

The Survey of Poultry Market Chain and the H7N9 Risk Assessment of Wholesale LBMs in Guangxi, Yunnan, Hunan Provinces of China

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1. Introduction

The first human H7N9 case was reported in China in March 2013, more than 1500 human cases were diagnosed and distributed in 20 provinces by the middle of 2017. Outbreaks and spreads of H7N9 pose threat to the public health and lead to huge economic losses to poultry industry in China. The surveillance and studies show that LBMs play an important role on spread of poultry diseases and the human infections with H7N9 are closely related to LBMs. The project is to use methodological approach of livestock value chain mapping and analysis to study risk and risk mitigation of poultry H7N9 in the poultry market chain in Guangxi, Yunnan, Hunan provinces of China.

2. Materials and Methods

We used questionnaire survey to collect the data and ArcGis to visualize the geographical distribution of wholesale LBMs in three provinces. A specific poultry wholesale market was selected as an example to quantitatively calculate entry risk. The data to calculate model parameters are from China Official Veterinary Bulletin(Dec. 2016) and epidemiological investigations. 98 Wholesale LBMs were investigated and 227 wholesalers were interviewed and the data collected were analyzed descriptively to understand risk of H7N9 circulating in and spreading out of wholesale LBMs. .

3. Results

3.1 The wholesale LBM distribution

There are 111 wholesale LBMs in three provinces. On average, there are 21.5 stalls and 2483 birds (ranging from 1549 to 3678) are sold per day in each market. The geographical distribution of the wholesale LBMs see Fig 1;

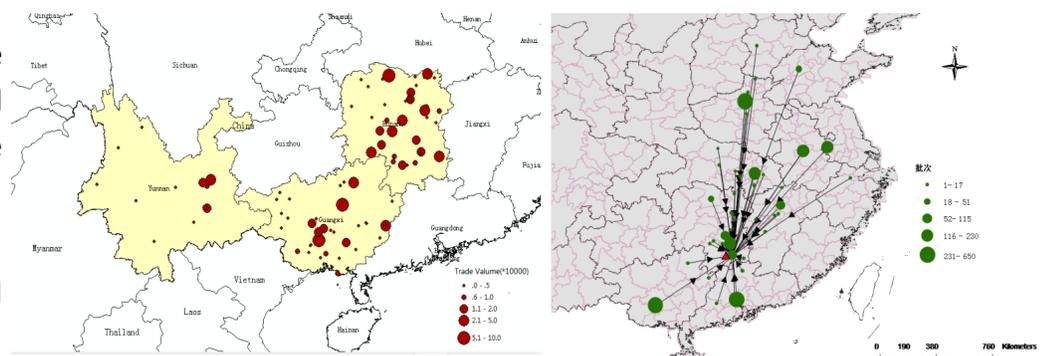


Fig 1. Geographical distribution of wholesale LBMS in three provinces

Fig 2. Distribution of poultry sources introduced of the specific wholesale LBM

3.2 Risk of H7N9 introduced into the wholesale LBM

- (1) Probability of at least one batch in which birds are infected monthly is 86.8% (see Fig3);
- (2) Expected batches of infected birds are introduced into the market monthly are 2.1(see Fig4);
- (3)Expected number of infected birds introduced into the market monthly are 388 (see Fig5);
- (4) Expected period which a infected batch is introduced into the market is 15.2 days (see Fig6).

3.3 Risk of H7N9 circulating in wholesale LBMs

Risk factors of H7N9 circulating in wholesale markets	Proportion of traders (95% CI)
Different batches mixed up	67.8%(61.3%-73.9%)
Unsold poultry kept in market overnight	83.7%(78.2%-88.3%)
Time of poultry kept in market	2.6 days (1.5 to 5.1)
Trading both waterfowl and other poultry	37.0%(30.7%-43.6%)
Slaughtering on the spot	46.3%(39.6%-53.0%)

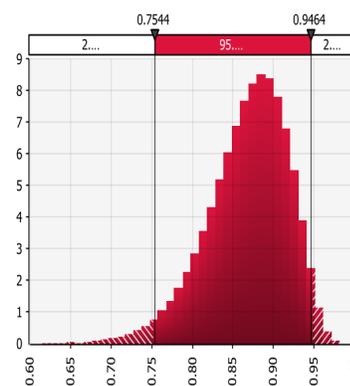


Fig3. Probability distribution of at least one infected batch introduced monthly

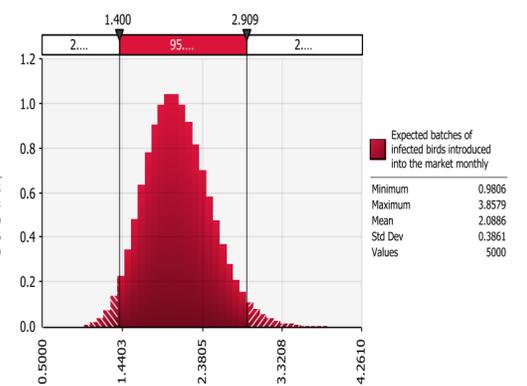


Fig4. Distribution of expected batches infected being introduced monthly

4.4 Risk of H7N9 spreading out of wholesale LBMs

16.3% wholesalers take unsold poultry out of markets for temporary storage, 6% wholesalers also feed poultry.

Risk factors of H7N9 spreading out of wholesale LBMs	Proportion of LBMs (95% CI)
Without disinfection tank for vehicles at entrance	95.9%(89.9%-98.9%)
No disinfection for vehicles and cages out of LBMs	91.8%(84.5%-96.4%)
No regular poultry-free rest days	90.8%(83.3%-95.7%)
Never conducting thorough cleaning	12.2%(6.5%-20.4%)
Never conducting thorough disinfection	99.0%(94.4%-100%)

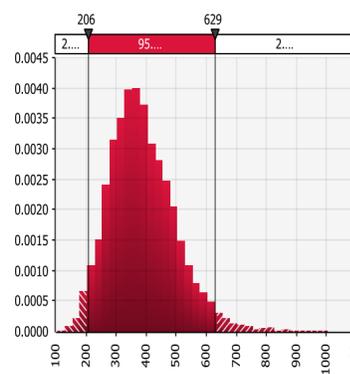


Fig5. Distribution of expected number of infected birds introduced into monthly

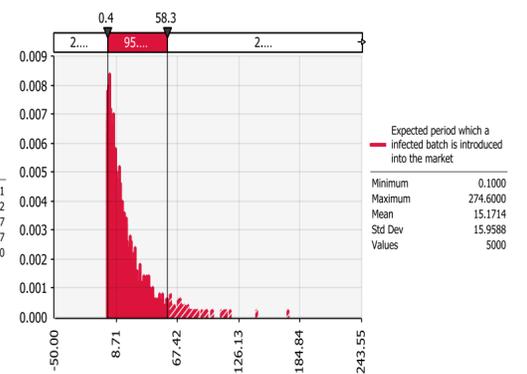


Fig6. Distribution of expected period which a infected batch is introduced into

5. Recommendation

According to the results of the survey, we can better understand the role of the wholesale LBMs on spreading of avian disease and the H7N9 risk in three provinces. In order to reduce the risk of introducing avian H7N9 virus to markets as well as their propagation and onward transmission to retail markets and producing sector, the recommendations as below:

- (1) The biosecurity guide for wholesale LBMs should be formulated, including location, design, facilities, traceability and management;
- (2) Guidelines or standards for cleaning and disinfection of wholesale LBMs, vehicles and cages leaving market should be set and implemented strictly;
- (3) Regular poultry-free rest days should be implemented with the market closed.