ASSESSMENT OF THE QUALITY LEVEL OF THE SUDANAESE STANDARDS AND RISKS ASSOCIATED WITH THE IMPORTATION OF HATCHING EGGS VIA KHARTOUM INTERNATIONAL AIRPORT

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المستخلص

هدفت هذه الدراسة لتقييم المخاطر الصحية المرتبطة باستيراد بيض التفقيس كما هدفت أيضا لتقييم المواصفات السودانية و الإجراءات المتبعة لها مقارنة بالمواصفات العالمية. تم جمع البيانات من وزارة الثروة الحيوانية والسمكية والهيئة السودانية للمواصفات والمقاييس بالإضافة الموقع الالكتروني الرسمي للمنظمة العالمية لصحة الحيوان. حللت المخاطر الصحية لاستيراد بيض التفقيس حسب الطريقة الموصوفة فى دستور المنظمة العالمية لصحة الحيوان للعام 2009. أظهرت نتائج تحليل المخاطر أن أجمالي (11,241,209) كتكوت و(62,307,030) بيضة تفقيس تم استيرادها خلال الفترة من 2005 إلى 2009م من 14 دولة , الذي يشكل مخاطر صحية قد تمكن من إدخال مرض أنفلونزا الطيور وبعض الأمراض الأخرى للبلاد. بالنسبة للحالة الصحية للدواجن في الدول المصدرة يعتبر مرض أنفلونزا الطيور مستوطن في مصر التي تعتبر الدولة المصدرة الرئيسة في عام (2005) . في عام 2006 أصيب حوالي ١٨.٣%

Key words: Hatching eggs, Standards, Importation, Sudan.

(المجموع الكلي = 235,626) وتمت إبادة 43.2% من المجموع الكلي للطيور المخالطة لنفس السبب. كما اظهر التقييم أن المواصفات السودانية لاستيراد بيض التفقيس لم يتم وضعهما وفقا لتقييم مخاطر يستند على أسس علمية كما هو متبع في المواصفات العالمية. كما أن الإجراءات الصحية المتبعة المطبقة للاستيراد كانت اقل صرامة مما لا يحقق الوقاية المطلوبة لذلك تمت التوصية بإجراء تحليل مخاطر على أسس علمية و حسب المعايير العالمية لصحة الحيوان بواسطة فريق متعدد التخصصات لتطوير المواصفات السودانية والإجراءات المتبعة في استيراد بيض التفقيس.

Abstract

This study was aimed to assess the quality level of the sudanese standards and risks associated with the importation of Hatching Eggs as well as the sanitary measures in place based on the World Animal Health Organization (OIE) standards. Data were collected from the Federal Ministry of Animal Resources and Fisheries (FMARF), the Sudanese Standards and Metrology Organization (SSMO) and from (OIE). For that purpose risk assessment was used as described in Section 2 of the (OIE, 2009). The results showed that a total of (11,241,209) chicks, and (62,3070,30) layers and broilers hatching eggs were imported into the Sudan during the period 2005 – 2009 from 14 countries, which may comprise potential risk of introducing Avian Influenza (AI) and many other diseases into the country. In viewing the poultry health status in the exporting counties, the Avian Influenza is endemic in Egypt, which represented the main exporting country of the two commodities in 2005. In 2006 about 18.3% out of 235,626 (susceptible population) were infected with Avian Influenza (AI) and 43.2% out of that (susceptible population) were destroyed for the same reason. Moreover, the sudanese standards of hatching had not been set according to scientifically based risk estimations and the sanitary measures in place were less stringent to achieve the appropriate level of protection. Therefore, a multidisciplinary scientific risk analysis following OIE standards are recommended for the importation procedures and setting the Sudanese standards.

Introduction

The nature of the poultry and poultry products commodities flow in the international trade comprises risks of introducing and spreading of diseases from country to country, which leads to probable outbreaks and unwanted impacts that permanently occur in all corners of the world. Some of the poultry diseases agents have regional impact; while others spread further e.g. pandemic of Highly Pathogenic Avian Influenza strain (HPAI) that occurred in many countries in Asia, Europe and Africa since 2003. Because of the pressure of liberalized trade, the increasing demands of poultry industry inputs nationally, and the avian diseases globally, there is a need for transparent processes to arrive at decisions which minimize the risks, considering the competency of the veterinary services in controlling the disease and ensuring the safety of these commodities. The World Trade Organization (WTO) standards are intended to provide clear identifiable references that are recognized internationally and encourage fair competition in free-market economies. The OIE Codes are recognized by the WTO as primary reference guides for international trade of animals and animal's products. The chapter on import risk analysis in the OIE terrestrial animal health code has been extensively revised to reflect recent changes in this field of veterinary epidemiology.
Since poultry industry sector has become very crucial to the Sudanese economy, with its considerable participation in food security, the government along with coordination and communication with various stakeholders should protect it from all probable diseases. This preliminary import risk analysis is an attempt intended as a decision-making tool to develop appropriate regulatory conditions with mitigations to address potential risks of poultry diseases introduction into the Sudan via Khartoum airport. The objectives of this research were:

1. To assess the probable risks associated with importation of hatching eggs
2. To evaluate the quality level of the sudanese standards of hatching eggs based on the international standards.

3. To evaluate the sanitary measures in place for the importation of hatching eggs.

Materials and Methods

Area of Study

Khartoum International airport (KIAP) is the major international airport in Sudan, situated in 15° 35' 22" North, 32° 33' 11" East in Khartoum town, one of the three towns comprising Khartoum capital. It forms the exit of imported commodities to other states by road network. KIAP is the only entry point through which 100% of the total amount of hatching eggs and day old chicks are introduced into the country.

Staff:

A)Staff of the Sudanese Standards and Metrology Organization airport – branch:

4 Veterinarians
4 Accountants
4 Drivers

B)Staff of the Quarantine and Meat Hygiene Department (QMHD)at the airport:

23 Veterinarians
3 Technicians
3 Labors
1 accountant
1 Driver

Sanitary procedures at Khartoum airport for the importation of hatching eggs consignments:

A joint committee composed of the Quarantine and Meat Hygiene Department (QMHD) (FMARF), and the Sudanese Standards and Metrology Organization SSMO, working 24 hours a day, inspecting the imported consignments of hatching eggs and day old chicks.

The following steps are implemented by the joint committee as standard national procedures:

1. Preliminary verification of documents of the consignments

2. Visual inspection:

Upon arrival in Khartoum airport, the consignments are visually inspected by the joint committee of Veterinary inspectors from (QMHD) and SSMO.

3. Verification of the consignments with the documents.

4. Certification of veterinary health certificate and quality certificate, or rejection of the consignment according to the findings.

Mention should be made that there is no animal quarantine facility at the Khartoum international airport is avialable. Neither the (QMHD) nor the (SSMO) collect samples for laboratory examination prior to issuance of entry permit of the commodities.

Data collection:

Data were collected from the monthly and the annual reports in the period from 2005 to 2009 from the Federal Ministry of Animal Resources and Fisheries (FMARF). Data on national Standards were collected from the Sudanese Standards and Metrology Organization (SSMO) – National Standard Directorate and the Khartoum airport branch. Data on Risk Analysis were collected from the guideliens of OIE terrestrial animal health code 2009 and from other research work. Data on exporting country poultry health status were collected from the official website of

OIE World Animal Health Information Department (WAHID). Other data were collected form the Argentina Veterinary Services and WTO and SPS agreement.

Data Analysis

Data of the imported consignments of hatching eggs were presented in tables and figures as frequency and percentage. Comparisons of the national standards of hatching eggs with the OIE recommendation, and national procedures of importation of hatching eggs were presented in tables.

The preliminary Risk Analysis:

Risk analysis questions:

- Were the consignments of hatching eggs considered as potential hazards?
- What was the likelihood of a HPAIV entering, establishing or spreading in Sudan by the importation of these commodities?
- Can the etiological agents HPAIV be detected by the Sudanese measures at the Khartoum Airport?
- What were the magnitudes of harm that will result from HPAI to poultry, human life or health, and the environment?

The methodology used in this risk analysis followed the guidelines as described in Section 2 of the OIE (2009). Preliminary qualitative risk analysis steps are:

I. Hazard Identification

Identification of the Avian Influenza Virus (AIV) which could potentially produce adverse consequences associated with the importation of hatching eggs.

II. Risk Assessment:

1- Release assessment – the likelihood of the (AIV) being imported in the hatching eggs.
2- Exposure assessment – the likelihood of the animals or human in Sudan being exposed to the potential hazard of Avian Influenza.
3- Consequence assessment – the consequences of entry, establishment or spread of the (AIV).
4- Risk estimation – a conclusion on the risk posed by the (AIV), consisted of integrating the results from release assessment, exposure assessment, and consequence assessment to produce qualitative measures of health and environmental risks. If the risk is no-negligible, then the organism was classified as a hazard.

III. Risk Management.

The recommended options to manage the risk of introducing the Avian Influenza into Sudan.

Results

Compared with a similar developing country, the Sudanese procedures for the importation of hatching eggs were not based on scientific risk analysis. For instance, there were no documented procedures for a formal decision based on risk analysis as well as no laboratory tests were conducted (table١). Comparisons of the Sudanese standards of hatching eggs with the international recommendations revealed that the OIE recommendations were not specified in the Sudanese standard of hatching eggs, the rest of the criteria are presented in (Table 2). Regarding the Sudan poultry health status, about 18.3% (out of 235,626 susceptible population) were infected with Avian Influenza (AI) and 43.2% (n= 101,814) were destroyed due to the same reason in 2006, while Infectious Bursal Disease (IBD) was reported in 2008: out of 6000 susceptible

population 68.3% (n= 4,100) were infected (Table 3). A total of 11,241,209 chicks, and 62,307,030 layers and broilers hatching eggs were imported into the Sudan in the period 2005 – 2009 from 14 countries, which may comprise potential risk of introducing Avian Influenza (AI) and many other diseases into the country. In viewing the poultry health status in the exporting counties, the Avian Influenza is endemic in Egypt, which represented the main exporting country of the two commodities in 2005 and was resolved in the rest of the countries according to the OIE notification. Ommat and Elhaj Soleiman were the most importing companies of hatching eggs during the period 2005 – 2009. Results are summarized in (Table 4 and 5, Figure 1)

Table (1): comparison between Sudan and Argentina in procedures of importation of hatching eggs

Activity/ status	Sudan	Argentina
WTO membership	**Observer**	**Member1995**
OIE membership	**Yes**	**Yes**
National standard of Hatching Eggs and Day Old Chicks conformity with the OIE standards	**No**	**Yes**
Import risk Analysis	**No documented procedure for a formal decision making process, based on risk analysis was presented.**	**Conducted**
Quarantine and control measures at the airport	**Visual inspection No quarantine facility Infected commodities can not be detected**	**Hatching Eggs are hatched at the airport**
Laboratory Tests	**No laboratory test is conducted, (only visual examination). And the shipment is released in no time after that**	**Serological tests are conducted for END, AI, mycoplasmosis, and *Salmonellosis*, (these hazards are determined by import risk analysis) And the shipment is released after approx 10 days**

Table (2): comparison between the Sudanese standards of hatching eggs with the OIE recommendations

Criteria	OIE recommendation	National standard of Hatching Egg
Identified hazard in the Hatching Eggs	**Avian chlamydiosis, IB, ILT, mycoplasmosis (*M. gallisepticum -M. synoviae*), Fowl cholera, Fowl typhoid, HPAI & LPAI, IBD, Marek's disease, ND, Pullorum disease, avian tuberculosis,**	**Not specified**
Vaccinated or not vaccinated against	**IB,ILT, HPAI,NAI, FC, IBD, MD**	**Not specified**
Hatching Eggs parents/hatcheries free from	**Salmonellosis, ILT, HPAI, NAI, IB, Mycoplasmosis, Avian tuberculosis, Pullorum disease**	**Not specified**
Hatching Eggs & Day Old Chicks parent vaccinated against	**Marek's disease**	**Not specified**
Come from establishments/ hatcheries which comply with the hygiene and disease security procedures referred to in Chapter 6.4.	**Yes**	**Not specified**
Identified diseases subjected to laboratory tests	**All the listed disease with the OIE approved lab. Tests in the terrestrial manual**	**Not specified**
Approved laboratory tests methods	**ELISA, HI, VN Agent id. AGID, ELISA, Tuberculin test**	**Not specified**

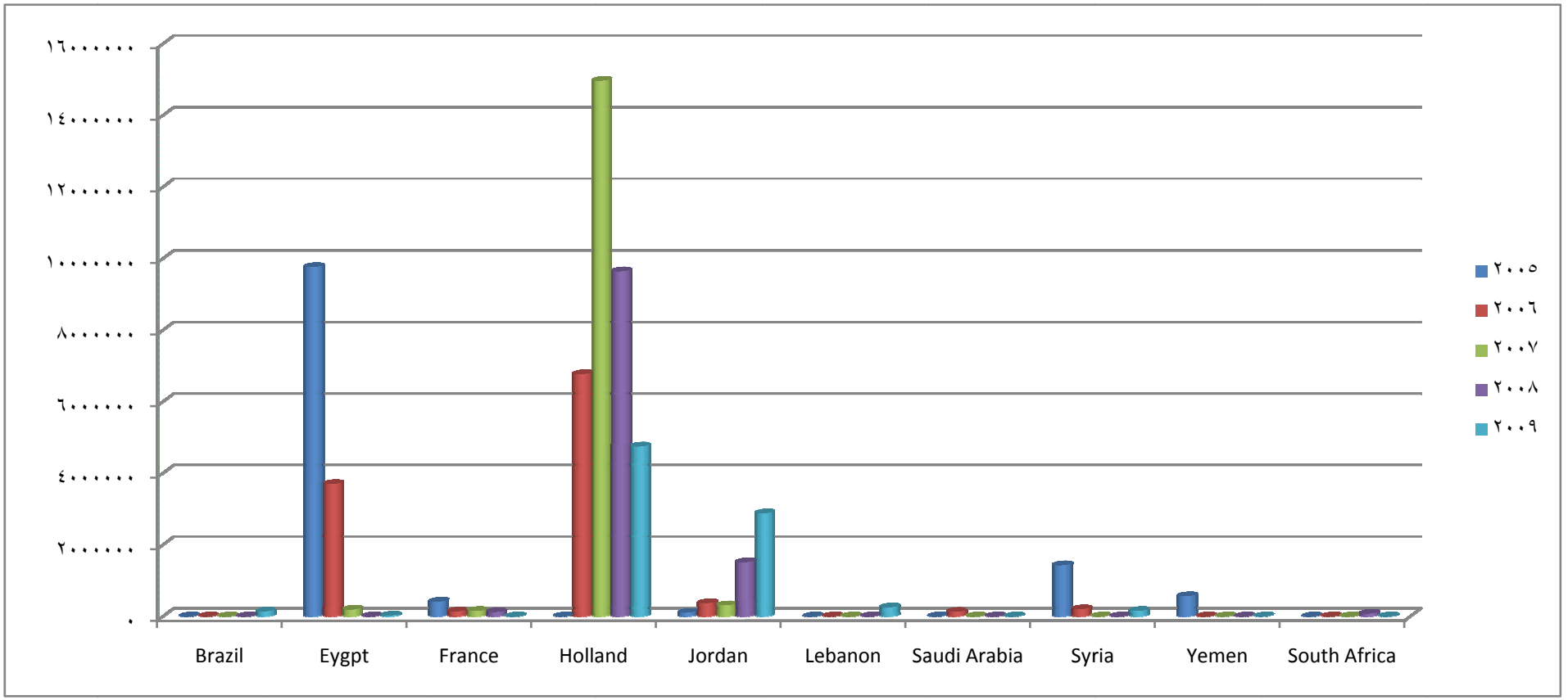
IB= Inf ELISA **IB= Infecttious Bronchitis, ILT= Infectious Laryngotracheatis, FC= Fowl Cholera, IBD= Infectious Bursal Disease, ND= Newcastle Disease, MD= Marek's Disease, CRD= Chronic Respiratory, ELIZA=Enzyme- Linked Immunosorbent Assay, VN= Virus Neutralization test, HI= Haemagglutination Inhibition test.**

Table (3): Summary of OIE-listed poultry diseases/infections present in Sudan 2005 - 2009:

Year	OIE-Listed disease	Occurrence	Serotype(s)	New outbreaks	Total outbreaks	Control measures	Routine Vaccinated	Susceptible	Cases	Deaths	Destroyed	Ring vaccinated
2005	**New castle Disease(ND)**	**+**	**No**	**6**	**6**			**130539**	**32366 (24.8%)**	**130 (.1%)**	**0**	**130539**
2006	**Highly Pathogenic Avian Influenza (HPAI)**	**+**	**H5N1**	**21**	**21**	**Qi S Z V**	**874000**	**235626**	**43050 (18.3%)**	**43050 (18.3%)**	**101814 (43.2%)**	**0**
	New castle Disease(ND)	**+**	**No**	**3**	**3**	**….**	**….**	**715**	**705 (98.6%)**	**18 (2.5%)**	**0**	**1300**
	M. gallisepticum	**+**	**No**	**4**	**4**		**….**	**….**	**….**	**….**	**….**	**….**
2007	**New castle Disease(ND)**	**+**	**….**	**….**	**….**	**M Qi V T**	**69000**	**….**	**….**	**….**	**….**	**….**
	Infectious Bursal Disease (IBD)	**+**	**….**	**….**		**M Qi V T**	**9000**	**….**	**….**	**….**	**….**	**….**
2008	**Infectious Bursal Disease (IBD)**	**+**	**No**	**4**	**4**	**Z**	**….**	**6000**	**4100 (68.3%)**	**2685 (44.8%)**	**0**	**0**
	M. gallisepticum	**+**	**No**	**1**	**1**	**T**	**….**	**245003**	**30090 (12.3%)**	**5357 (21.9%)**	**0**	**0**
	Pullorum disease	**+**	**No**	**2**	**2**	**T**		**245023**	**30096 (1.2%)**	**5359 (2.2%)**	**0**	**0**
2009	**New castle Disease(ND) (domestic)**	**+**	**….**	**….**	**….**	**Qf Z V**	**485200**	**….**	**....**	**….**	**….**	**….**
	Avian infectious Bronchitis(IB) (Domestic)	**+**	**….**	**….**	**….**	**T**	**….**	**….**	**….**	**….**	**….**	**….**
	Infectious Bursal Disease (IBD)	**+**	**No**	**1**	**1**	**Z V**	**136138000**	**1800**	**200 (11.1%)**	**100 (5.5%)**	**100 (5.5%)**	**1600**

Source: OIE ,World Animal Health Information Database (WAHID), 2005 – 2009.**Legend: Qf = precautions at the borders, M = monitoring, Te = screening, Gsu = general surveillance, Tsu = targeted surveillance, Qi = movement control, S = stamping out, Sp = modified stamping out, Z = zoning, Vp = vaccination prohibited, V = routine vaccination, T = treatment, Cr = control of wild reservoir, Cn = control ofarthropods**

Figure (1): Quantities of Imported Hatching Eggs from the different origins during the Period 2005 -2009



Source: **Federal Ministry of Animal Resources and Fisheries monthly reports 2005 – 2009**

Table (4) exporting countries notifications of Avian Influenza to the OIE and dates resolved.

Country	Date of Notification	Disease	Reason for Notification	Disease manifestation	No of Outbreaks	Date resolved
Egypt	**18/02/2006**	**HPAI**	**Reoccurrence**	**Clinical disease**	**1086**	**endemic disease 07/07/2008**
France	**20/02/2006**	**HPAI**	**Reoccurrence**	**Clinical disease**	**38**	**18/04/2006**
France	**05/07/2007**	**HPAI**	**First occurrence**	**Clinical disease**	**3**	**14/08/2007**
France	**02/02/2009**	**LPAI**	**Reoccurrence**	**Clinical disease**	**2**	**17/04/2009**
France	**16/11/2009**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**02/03/2010**
France	**21/01/2010**	**Pandemic A/H1N1 virus**	**Emerging disease**		**1**	**01/02/2010**
Germany	**16/02/2006**	**HPAI**	**Reoccurrence**	**Clinical disease**	**123**	**03/09/2006**
Germany	**18/12/2007**	**HPAI**	**Reoccurrence**	**Clinical disease**	**3**	**28/01/2008**
Germany	**26/06/2007**	**HPAI**	**Reoccurrence**	**Clinical disease**	**301**	**30/10/2007**
Germany	**10/10/2008**	**HPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**14/10/2008**
Germany	**17/10/2008**	**LPAI**	**Reoccurrence**	**Clinical disease**	**35**	**18/02/2009**
Jordan	**27/03/2006**	**HPAI**	**First occurrence**	**Clinical disease**	**1**	**27/03/2006**
K.S.A.	**31/03/2007**	**HPAI**	**First occurrence**	**Clinical disease**	**1**	**27/03/2007**
K.S.A.	**19/11/2007**	**HPAI**	**Reoccurrence**	**Clinical disease**	**29**	**29/01/2008**
South Africa	**03/07/2006**	**HPAI**	**Reoccurrence**	**Clinical disease**	**24**	**26/07/2006**
U. K.	**06/04/2006**	**HPAI**	**Reoccurrence**	**Clinical disease**	**1**	**01/05/2006**
U. K.	**13/11/2007**	**HPAI**	**Reoccurrence**	**Clinical disease**	**2**	**29/04/2008**
U. K.	**03/02/2007**	**HPAI**	**Reoccurrence**	**Clinical disease**	**1**	**25/06/2007**
U. K.	**25/05/2007**	**LPAI**	**First occurrence**	**Clinical disease**	**1**	**15/06/2007**
U. K.	**15/06/2007**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**06/07/2007**
U. K.	**11/01/2008**	**HPAI**	**Reoccurrence**	**Clinical disease**	**2**	**27/03/2008**
U. K.	**05/06/2008**	**HPAI**	**New strain**	**Clinical disease**	**1**	**20/08/2008**
U. K.	**18/09/2009**	**Pandemic Influenza A H1N1**	**Emerging disease**		**7**	**15/01/2010**
U.S. A.	**03/04/2007**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**06/05/2007**
U.S. A.	**23/07/2007**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**20/09/2007**
U.S. A.	**23/07/2007**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**04/08/2007**
U.S. A.	**04/09/2008**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**29/10/2008**
U.S. A.	**11/06/2008**	**LPAI**	**Reoccurrence**	**Sub-clinical**	**1**	**14/07/2008**
U.S. A.	**30/11/2009**	**pandemic A/H1N1 influenza virus**	**Emerging disease**		**1**	**21/12/2009**

World Animal Health Information Database 2005 – 2009 ****Source: OIE***

Table (5) Estimation of AI exposure risk of the imported consignment of hatching eggs to the poultry population in Sudan:

company	Hatching eggs	Risk factors	Risk estimation
Abdelmoty	**0**	▪ **Sales systems of some importing companies depend on distribution of chicks to their clients near the airport and in the streets,** ▪ **sometimes the chicks consignments are transported from the airport in public vehicles (spread the HPAIV to man and animal)** ▪ **The packing materials (plastic crates) of chicks consignments are used for other products** **e.g. Packing of vegetables…etc.** ▪ **Marketing distribution of the products (layers** **and broilers chicks, table eggs, chickens) in almostall the states.** ▪ **Lack of biosecurity** **Transmission through contaminated Fomites (crates and Vehicles)** **-Vaccination crews** - **Wild birds** - **Labors** - **Visitors**	**High**
Abosharaf	**65,520**		
Abayazid	**29,790**		
Acolid	**4,233,420**		
African Co	**28,800**		
Alpha	**0**		
Anfal	**70,560**		
Apico	**2,520**		
Arab co	**8,763,080**		
Asaad	**0**		
Bahry Poultry	**0**		
Beit Elsharg	**0**		
Coral	**6,498,880**		
Elfao	**1,144,80**		
Elghaly	**0**		
Elgaris	**6,933,60**		
Elghar	**783,360**		
Elgariya	**38,160**		
Elhaj Soleiman	**99,000**		
Elshaheed	**1,009,800**		
Elsyal	**78,480**		
Eltaef	**170,640**		
Eltarfa	**57,240**		
Elwafa	**174400**		
Enma	**26,925,20**		
Fordan	**90,000**		
Gabis	**76,320**		
Garovet	**72,000**		
Hadir	**0**		
Hamza Farm	**0**		
Hivet	**0**		
Jammaa	**0**		
Kados	**0**		
Kairat Elnil	**0**		
Khalifa Gandor	**17,638,20**		
Kweitya	**150,560**		
Lana	**0**		
Mico	**0**		
Mony	**0**		
National project	**101,540**		
Ommat	**13,209,940**		
Sanhory	**0**		
Salsabeel	**71,192,20**		
Shibeeka	**4,711,200**		
Sonata	**0**		
Tarig Razaz	**3,325,300**		
Zasco	**106,110**		
Total	**56,330,020**		

Discussion

This research was designed to assess the probable risks associated with importation of hatching eggs, to evaluate the quality level of the Sudanese standards and the sanitary measures in place based on the international standards. The results showed that the importation of hatching eggs comprises potential risk of introducing Avian Influenza and many other diseases into the country, and the Sudanese standards of hatching eggs have not been set according to scientifically based risks estimations and the sanitary measures in place are less stringent to achieve the appropriate level of protection. The SPS Agreement strongly encourages members to base their health regulations to protect against the animal and public health risks associated with the importation of animals and animal products on OIE international standards such as the *Terrestrial Code*, requiring WTO members to harmonize their sanitary and phytosanitary measures on the standards guidelines and recommendations adopted, (OIE –Terrestrial Animal Health Code2009), in case relevant standards are absent, or there is scientific based risk analysis justification for a more stringent level of protection than that provided by a standard, (SPS agreement 2009).

Since Sudan is now negotiating for WTO accession and soon will be a WTO member, Sudan should put in place standards and measures that are required to achieve its health protection objectives, providing measures that are technically and economically feasible. Despite the fact that it was set by specialized technical committee from different institutions the, sudanese standards for importation of hatching eggs.

- Has not stated sanitary requirements, and has not specified any hazard, despite the potential hazards that associated with commodity in the OIE code,
- The status of vaccination of the parent stocks against the poultry diseases are not specified
- The status of parent stocks of freedom from OIE-listed diseases is not specified.

- There is no indication of compliance with international hygiene and disease security procedures referred to in Chapter 6.4. of OIE terrestrial code for establishments/ hatcheries from which the hatching eggs come.
- Laboratory tests to monitor poultry diseases are not stated in this standard.
- The text of the standard is published only in Arabic language, and it is not circulated to stakeholders, there is a need to publish the standard is English as well for all interested parties nationally and internationally.

Animal Health and Epizootics Diseases Control (AHEDC) - Federal Ministry of Animal Resources and Fisheries (FMARF) facilitated by an extensive and well resourced veterinary infrastructure has the capacity to design prevention, control and eradication programs for selected diseases and has the expertise to assess their disease control efforts on a scientific basis, but the poultry health and diseases control programs has started in the last few years despite the importance of commercial poultry industry to the national economy, which started long time ago and there are other poultry diseases affecting this sector.

In this study the hatching eggs as well as the fomites (contaminated packing materials, bedding & vehicles), may serve as potential sources of poultry diseases agents into the Sudan. The Avian Influenza is the only disease that is subjected to official control program; which was developed in response to the escalating global threat of the disease and not as a scientific prioritization of poultry diseases. Fundamental review is needed to monitor other poultry diseases and assess their impacts on the aviculture, public health, economy and the environment in Sudan. The importation of the hatching eggs comprises potential risk of introducing AI and many other diseases into the country, as stated in the OIE chapter 10, Terrestrial code 2009. NAI viruses must be considered to have the potential to lead to the development of disease and are classified as potential hazards in the hatching eggs and day old chicks' commodities. There are also a number of non-NAI subtypes with the capacity to cause disease in poultry. The full potential for such disease relationships is not

understood and genetic changes in non-NAI strains, or encounters with new potential hosts, may result in disease. Therefore all avian influenza viruses are classified as potential hazards in hatching eggs and day old chicks' commodities. Sudanese standards has less stringent imports requirements which do not meet the appropriate level of protection. Secondly, the procedures do not require laboratory tests to be conducted prior to certification. The national veterinary authority is required in the procedures (except monitoring the level of immunity against Salmonellosis, Mycoplasmosis stated in the standard of day old chicks - which is not practiced -) only the visual examination to the consignments is practiced, so the AIV and any other disease etiological agents can not be detected at the Khartoum airport and the risk estimation is high. There is lack of bio-security measures in the handling and the equipments used and transportation of consignments of the hatching eggs by the labors and inspectors at the airport.

Other factors including: the behavior of some importing company sales systems distribute to their clients near the airport and in the streets directly after being released from the airport which comprise risk of introducing the pathogen to man and poultry ,The packing materials (plastic crates) of chicks consignments are used for other products e.g. Packing of vegetables…etc. it also

comprises potential risk of spreading the pathogens; the wide range marketing distribution of poultry products (layers and broilers chicks, table eggs, chickens etc...) all over the Sudanese states, lack of biosecurity in the custom and culture practiced in handling of the poultry products, transmission through contaminated Fomites (crates and Vehicles), vaccination crews, wild birds, labors, visitors etc… table (8) These entire factors contribute in distributing the introduced pathogens to the population at risk in the country, and the overall estimation of spreading the pathogen is high. The exposure assessment for AI viruses is considered to be non-negligible. Because entry, exposure, and consequence assessments are non-negligible, the risk estimate is non-

negligible and avian influenza viruses are classified as a hazard in the commodity. Therefore, risk management measures can be justified.

Recommendations

Based on the results of this study, the following are recommended:

1. The Sudanese veterinary authorities should adopt the OIE standards and recommendations, as indicated in articles 10.4.7., 10.4.8., 10.4.10, 10.4.11.OIE - Terrestrial Animal Health Code2009.

2. All consignments of hatching eggs must be quarantined and approved by FMARF in the Khartoum airport and samples are tested using methods described in the *OIE Manual of* Diagnostic Tests and Vaccines for Terrestrial Animals for Avian Influenza viruses and completed with negative results prior to clearance.

3. Science based- risk analysis following OIE standards should be undertaken, by a multidisciplinary team in setting and updating the:

- Preparedness contingency plans for controlling animal diseases
- Sudanese standards of animals and animals' products generally and standards of day old chicks and hatching eggs in particular, publishing them in both Arabic and English and be circulated to relevant partners, applied, monitored in a professional and transparent manner, so that a safe international trade in animals and animal products can be guaranteed.

4. Provide reliability to quality assessments and certifications SSMO and the national veterinary services should always co-operate on the basis of sound scientific principles, technical, ensuring transparency, address any weaknesses identified.

5. Conduction of database capacity systems - in both SSMO and the national veterinary services - of animal and animals' products besides efficiency in reporting systems that consistently provide valid and precise analysis. Furthermore, because of the complexities involved, the conduction of a full import risk analysis is now regarded as a distinct scientific discipline; training is essential, and learning from already conducted Import Risk Analysis is highly recommended.

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References

Ahl aS, Acree JA, Gipson PS, Mcdowell RM, Miller L, Mcelvaine md(1993). Standardization of nomenclature for animal health risk analysis. Revue scientifique et technique Office International des Epizooties; 12 (4): 1045-1053.

Animal Health & Epizootics Disease Control (2005- 2009) Federal Ministry of Animal Resources and Fisheries (FMARF), , Reports.

Animal Health & Epizootics Disease Control (2005- 2009) Khartoum State Reports.

.International Committee on the Taxonomy of Viruses (2002). ICTVbB – The Universal Virus Database, version 3. *http://www.ncbi.nlm.nih.gov/ICTVdb/ICTVdB/*.

Risk Analysis MAF Biosecurity New Zealand (2009) *Import risk analysis* ,Hatching eggs from chickens from the European Union, Canada, the United States of America, and Australia.

World Organization for Animal Health (OIE) (2010) *Terrestrial Animal Health Code*.

World Organization for Animal Health (OIE) *(2009).* Manual *of Diagnostic Tests and Vaccines* for Terrestrial Animals

Sudanese Standards and Metrology Organization guide (2005) second edition.

Sudanese standard of hatching eggs (2008) updated.

United Nations Economic Commission for Europe (1998). Standards and Regulations in International Trade - Round Table on the impact of standards on international trade Geneva, 15 June 1998.

Veterinary Services National Center for Import and Export Regionalization Evaluation Services (2004). Risk of Exporting Exotic Newcastle Disease (END) in Poultry and Poultry Products from Argentina to the United States.