia spp.* germ, they contain almost all the fourteen (14) germs that are studied. Water from the wells is the second most infected water source with ten (10) germs, namely *Klebsiella spp., Shigella spp., Arizona spp., Providencia spp., Salmonella spp., Actinomyces pyogenes, Proteus spp., Listeria monocytogenes, Staphylococcus epidermidis* and *Citrobacter spp*. Drilling is the less infected source with seven (07) germs, namely *Staphylococcus epidermidis, Klebsiella spp., Actinomyces pyogenes, Listenia monocytogenes, Salmonella spp.*, *Citrobacter spp.* and *Proteus spp.*

Discussion

Results from the present study are in agreement with those obtained by Jordan and Pattison (1996). These authors indicate that the water used in poultry farming is a major source of contamination. It is therefore compulsory to conduct, at least once a quarter, a bacteriological water analysis at the level of wells or public network of water supplies used by livestock. Differences observed among towns for the same germs are consistent with the thesis developed by Jourdain (1991) which points out that the development of any microbial germ mainly depends on favourable conditions prevailing in its environment. Although no epidemic disease in bird populations was reported during the period of the study, highest mortality rate (48.46%) was recorded in Bohicon. In the poultry rearing sector of Bohicon, it is common place to observe chicken litters stocked near henhouses often built without any compliance with zootechnical standards. For lack of place, there is only two-meter distance between two henhouses. These bad husbandry practices bring about a serious environmental problem, pollute and favour the multiplication of microbes in water supplies. In this regard, Villate (1997) advises that, at poultry farm level, it is necessary to set water supply units outside rearing compounds, in stores. These water supply units must be well covered to avoid any contamination through dust originating from these facilities.

These results match well with the results of Pilet and Bourdon (1981) who reported that, to be able to confirm the virulence of a microbial strain, a number of conditions are requested, including the abundance of the strain under the microscope, even if the host agents do not obviously show specific symptoms caused by the virulence of a microbial strain.

The presence of different germs in water tanks, drillings and wells is to be seen as an indicator of pollution, therefore an obvious sign of the presence or the absence of pathogenic micro-organisms. The stressful environments under which poultry flocks are kept may also increase the virulence of a germ. Indeed, according to Janben *et al*. (2201), there could be no pathogenic agents in water (viruses, bacteria, parasites) that might cause an immediate risk of contamination. More than half of the germs of *Staphylococcus epidermidis* and *Klebsiella spp.* identified come from water tanks. Moreover, the proportion of germs identified (59.26%) in water tanks is more important compared with other water sources. Water tanks are the most widespread water sources in the Zou Department and mainly in Bohicon. Rain water collected from house roofs find directly its way into water tanks which, in most cases, are badly covered, and without any appropriate hygienic and disinfection systems. It is commonplace to find in these water tanks plant leaves and sometimes dead lizards, and also chicken faeces stored up close to water tanks. These ill practices in the poultry farming systems are major causes of the very high level of contamination of water tanks, compared with the other water sources. Statistically, the drilling supply is the less infected out of the three other sources. This can be explained by the fact that the drilling is usually better protected. The important depth and the reduced diameter are so many favourable conditions in the protection of this water source. However, it is costly and repels poultry farmers who have no hesitation in choosing alternative options, such as water tanks or wells with very large diameter. Although these wells may be as deep as possible, they are often not well protected and are easily polluted by chicken faeces or other organic substances. In fact, germs such as the salmonella can proliferate in water when temperature (as of 18°-20°c) is appropriate and particularly when organic substances are abundant (Villate, 1997). This is the case with water tanks or wells polluted by faeces. These waters are considered as surface waters and, thus, are prone to contamination.

Conclusion

Water supplies used in the rearing of exotic poultry in the Zou Department were all infected. A total of fourteen (14) germs were identified in the studied samples. These are *Arizona spp.*, *Escherichia coli, Salmonella spp., Citrobacter spp., Staphylococcus epidermidis, Actinomyces pyogenes, Shigella spp., Listeria monocytogenes, Klebsiella spp., Staphylococcus aureus, Providencia spp., Proteus spp., Serratia spp.* and *Levinea spp*. Water tanks were the most infected source, as they contained all the above-mentioned fourteen germs. Wells were the second most infected water supplies with the germs of *Klebsiella spp., Shigella spp., Arizona spp., Providencia spp., Salmonella spp., Actinomyces piogenes, Proteus spp., Listeria monocytogenes* and *Staphylococcus epidermidis*. Drillings were the least infected sources: they revealed the presence of the following bacteria: *Staphylococcus epidermidis, Klebsiella spp., Actinomyces piogenes, Listeria monocytogenes, Salmonella spp.* and *Proteus spp*. Therefore, a sustainable purification programme has to be implemented in the Department to help clean up and thoroughly disinfect water tanks, drillings and wells on a regular basis, and, eventually, protect wells with large diameter.

References

ALIOU, Y. (2001) Contribution à l'étude des caractéristiques dominantes de gestion technique des exploitations avicoles commerciales des grandes agglomérations au Sud-Bénin. Mémoire de fin d'étude. Collège polytechnique Universitaire/Université Nationale du Bénin (CPU/UNB), Cotonou, Bénin, 65 p.

CHRYSOSTOME, C.A.A.M., BELL, J.G., DEMEY, F. and VERHULST, A. (1995) Seroprevalence to three diseases in village chickens in Benin. *Preventive veterinary Medecine* 22: 257-261.

JANBEN, T., SCHWARY, C., PREIKSCHAT, P., VOSS, M., PHILIPP, H.C., WIELER L.H. (2001) Virulence-associated genes in avian pathogenic Escherichia coli (APEC) isolated from internal organs of poultry having died from colibacillosis. *Int. J. Med. Microbiol.* 291: 371-378.

JOURDAIN, I. (1990) L'aviculture en milieu tropical. Maison Alfort-Lyon 148 p.

JORDAN, F.T.W. and PATTISON, M. (1996) Poultry diseases. W.B. Saunders Company, London, UK, 38-43.

LHOSTE, P.R. (1993) Manuel précis d'élevage, 277-279.

N'NOUME, L. (2000) La filière poulet dans le Sud-Bénin: Etat des lieux. Mémoire de fin de cycle. Collège Polytechnique Universitaire/Université Nationale du Bénin. Abomey-Calavi, Cotonou, Bénin, 56 p.

PILET, C. et BOURDON, J.I. (1981) Bactériologie médicale et vétérinaire. 2éme édition, 2[ème] édition, Tome II. Paris-France, 108-184.

VILLATE, D. (1997) Maladies des volailles. Edition Agricole, Paris-France, 68-69.

~~~~~~
~~~~~~

Potentialities of the indigenous chicken and its role in poverty alleviation and nutrition security for rural households

K. SARKAR* and J.G. BELL

Smallholder Livestock Development Project (SLDP) in Five Southern Districts, Dhaka, Bangladesh

***Corresponding author: <sldp2noa@bdonline.com> or <sarkarkalidas@yahoo.com>**

Submitted for publication 30 April 2006; received in revised form 24 December 2006; accepted 31 December 2006

Summary

It is a common perception among poultry specialists that the production potential of indigenous chicken is very low due to its inherent genetic characteristics, and consequently their contribution to income generation and household nutrition security is obviously not efficient and satisfactory. But results from field studies reveal that indigenous or *deshi* chickens are able to contribute efficiently and economically, if small interventions are made in a few aspects of their traditional husbandry practices. In the traditional management system, hens are over-burdened with a wide range of activities and tasks. They lay a clutch of eggs, hatch chicks, brood and rear them for a considerable period of time and thus accomplish a production cycle within 125-130 days. Altogether only 3 production cycles can be achieved from a hen in a year. In a production cycle, a hen is able to contribute less time for productive purposes and spends much time undertaking tasks like brooding and rearing of chicks. Weaning of chicks at an early stage of life and practicing creep feeding in low-cost bamboo made houses are appropriate technology for increasing the survival rate of chicks and increasing the frequency of egg production by the indigenous hens. Minimum balanced feed supplementation, along with weaning, helps to reduce the length of production cycles and maximize the laying performances of scavenging hens. Higher survival rate of chicks and more eggs from a hen in a year obviously increase the income and nutritional status of the households who raise chickens.

Keywords: creep feeding; family poultry; poverty alleviation; nutrition security; weaning

Introduction

Almost every household in rural areas keeps a small flock of scavenging poultry, generally known as backyard or family poultry, and the birds are usually indigenous chickens. Backyard poultry enriches the poorest of the poor and rural landless labour families through a holistic and self-reliant approach not only in terms of improving income, employment and nutritional status but also in terms of fostering community development, gender empowerment and protection of the environment.

Bangladesh has a great diversity of native chickens. Most native chickens of Bangladesh have a coloured appearance, meat that tastes good but low productive performance due to broodiness (Mollah *et. al*., 2005). But, Sonaiya (1995) stated that the low productivity of scavenging chicken is due to the management system and the variability in quality and quantity of feed, rather than inherent low productivity. In traditional husbandry practices, indigenous chickens are over-burdened with a wide range of activities and tasks (Guèye, 2005). In a production cycle, a hen spends much time undertaking tasks like brooding and rearing chicks and has little time spare for productive purposes.

Therefore, for enhancing productivity, efficiency and profitability of indigenous chickens, practical interventions should be developed. In the present paper, interventions adopted in the field to enhance the potentialities of indigenous chickens are discussed. Emphasis is also given on how the enhanced productivity could contribute to poverty reduction, as well as food and nutrition security for rural households.

1. Productivity of indigenous chickens in the traditional management system

In the traditional system of management, a hen performs a number of activities and tasks and may be categorised as production and management activities, respectively, which are:

1. Productive activities:
   i. Laying eggs;
   ii. Hatching chicks.
2. Management activities:
   i. Brooding and taking care of chicks;
   ii. Protection chicks from predators;
   iii. Familiarizing chicks with scavenging feed resources;
   iv. Teaching them the technique of scavenging.

All these activities take place in an orderly fashion called a production cycle. The cycle starts with laying, followed by the acts of brooding and rearing. A clutch length comprises 11-21 days, incubation of eggs takes 21 days, and for brooding and rearing of chicks a hen spends 70-90 days, thus accomplishing a production cycle within 102-132 days. A hen can altogether complete only 3 production cycles in a year. The activities of native hens are categorised in terms of percentage of days in a year (*Table 1*).

Table 1 Hen's activities in terms of percentage of days.

Activities of hen	**In one year period**	
	No of days	**% of days**
Laying eggs	40-65	11-18
Incubation	63	17
Brooding, rearing and body maintenance	237-262	65-72

From the above table it can be seen that a hen can spare only about 128 (35%) days for production and about 237 (65%) days in a year for brooding, rearing and maintenance of her depleted body conditions. She can only spare bare a minimum time for egg production. During this short span of productive time, native chickens of Bangladesh lay only about 43 eggs per hen per year under the scavenging system in rural areas (Huque and Huque, 1990), but Ahmed and Hasnath (1983) reported 40-45 eggs per hen per year. Egg production of native chickens in Ethiopia and Nigeria were reported by Tadelle *et al*. (2000) and Bessei (1987) as 40 and 30 eggs per hen per year respectively.

Sonaiya (2005) stated that, in Nigeria, the mean flock size was 16 birds per household and hens mature at 24 weeks of age, producing 3 clutches of 10 eggs each (30 eggs/year), 86% of which hatched, with only 33% chicks surviving. The results of our field study on the productivity of indigenous chickens in Bangladesh without interventions are presented in *Table 2*. It was found that only 15-40% of the chicks that hatched survived up to the market age of 90-100 days.

Table 2 Productivity of native hens and survival rate of chicks under traditional management in rural condition.

Activities	Number/clutch	Number/year
1. Egg production / hen	12-18	40-54
2. Hatching chicks / hatch	8-12	24-36
3. Chicks survived up to market age (90-100 days)	2-5	6-15

From the above result and discussion it is revealed that the productivity of indigenous chicks under traditional system of management is fairly low. But a question can be asked as to whether this low productivity is due to inherent genetic characteristics or due to the system of management.

2. Low productivity of indigenous chicken and its causes

It was found that native hens can spare only 40-65 days in a year for egg production and spends 237-262 days for brooding and rearing of chicks. By intervening, it is possible to complete these tasks of brooding and rearing within only 24-30 days. A production cycle therefore is completed within (21 days for laying + 21 days for incubating + 24 days for brooding and rearing): 66 days instead of 130 days. By saving the time spent for management activities and sharing it for production purposes, it is possible to harvest on an average 5.53 production cycles per year from a hen instead only 3. A native hen can lay eggs in 5.5 clutches of which 15-18 (18 x 5.5=99) eggs per clutch in a year. By intervening in management practices, egg production of native chickens can simply be doubled.

This productivity potential of native hens has been reported by Sonaiya (1995), Prasetyo *et al*. (1985) and Huque *et al*. (1990). Sonaiya (1995) stated that the low productivity of scavenging chickens is due to the management system and the variability in quality and quantity of feed rather than inherent low productivity. Prasetyo *et al*. (1985) conducted an experiment to study the effect of chicks and hen separation on village chicken egg productivity. The effect of the hen's activities on production performances of the study is presented in *Table 3*.

Table 3 The effect of hen's activities on egg production.

Hen activities			Production parameters (one year)	
Lay	Hatch	Rear	Brooding days	Egg production (No.)
+	+	+	257	52
+	+	0	145	115
+	0	0	125	132

Source: Prasetyo *et al*. (1985).

From the above facts and discussions, it is revealed that the low production potentialities of native chickens are mainly due to the system of management but not due to their inherent genetic characteristics.

3. What are the critical issues for low productivity of indigenous chickens?

The issues, which appeared to be critical for low productivity of indigenous chickens, are presented below:

1. Hen spends more time for:
   a) brooding, rearing and taking care of chicks, and
   b) maintenance of her depleted body conditions, and manages to spare little time for egg production.
2. Strong competition between productive and non-productive surplus chicken population for feed in households.
3. Lack of quality feed and sufficient quantity of feed during incubation, maintenance and laying periods.
4. Insufficient disease control measures.

It was observed in *Table 1* that native chickens spend more time to undertaking management activities and less time for laying and incubation, 128 days in production and 237 in brooding, rearing and maintenance.

Rural households keep many non-productive, surplus stocks in backyard flocks. The flock size kept by the households depends mostly on their socio-cultural and economic circumstances.

We found that among the total chicken population of the households in the Smallholder Livestock Development Project in Five Southern Districts (SLDP2) only 43% were layers and 14.55% of them were hens currently in laying condition. A large population, about 39% of the total chickens, was found surplus and non-productive. This surplus chicken population obviously exerts pressure on the availability of scavengeable as well as supplemental feed to the productive stocks. A breakdown of the indigenous chicken population in the SLDP2 project area is presented in *Table 4*.

Table 4 Breakdown of indigenous chicken population in households of the SLDP2 project.

Parameters	No	%
1. Total chicken population of the households	2673	100
2. Layer among total population	1147	42.91
2.a. Layers found currently laying	389	14.55
2.b. Layers presently incubating	203	7.59
2.c. Layers presently brooding	189	7.07
2.d. Layers in maintenance phase	366	13.69
3. Breeding cocks	115	4.30
4. Replacement cocks (at 20% of cocks)	23	0.86
5. Replacement pullets (at 30% of layers)	344	12.86
6. Surplus stocks kept by the households	1044	39.05

Note: Data summarized from 168 households of 3 Districts of SLDP-2 in the Noakhali region, Bangladesh.

In Bangladesh, chickens managed to get on an average 14-25 g scavengeable feed per head per day (Huque *et al*., 1992). Studies carried out in Nigeria revealed that the availability of scavengeable feed varies from as low as 8.6g per head per day to 26.9g per bird per day (Sonaiya *et al*., 2002). It is therefore found that there prevailed a shortage of feed in the scavenging feed resource base, and competition between non-productive surplus and productive stocks certainly influences the productivity of laying hens. Backyard chickens rely heavily on scavenging, with very irregular supplementation, and energy is the first limiting nutrient. Since the bulk of scavengeable feed is fibrous, chickens respond dramatically to energy supplement. Protein, especially insects and worms, are more readily available. But, in dry seasons, mineral and vitamin deficiency are common. On farm trials indicate that a combination of vaccination against Newcastle disease (ND) and feed supplementation significantly increased the average clutch of hens (Sonaiya, 2005). From the above discussion it is revealed that feed and management appeared to be most critical in increasing the productivity of native chickens rather than its inherent characteristics.

High mortality of chicks also appeared as critical. The survival rate of chicks in village conditions varies from 15% to 40%. High mortality of chicks is the main constraint of expansion of backyard poultry flocks. Low survival of chicks also reduced household income and consumption. Therefore, high chick mortality also seems to be critical in addressing the productivity of chickens and in turn the income and nutritional security of rural households. The causes of low survival of chicks as identified from the field are as follows:

1. Scavenging from early days of life;
2. Malnutrition;
3. Diseases;
4. Predators.

4. Interventions to address the productivity of hens and survival of chicks

The interventions needed to increase the productivity of native chickens and also to increase the survival rate of chicks are given below:

1. Weaning of chicks (separation of broody mother from chicks) at an early stage of the chicks' life;
2. Creep feeding of chicks with high protein diet under confinement during the vulnerable period (up to 4 weeks) of their life;
3. Timely vaccinations of chicks. After 4 weeks, semi-scavenging management practices should be adopted to minimise the cost of production;
4. Balanced supplementation of a portion of hen's ration during incubation, maintenance and laying periods;
5. Timely marketing of chickens.

5. Modalities of intervention for maximizing the potentialities

Modalities of interventions, which would be adopted for field applications to maximise the potentialities of native chickens, are:

1. Separating baby chicks from their mother within 5-7 days after hatching in summer and after 10-15 days in winter (in Bangladesh climate). Chicks that are separated should be kept out of sight of broody mother. This removes the instinct of broodiness of mother, and she comes to lay within 15-20 days after separation. It increases the clutch size of hens.
2. Creep feeding of chicks under confinement up to 4 weeks in low-cost bamboo made houses with high protein diet (broiler starter ration, 20-22% crude protein and 2900-3100 Kcal metabolisable energy/Kg of feed), thereafter prac-

ticing semi-scavenging management. This combats malnutrition, predation and increases the survival rate of chicks. A faster growth rate of chicks can be ensured, and disease control measures can easily be taken.

3. Providing 30-50g balanced feed per hen per day during incubation, maintenance and laying periods in addition to normal scavenging. This minimises the body weight loss of broody mother during incubation. The broody mother regains her lost body weight within a short period of time and starts the next clutch quickly. A balanced supplementation helps to harmonise the hormonal rhythm in the production cycle.
4. Regular vaccination, medication and deworming of chicks and mother. Vaccination of chicks against Newcastle disease and fowl pox increases survival rate of chicks. Water-soluble vitamins and anti-helminthes increase growth rate. Timely administration of anti coccidial drugs to prevent coccidosis.

6. Loss of weight of broody hen during incubation and its effect on egg production

Women in rural communities usually do not offer any feed to the broody hen during incubation. It seems that many are prejudiced against feeding of broody hens in Bangladesh. From our study, it was found that under traditional management, the hen lost 27-35% of her body weight at the time of incubation, and it takes more than two months to regain it. So long as the hen cannot regain her lost body weight, she cannot start the next clutch. Feeding of the broody hen during incubation definitely increases the egg production of native chickens. The body weight loss and the pattern of its regain and effect of different levels of feed on hens are presented in *Table 5*.

Table 5 Body weight loss of broody hens and pattern of regain during incubation.

Parameters	Minimum	Maximum	Mean ± SD
Weight of hen when eggs set (g)	1200	1800	1439 ± 144
Weight of hen at hatch out day (g)	825	1450	1059 ± 161
Loss of weight during incubation (g / %)	300 / 18	500 / 35	380/27 ± 64/5
Weaning after hatch (days)	13	31	19 ± 6
Weight of hen at weaning (19 days after hatch)	900	1500	1175 ± 158
Weight regain at weaning (g / %)	50 / 3	250 / 25	116/5 ± 58/7
Weight of hen 15 days after weaning	1040	1700	1273 ± 166
Weight regain 15 days after weaning (g / %)	100 / 8	400 / 36	214 / 21 ±77/9
Weight regain in each day (g)	6.32	7.35	6.26

Note: Data collected from 6-9-04 to 31-12-04 from 53 broody hens of 23 households in Noakhali region of Bangladesh.

Table 6 shows the effect of different levels of feed supplementation on body weight loss and regain. Among feed regimes, 30-60g feed per day per broody hen gives the best result in minimising loss and regaining weight. In traditional feeding, it takes 64 days to regain the lost weight of hen during incubation. In case of 30, 60, 90 g feed per day, it needs only 20, 10 and 10 days, respectively. A little supplemental feed during incubation also minimised the body weight loss of broody hens. Supplemental feeding during incubation reduces the time needed for body maintenance of hen and contributes to increased egg production by increasing clutch size and reducing the length of production cycle of hens.

Table 6 Effect of different levels of feed on body weight loss and regain.

	Loss of weight (%)	Loss of weight per day (g)	Time for regaining weight (day)
Traditional feeding	27	18	64
30 g feed/day	10	6	20
60 g feed/day	6	3	10
90 g feed/day	5	3	10

Note: Data obtained from 18 broody hens of 18 households of Noakhali district, Bangladesh in February, 2006.

7. Effect of weaning on performance cycle and productivity of chicken

Early weaning of chicks (separation of chicks from broody mother) is the best possible way to increase the egg production of indigenous chickens. It is found that a hen spends a fairly long time (at least 80-90 days per batch) for brooding, rearing and scavenging. It might be regarded as the root cause of low egg production of native hens. By cutting down the time through the technique of weaning, the egg production capabilities of hens could be doubled. The effect of early weaning of chicks on performance cycle and productivity of hens is presented in *Table 7*. Data presented in the table were obtained from random monitoring of field activities during the time of district workshops of SLDP2 project and also during the time of regular field monitoring.

Table 7 Effect of early weaning of chicks on performance cycle and productivity of hen.

Parameters	Minimum	Maximum	Mean
Weaning after hatch (brooding days)	4	14	7
Weaning to next clutch (body maintenance days)	11	25	17
Length of laying clutch (egg laying days)	17	26	21
Incubation days	21	21	21
Length of a performance cycle (days)	53	86	66
No. of performance cycle /hen /year	4.24	7	5.53
Egg production per layer/clutch	13	22	18
Egg production/layer in a year	55	110	99

Data summarised from 168 households and on 368 batches of chicks and 368 production cycles from 8 upazilas in SLDP2.

From the above results, it is seen that a performance cycle of a hen is completed within 53-86 days, with a mean of 66 days. Shortening the length of production cycle contributed to an increased number of clutches, was 4.24 to 7 per year, with a mean of 5.53. Egg production in a clutch varies from 13-22, with a mean of 18. By early weaning of chicks, the egg production of a hen is increased up to 110/year with an average of 99 (27-30 % production/hen/year). This production is just double in comparison to traditional management of native chickens. The production cycle of native hens in traditional systems of management and those with interventions are shown in *Figure 1*.

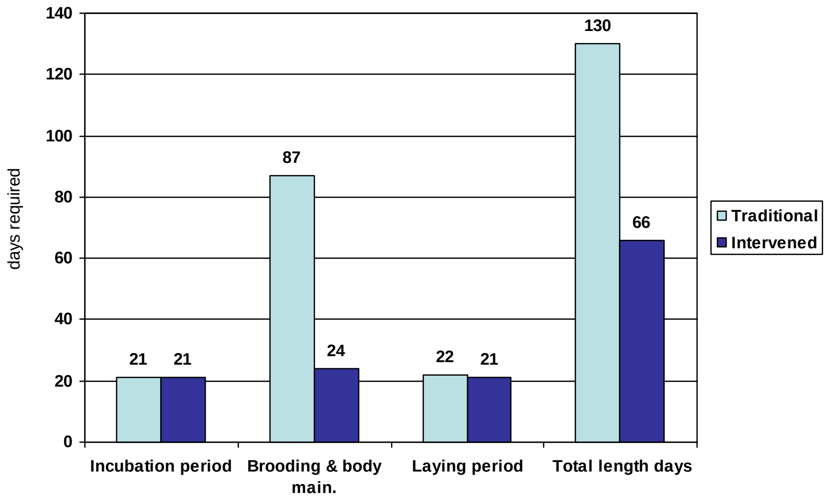


Figure 1 Production cycle of hen in traditional systems of management vs. those with interventions.

The figure demonstrated that the separation of the hen from chicks certainly increases the productivity of native hens. This result is supported by studies of Prasetyo *et al*. (1985) and Huque *et al*. (1990). It is therefore revealed that the management plays the key role in regulating the production potentials of native chickens rather than inherent character.

8. Creep feeding that increases the survival rate of village chicks

Under traditional management in villages, chicks are allowed to scavenge with their broody mother just after hatching. Rice or broken rice available in the house is given as feed with or without water. In the early days of life, young chicks are not able to eat this type of low quality and hard feed, naturally they suffer from malnutrition and, within a week, they start dieing. Nevertheless, they become the prey of predators and diseases. It is observed that, within 10-15 days after hatching, about 60-80% chicks have died. High mortality of chicks is the main constraint for expansion of back-yard chicken flocks in rural communities and may be the major impediment to increasing income from raising chickens. Creep feeding of chicks with a high protein diet under confinement during the vulnerable period of their life increased their survival rate. The results of creep feeding on survival of chicks in village conditions in SLDP2 project of Noakhali region are shown in *Table 8*.

The results show that creep feeding significantly increased the survival rate of the chicks. The more chicks survive, the more chickens farmers will consume, and they also earn more money by selling them.

Table 8 Creep feeding and survival of chicks in village conditions.

Parameters	Total of upazila	Max. /upazila	Min. /upazila	Mean ± SD /upazila
Eggs set for hatch	5808	1056	217	726 ± 265
Chicks hatched	5064	1008	181	633 ± 248
Hatchability (%)	87	95	83	87 ± 4
Chicks survived	4666	991	162	583 ± 247
Survival (%)	91	98	85	91 ± 4
Survival % up to 3 weeks	93	99	87	93 ± 3
Survival % up to 10 weeks	88	97	79	88 ± 6
No. of chicks/household/month	31	46	18	31 ± 10

Note: Data summarised from 397 broody hens and 168 households in Noakhali, Laxmipur and Feni districts of Bangladesh

Another study was conducted in the SLDP2 project area where creep feeding was maintained for four months in 20 households, and a total of about 80 broody hen's chicks performances were studied from different batches to know their growth rate, feed efficiency, mortality and investment-profit ratio (*Table 9*).

Table 9 Performance and profitability of indigenous chicks under creep feeding management.

Parameters	Maximum	Minimum	Mean ± SD
1. No. of chicks hatched/batch	20	8	13 ±3.41
2. No. of batches/unit per month	6	2	2.70 ±1.17
3. Hatchability (%)	100	93	93 ±0.10
4. Age at marketing (weeks)	13	5	9 ±1.54
5. Body weight at marketing (g)	550	375	462 ±385
6. Mortality up to market (%)	15	0	7.69 ±6.57
7. FCR (Feed intake kg/ kg body wt)	2.00	4.91	3.04 ±2.93
8. Feed cost/batch (BDT)	376	110	214 ±79.60
9. Cost of vaccination, medication (BDT)	100	10	46 ±29.38
10. Income/batch (BDT)	1400	300	645 ±247
11. Net profit /batch (BDT)	924	180	385 ±183
12. Investment : profit ratio	1:2.00	1:1.50	1.1.75

FCR: Feed conversion ratio; BDT: Bangladesh Taka (US$ 1 = BDT 67.00)

From the results in *Table 9*, it is seen that creep feeding increased the survival rate of chicks in village conditions and which undoubtedly contributes to increasing the income of the households who practiced the system. Highest income was found BDT 924 / batch, with a mean of BDT 385. Investment and net profit ratio varied from 1:1.50 to 1:2.00, with a mean of 1:1.75.

9. Income generation and poverty reduction in households from raising poultry

In many projects in Bangladesh, exotic hybrid genotype (RIR X Fayoumi) chickens were used as a tool for poverty reduction of majority of the target people. But the targeted income was not achieved. The average income of farms using this hybrid (95% of target people) of SLDP2 was estimated only BDT 226 (US$ 3.30) per month by Riise *et al*. (2005). But as soon as the beneficiaries adopted the technology of weaning and creep feeding, their income increases significantly within 3-4 months. Data collected during regular monitoring of field activities regarding the income of SLDP2 beneficiaries are presented in *Table 10*.

Table 10 Monthly income of household from raising poultry.

Parameters	Maximum	Minimum	Mean
Income excluding household consumption (BDT)	2163	360	897
Income including household consumption (BDT)	3256	579	1462

Income range of households	No. of households	% of households
BDT 360 - 600	84	50
BDT 700 - 1100	48	29
BDT 1200 - 2000	30	17
BDT 2100 and above	6	4

The above data revealed that monthly income per household from raising poultry varies from BDT 360 to 2163, with an average of BDT 897, without considering the value of household consumption of eggs and chickens. But, when the value of consumed eggs and chickens is taken into account, the income of the households increases by 39%. Inter-household income range varies significantly depending upon the interventions and adoption of technology. Alleviation of poverty is a large canvass, and holistic approaches are needed for it. It is beyond doubt that, through rearing of indigenous chickens by adopting early weaning and creep feeding technology, the income of rural households increased significantly.

10. Nutrition security for rural households and the role of indigenous chickens

Nutrition security implies access by all people at all times to enough nutritious food for an active and healthy life. Nutritious food, especially protein rich food, is required to combat malnutrition. Eggs and chicken meat play a pivotal role in combating malnutrition for the rural communities. Poor rural people have got a very limited capacity to afford protein-rich food for their family. But it is seen that with increasing the production of eggs and chicken, net protein consumption of the households increases significantly. Information was collected to know the consumption scenario of eggs and chicken meat among the SLDP2 project beneficiaries (*Table 11*).

Table 11 Monthly consumption of eggs and chicken meat by the beneficiaries.

Parameters	Minimum	Maximum	Mean
Members per household	5	9	7
Egg consumption / household	12	90	39
Egg consumption / head	2	10	6
Meat consumption / household (g)	1533	6573	3277
Meat consumption / head (g)	374	1103	584

Note: Data summarized from 168 households

The mean *per capita* consumption of eggs and chicken meat per month was found to be 6 and 584g, respectively, among the SLDP2 project beneficiaries. Annual per capita consumption of egg and chicken meat in the country was 12 and 3700g, respectively (BBS, 1998). Saleque (2005) reported *per capita* consumption of meat per year as only 1.3 kg. The data available regarding the consumption of eggs and chicken meat by the population of the country is just an idea; it is not at all an accurate reflection of the true situation. However, it is beyond any doubt that the consumption of chicken meat and eggs among the SLDP2 beneficiaries was many times higher than that of national average. Therefore, it can be concluded that raising indigenous chickens in a system of management with interventions ensures nutrition security of the rural households.

Conclusions

- The low production potential of native chicken is mainly due to the system of management rather than their inherent characteristics.
- Potentiality of native chickens can easily be doubled through adopting of the technology of early weaning and creep feeding.
- Weaning and creep feeding increases the survival rate of village chicks.
- Increased egg production and more chicks survived, sold and consumed would contribute to poverty reduction and nutrition security of rural households.
- By combination of the technology of “weaning and creep feeding” along with “backward and forward linked packages”, backyard poultry sector could emerge as a giant export oriented “organic native chicken” industry.

References

AHMED, A. and HASNATH, M.A. 1983 A study on the heritability estimates of body weights of indigenous chickens. *Bang. Vet. J.* 17: 19-24.

BESSEI, W. 1987 *Tendencies of world poultry productions*. Proceedings of 3rd.internatinal DLG-Symposium on Poultry Production in Hot Climates, Hamelin, Germany, pp. 8-34.

BANGLADESH BUREAU OF STATISTICS (BBS) 1998 Statistical pocket book of Bangladesh Ministry of Planning, Govt. of the People’s Republic of Bangladesh, Dhaka, Bangladesh, pp. 373-374.

GUÈYE, E.F. 2005 Gender aspects of family poultry management systems in developing countries. *World’s Poultry Science Journal* 61: 39-46.

HUQUE, Q.M.E. and HAQUE, M.E. 1990 The onset of lay in indigenous hens following hatching of chicks. *Poultry Advisor* 23: 57-60.

HUQUE, Q.M.E., EBADUL, M.H. and RIGOR, E.M. 1990 The effect of chick separation on productivity of hens and chicks. *Asian Australian Journal of Animal Science* 3: 121-123.

HUQUE, Q.M.E., UKIL, M.A., HOSSAIN, M.J. and HAQUE, M.E. 1992 Nutritional status of scavenging hens in Bangladesh. *Bangladesh Journal of Scientific Research* 10: 217-222.

MOLLAH, M.B.R., ALI, M.A., ISLAM, M.S. and ALAM, M.S. 2005 Evaluation of frizzle, nacked neck and non-descriptive chickens of Bangladesh using randomly amplified poly-morphic DNA markers. Proceedings of 4th International Poultry Show and Seminar, 2005, World's Poultry Science Association, Bangladesh Branch, pp. 196-198.

PRASETYO, T., SUBIHARTA, W.D. and SABRANI, M. 1985 *The effect of chick and hen separation on village chicken egg productivity*. Research report 1984-1985, Research Institute for Animal Production, Indonesia, pp. 22.

RIISE, J.C., CHRISTENSEN, P.F., KRYGER, K.N. and SEEBERG, D.S. 2005 *Study on Danida support to the Livestock Sector - Small holder poultry sub-sector in Bangladesh*, Vol. 1, Main Report.

SONAIYA, E.B. 1995 Feed resources for smallholder rural poultry in Nigeria. *World Animal Review* 82(1): 25-33.

SONAIYA, E.B. 2005 Research, development and outreach in family poultry in Nigeria. Proceedings of 4th International Poultry Show and Seminar, 2005, World's Poultry Science Association, Bangladesh Branch, pp. 157-161.

SONAIYA, E.B., OLUKOSI, O.A., OBI, O. and AJUWON, K.M. 2002 Vaccination, feed supplementation and feed resources for scavenging chickens. Proceedings of the 3rd Scientific Coordination Meeting of FAO/ IAEA, 6-10 May 2002, Quatre Bornes, Mauritius, www.iaea.or.at/progammes/nafa/d3/mtc/sonaiya.doc-pdf

SALEQUE, A. 2005 Hygienic broiler meat production and processing: A new market opportunity in Bangladesh. Proceedings of 4th International Poultry Show and Seminar, 2005, World's Poultry Science Association, Bangladesh Branch, pp. 65-69.

TADELLE, D., ALEMU, Y. and PERES, K.J. 2000 Indigenous chicken in Ethiopia: genetic potential and attempts at improvement. *World's Poultry Science Journal* 56: 45-54.

~~~~~~
~~~~~~

SHORT COMMUNICATION No 1:

The rice husk hatchery in the microfinance and technical support project in Bangladesh

J. NAHAR[1]*, K.A. FATTAH[1], S.M. RAJIUR RAHMAN[1], Y. ALI[1], A. SARWAR[1], E. MALLORIE[2] and F. DOLBERG[3]

[1]Palli Karma-Sahayak Foundation (PKSF), PKSF Bhaban, Plot: E-4/B, Agargaon Administrative Area, Sher-e-Bangla Nagar, Dhaka-1207, Bangladesh; [2]4 Addisland Court, Holland Villas Road, London W14 8DA, UK; [3]Department of Political Science, University of Arhus, 8000 Arhus C, Denmark

***Corresponding author: <jebunnahar@pksf-bd.org>**

Submitted for publication 11 January 2007; received in revised form 12 January 2007; accepted 12 January 2007

Introduction

Sonaiya and Swan (2004) describe in chapter 5 of a manual on small-scale poultry production how artificial incubation techniques have evolved over thousands of years in many parts of the world and that one such technique was the parched or heated rice technique developed for hatching duck eggs in China. They go on to explain that as duck egg-shells are less brittle than chicken eggs, the system was never adopted for chicken eggs in China. However, after the technology was introduced into Bangladesh in the 1970s chicken egg hatching was found to be equally successful, but in smaller bundles of 30-40 eggs (Sonaiya and Swan, 2004). The purpose of this short article is not to repeat the description of the technology as presented by Sonaiya and Swan (2004), but to present some results from the Microfinance and Technical Support Project (MFTSP) in Bangladesh, where the technology is successfully applied and it is an attempt to identify some factors that we consider to be critical for successful application of the technology in a development project.

MFTSP is being implemented by the Palli Karma-Sahayak Foundation (PKSF, www.pksf-bd.org) through 24 of its Partner Organisations (POs). PKSF ("Rural Employment Support Foundation") was established in 1990 as an apex microcredit funding organisation for eradication of poverty. It provides loan funds to 200 NGO-MFIs (micro-finance institutions), who are its POs. Dr. M. Yunus, who pioneered micro-finance in Bangladesh and won the 2006 Nobel Peace Prize for his work, is on the board of PKSF. MFTSP is supported by a loan from the International Fund for Agricultural Development (IFAD).

A series of smallholder livestock projects implemented in Bangladesh, since the early 1990s with support from donors such as IFAD, Danida and the Asian Development Bank (ADB), had attempted to introduce the hatching technology, but these efforts had failed to such a degree that when the MFTSP was appraised in 2002, it was not – according to the appraisal report – advised to use the technology.

The mini-hatchery in MFTSP

In MFTSP, the parched or heated rice technique is called the mini-hatchery. The units can vary in size with a capacity for a few hundred eggs to several thousands, and the establishment cost in MFTSP ranges from about US$10 to 425 per hatchery. They can be set up in areas with no electricity.

The results of 1072 completed batches are summarised in *Table 1*.

Table 1 A summary of results with the rice husk hatchery in MFTSP by September 2006.

Women trained by the project	93
Operating units	129
Batches hatched	1072
Average number of eggs set per batch	432
Chicks hatched per batch	315
Hatchability	73%
Purchasing cost of fertile eggs	Taka* 5.5
Production cost per batch	Taka 2731
Selling price of day-old chick	Taka 17
Average gross income per batch	Taka 4636
Net income per batch	Taka 1905

*US$ 1 = Bangladesh Taka 69

The table requires some explanations.

The Project Coordination Unit (PCU) at PKSF has had responsibility for training 93 women in the hatching technology. However of these 93 it is estimated that 24 have stopped their hatching work and dropped out, but as the technology is established the POs themselves begin to facilitate training and the result is that there are a total of 129 operating units.

The hatchability of 73% is very satisfactory. Sonaiya and Swan (2004) reported that hatchability from 65-75% should be expected.

Why does it work in MFTSP?

It is obvious to ask the question as to why the technology works in MFTSP in view of the fact that it was much less successful in other projects.

We offer these explanations:

– Duration and type of training: The training is "hands-on" through a full hatching cycle from the time that the eggs are set and till the chicks or ducklings are hatched. Class room instructions are provided, but there is a strong emphasis on learning by doing.

- Follow-up and monitoring: There is a very strong emphasis on follow-up and monitoring. These are strong features of PKSF's corporate culture and important reasons for its success with micro-finance. Accordingly it is not difficult to apply the same management principles to the mini-hatcheries.
- A role is also ascribed to modern information technology. Mobile phones are in practically all villages in Bangladesh due to the early initiatives of the Grameen Bank and Dr. Yunus, who introduced micro-credit loans for mobile phones (www.grameen-info.org/grameen/gtelecom). Accordingly every woman who operates a mini-hatchery is equipped with the number of the Project Coordinator's mobile phone and knows that if she is in trouble, she can access the person of highest authority within the project through a telephone call – and there may be a gender dimension here as it is a woman talking to a woman.
- In earlier attempts that failed the heavy workload associated with running the hatcheries was thought to be a problem as eggs had to be turned regularly, even during the night. In MFTSP, a simplification is introduced. Eggs are turned before bedtime at around 10 pm and not again till early morning and this works as it appears from the hatching rates.
- Business Development Services: There are in-built marketing arrangements in the project, and this contributes significantly to the success. Mini-hatchery owners buy their fertile eggs from other project participants, who run small parent farms in confined production systems to ensure the pureness of the parent lines which are Fayoumi females and Rhode Island Red males. Earlier works, including on-farm trials (Rahman *et al.*, 1997), have shown that the performance of this breed combination compares well under village conditions in Bangladesh. After hatching, the mini-hatchery sells their day-old chicks to another project participant, who runs a Chick Rearing Unit (CRU) and after 8 weeks the CRU sells to yet another category of project participants, who keep poultry for egg production. Any surplus of chicken may be sold in the local market.

Conclusion

It is concluded that it is possible to make rice husk hatcheries work successfully, and our finding is that it boils down to good management expressed through appropriate training and close monitoring.

References

SONAIYA, E.B. and SWAN, S. (2004) Manual on Small-Scale Poultry Production. FAO Animal Production and Health series. www.fao.org/docrep/008/y5169e/y5169e00.htm#Contents

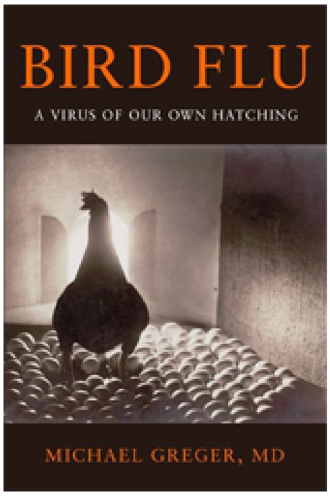
RAHMAN, M., SORENSEN, P. JENSEN, H. A. and DOLBERG, F. (1997) Exotic hens under semi scavenging conditions in Bangladesh. *Livestock Research for Rural Development* Vol. 9, No. 3: www.cipav.org.co/lrrd/lrrd9/3/bang931.htm

~~~~~~
~~~~~~

Bird Flu – A Virus of Our Own Hatching

■ **<u>Book reference</u>:**

Greger, Michael; *Bird Flu, A Virus of Our Own Hatching*; Hardcover; Lantern Books; New York, NY. 2006; ISBN 1-59056-098-1; List Price: $30.00; 465 pages; November 2006; www.birdflubook.com



■ **<u>Contact details of the author</u>:**

Michael Greger, M.D.; 2100 L St., N.W.; Washington, DC 20037; USA

Direct line: (301) 258-3110; Fax: (301) 258-3081; E-mail: <mhg1@cornell.edu>

■ **<u>Book Review written by</u>:**

Dr. Jonathan G. Bell, Community-Based Avian Influenza Control, Gedung BRI II, Suite 2807, Jl Jend. Sudirman No 44-46, Jakarta 10210, Indonesia,

E-mail: <jonathan_bell@dai.com> or <jonathangbell@gmail.com>

The strength of this book lies in the second section, in which the author discusses the conditions that made possible the emergence of highly pathogenic avian influenza virus. He explains how in China the new found proximity of large-scale intensive chicken production units to large numbers of ducks normally carrying non-pathogenic avian influenza virus provided the conditions in which the virus, after a myriad of possibilities for serial passage between hosts in close proximity, could mutate to a highly pathogenic variant. This discussion is very well supported by references to leading avian virologists. Dr. Greger also discusses in quite some detail the role of intensive poultry production in bacterial zoonoses.

Overall, the book is very well supplied with references. However, while there are quite a few references to primary research reports, there are also many references which are only to secondary sources. For example, it is disappointing to look up a reference on the key mutations required for the avian virus to hypothetically become capable of efficient human to human transmission, only to be referred to an article in *The New York Times*. The section on the hypothetical human pandemic will perhaps be of less interest to readers working in field of family poultry, particularly since it focuses largely on only the author's own country, the USA.

For those who already have an education in immunology, the military metaphors that are used to describe the immune system tend to be confusing: for example, one is left wondering how a 'grenade pin' fits in amongst the usual biochemical terminology.

The book is written with wit, and, lest we find the subject matter too heavy, the text is liberally sprinkled with puns such as "one flu over the chickens nest" and "flu year's eve". It is possible to read the entire book online at: www.birdflubook.com.

In avian influenza control circles one often hears it said that the more intensive the poultry production system is, the greater the "biosecurity" is: indeed, but this is out of necessity, just as in a broader sense outside the biological domain, the greater the level of industrialisation is, the greater is the need for security. What is forgotten is that the *lower* the level of intensification is, the greater the level of *hygiene* is amongst the poultry. At one extreme is the traditional totally extensive system with small numbers, with limited scope for the spread of highly pathogenic virus, because of the limited number of direct bird to bird contacts, and because virus in the droppings can be killed by sunlight. At the other extreme are the massive broiler production units in the US, where the litter is not even changed between batches. The virus is now present in family poultry, and of course if the family poultry was removed the virus in it would be removed, too. But if poultry production was to be "restructured" towards intensive production in response to avian influenza, as some are seriously suggesting, notwithstanding any short term effect on the current virus, the risk of emergence of new highly pathogenic avian influenza variants, not to mention other zoonoses, would be greatly exacerbated. It is the merit of this book to make this point abundantly clear.

~~~~~~
~~~~~~

WPSA/INFPD Meeting during the 12th European Poultry Conference in Verona, Italy *[12 September 2006]*

The purpose of the meeting was to strengthen collaboration between WPSA (World's Poultry Science Association) and its Working Group, INFPD, and upgrade the INFPD Newsletter. The following persons were present to the meeting: D. Martin, Editor of World's Poultry Science Journal (WPSJ); E.B. Sonaiya, Coordinator INFPD; E. Guerne-Bleich, FAO Animal Production Officer; E.F. Guèye, Editor of INFPD Newsletter; and R.A.E. Pym, Member of the WPSA Board and WPSJ International Editorial Board.

After introductory remarks and very positive appreciation of the collaboration between WPSA and INFPD so far, the convenor (E. Guerne-Bleich) stated the purpose of the meeting. There was extensive discussion on the three following points: (1) Mission Statement of INFPD, Working Group of WPSA; (2) The INFPD Newsletter until 2005; and (3) Proposal for the upgrade of INFPD Newsletter for 2006. After discussions relating to point (3), the following resolutions were adopted:

- Additional reviewers from various fields of family poultry science and from other institutions such as NGOs must be selected for the INFPD Newsletter Editorial Board.
- As from March 2007, some relevant, well-designed and well-written papers published in the INFPD Newsletter will also be published in the WPSJ, either as full articles or summaries. These contributions will be published twice a year in a new section of WPSJ called "Small-Scale Family Poultry". The advantages of doing this include: reaching wider readership; motivating scientists to publish their works on family poultry; providing more prestige for the work on family poultry, and attracting more scientists in this field.
- It must be stated that authors of papers to be published in the INFPD Newsletter are fully responsible for the accuracy of the references they provide in their manuscripts.
- While two reviewers will be needed to evaluate original papers selected by the Editor, review papers may be assessed by only one reviewer.
- Before any paper is accepted for publication in the INFPD Newsletter, appropriate author(s) must give their agreement to publish by completing and signing a copyright form. This is, for legal reasons, particularly relayed to online publishing.
- Some scientists may be invited to write papers on specific and topical issues of family poultry science. An editorial calendar will be drawn up to help plan this.
- The WPSJ first issue in 2007, Vol. 63 No. 1, will include the pilot integration with the section, Small-Scale Family Poultry, possibly as a supplement or as an integral part of the contents of that issue. The INFPD Newsletter Editor will prepare the Avian Influenza supplement for the WPSJ before the end of December 2006; for this he will take only the best 2-3 papers' summaries and the Editorial in English and it was proposed that E.B. Sonaiya and R.G. Alders will contribute two additional papers on Avian Influenza. The full papers will be translated into French and posted on the INFPD website and WPSJ readers will be oriented with an electronic link.

Appropriate actions will be taken to implement the adopted resolutions. It was also proposed that the coordinator of INFPD, Prof. E.B. Sonaiya, will prepare a letter to the INFPD members to announce these collaborative steps agreed during the Verona Conference.

~~~~~~

WPSA Travel Grant Programme

WPSA programme about providing travel assistance for young WPSA members and students to participate in regional and global WPSA conferences

It is generally agreed that enhancing the educational, research and experience opportunities of young poultry science professional and technical people is critical to the pace of development of more efficient poultry production, whether it is in an intensive technological industry or in small-scale, family production systems. It should also be stressed that any travel assistance we can provide should be independent of and in addition to that currently provided by World's Poultry Congresses, Regional Conferences or individual Branches. That is, it should target and benefit additional STUDENTS and YOUNG MEMBERS (both scientists and poultry producers) from developing countries and STUDENTS from developed countries. A scheme of open competition for such WPSA Travel Scholarships now is available.

To illustrate this, travel grants were provided to 17 people enabling them to attend the XXII European Poultry Conference held in September 2006 in Verona, Italy. The list of Travel Grant recipients is as follows:

Name of Recipient	WPSA Branch
Deniz Ilaslan	Turkey
Dr. I.V.P. Dharmawardena	Sri Lanka
Dr. H.P. Premasiri	Sri Lanka
Abbas Ali Gheisari	Iran
Payam Haghighi Khoshkoo	Iran
Bilgehan Yilmaz Dikmen	Turkey
Zafar Hayat	Pakistan
Zahid Nasir	Pakistan
S.G. Banga	India
Sandeep Gupta	India
Mehran Torki	Iran
Maria Enge'lica Fellenberg	Chile
S. Yuvaraj	India
P. Vasan	India
Tarek Amin Ebeid	Egypt
Yahya Zakaria Eid	Egypt
S. Ezhil Valavan	India
Mjid Toghyani Khorasghany	Iran
~~~~~~

Application form

You can download the application form in Word or PDF-format from the WPSA website: www.wpsa.com

Please send the application form, accompanied by a letter of recommendation from a well-known member of your Branch, to the general secretary of WPSA:

Dr Piet Simons
P.O. Box 31, 7360 AA Beekbergen, The Netherlands
Fax: +31 55 506 4858; E-mail: <piet.simons@wur.nl>

~~~~~~
~~~~~~