

## REVIEW ON ANTIBIOTIC RESIDUES OF FARMED SHRIMP

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### 1. INTRODUCTION

Aquaculture plays an important role for supplying fish production to meet the growing fish demand. This activity has become the fastest growing food activity in the world<sup>1</sup>. The world aquaculture production has increased from some 2 million tons in the beginning of the 60<sup>th</sup> to 34.1 million tons in 1996<sup>2</sup>. Aquaculture products are continue to grow and expected to increase further. It is forecasted that in future, farmed aquatic-animals will be an even more important source of protein foods than they are today.

The last two decades showed the production of farmed shrimp has grown at the phenomenal rate of 20-30% per year. According to Rosenberry (2001), the world's shrimp farmers produced 865,000 MT of whole shrimp in 2000 which shows great increment compared to production in 1999, 642,750 MT<sup>3</sup>. The Asia region is the leading shrimp producer meanwhile the major markets are in the USA, Japan, and Europe. Thailand remains to be the top exporter with volumes just marginally under 250,000 MT in 2000, whereas Indonesia was the world's second largest exporter in value terms in 2000 with sales of just under US\$ 950 million (105,000 MT)<sup>4</sup>.

The continuous productions of shrimp farms through intensive farming system in Taiwan, Thailand, Indonesia and China have raised a question of sustainability. Disease has become the major deterrents for achieving maximum production. In order to overcome this problem, some chemicals and antibiotics are being introduced in shrimp hatchery and farm for prevention and treatment of diseases. However, some of antibiotics are harmful for human and need to be monitored and regulated properly.

Antibiotics such as aristolochia, chloramphenicol, chloroform, colchicine, nitrofurantoin, dimetridazole and metronidazole are drugs that control a wide range of bacteria but are toxic to humans. These antibiotics are forbidden by the European Union (EU) from containing in food products. Meanwhile, these antibiotics are used in some countries to control disease in shrimp, crawfish and bees.

The use of antibiotics for food animals raises two main issues: risks for human health and bacteria resistance acquisition to used antibiotics. Antibiotics residue in the farmed shrimp usually caused by the input of the antibiotics to the animals through feed and bathing treatment. Those antibiotics remain in the tissue of the animal. Recently, the most common prohibited antibiotics found in shrimp are chloramphenicol and nitrofurantoin. The effects of these antibiotics to human are believed to be associated with increasing risk of cancer. However, the effects to human health of the main antibiotics found in cultured shrimps with part per billion (ppb) amounts or less has not yet been studied in detail.

## **2. CURRENT STATUS OF ANTIBIOTIC RESIDUES PROBLEMS OF FARMED SHRIMP IN THE REGION**

A number of recent reports and press releases have raised public concerns about the safety of antibiotic drug usage in aquaculture. As reported by Bangkok Post, on March 14, 2002, the Netherlands informed Thailand's Department of Livestock that trace amounts of nitrofurans were found in chilled/frozen chicken and shrimps and prawns exported from Thailand. Anyway, this is not the first case from Thailand since in November 2001, Thai-made canned sand shrimps were found contaminated with chloramphenicol. According to the European Union's rules, any product contaminated with banned antibiotic is prohibited for use and will be destroyed. There were several cases reported for shrimp shipments from Thailand to EU were rejected due to the presence of nitrofurans in March 2002. At the same time, nitrofurans and chloramphenicol have been detected in prawn shipment from Vietnam to UK. Due to this, exporters were significantly affected given that they are to lose that lot of merchandise and to be liable to pay a 'destruction fee'. Antibiotic residues also found in shrimp from Myanmar, Indonesia and Malaysia were reported by EU.

Therefore, there has been an increasing level of concern over the use of the antibiotics and its continuous use in aquaculture. The US Department of Food and Drug Administration (FDA) has increased its sampling of import shrimps and crawfish, following of Canada and the EU new regulations.

## **3. PRELIMINARY INFORMATION AND ANALYSIS**

According to the *fsainews* (May, 2002), the European Commission has issued three decisions that make it mandatory to test for antibiotic residues in imports of shrimp from Vietnam and Myanmar and on both shrimp and poultry imported from Thailand. These decisions are based on results of recent analysis by Member States of EU on imports of fish and poultry where the presence of nitrofurans residues on shrimps imported from Vietnam and on shrimps and poultry imported from Thailand were detected. Results of tests on shrimps imported from Myanmar revealed the presence of chloramphenicol residues. Previously, on September 19, 2001, the European Commission issued a decision to instruct intensively examines all shipments from Vietnam for antibiotics residue.

Consequently, the EU has closed its doors on imports shrimp from China and part of Southeast Asia due to the presence of chloramphenicol and nitrofurans. Meanwhile, the demand for shrimp from Japan has been reduced due to the economic downturn. The United States is the only destination for surplus production. The shrimp tested positive for chloramphenicol in EU would be allowed to enter the USA because the US Food and Drug Administration permits level up to 5 ppb. The EU does not allow any residues of chloramphenicol in foods, while the United States allows up to 5 ppb and Japan up to 30 ppb. The current emergence of the chloramphenicol issue in Europe is partly due to the standard of "zero tolerance" set for the drug, which is not really based on the scientific research. In addition, only the most sophisticated equipments are able to detect these very small amounts of antibiotic.

Thailand and Vietnam have been implemented many programs in order to solve this problem. Thailand has come out with a guideline of solution for the government and related agencies to tackle the problems in all aspects for long-term and sustainable solutions. For

example, guidelines for Production Aspect and Improvement of Inspection System on Food Products for Export. Similarly, Vietnam has also released many measures in time to implement the policy not to use antibiotics in aquaculture. Early this year, the Prime Minister of Vietnam instructed various levels of officer to take necessary action against illegal chemicals in agriculture fields. As a result of programs and policies implemented so far, Vietnam has shown positive results where the total of 1,231 of shrimp shipment exported to EU, 997 shipments has been examined for antibiotics residue but no trace was found. Thus, on the Sept. 20, 2002, the EU decided to lift its intensive examination of all shrimp shipment from Vietnam for antibiotic residues after about a year of imposition.

It is important for the ASEAN members to know the situation faced by each country on the antibiotic residue issue, in order to come out with appropriate follow-up activities for the region. Antibiotic residue of farmed shrimp become a hot issue discussed among consumers, shrimp producers, shellfish traders, and other related traders. This phenomenon is directly affecting shrimp price at the global market. This issue needs to be tackled at the regional level since many shrimp producer countries come from the Southeast Asian region. Therefore, the questionnaire developed by SEAFDEC was the first approach in order to develop proper program in the future for the region.

Basically, the questionnaire required information on the current situation in each country related to antibiotic residue issue. The lists of questions are as follows:

1. Does your country have some problems with antibiotic residue in aquaculture?
2. What are the common chemicals/antibiotics used by farmers in your country?
3. Are farmers aware that some of chemicals are banned or can be used for limited dosage for aquaculture activities?
4. Do farmers use the chemical according to the recommendation dosage?
5. How many (in terms of %) of the aquaculture farmers practice using antibiotic in their operation out of the total numbers that involved with aquaculture activities?
6. Does your country have monitoring/enforcement mechanism in order to minimize the usage of the chemicals in aquaculture field? How effective is it, so far?
7. Does your country provide any program as alternative for the antibiotic usage, such as "Good Farming Management" program?

The analysis was done based on the feedback from all SEAFDEC member countries and Japan, excluding Indonesia and Lao PDR. Detailed information on feedback questionnaire from all SEAFDEC member countries can be obtained in the REF04a-j.

Antibiotic residue of farmed shrimp is the common problem faced by several countries in Southeast Asia, particularly Thailand and Vietnam. Other countries like Indonesia, Myanmar and Malaysia also face similar problem but not really as serious. Almost 90% of the shrimps produced in Southeast Asia countries are mainly for export. Detention and rejection of the products by imported countries will cause great effect to the shrimp industry in the region.

Based on the feedback questionnaires, the most common antibiotics being used by shrimp farmers in this region are oxytetracycline, nitrofurantoin, and chloramphenicol. Other antibiotics that also being used are tetracycline, sulfamonomethoxine, chlortetracycline, enrofloxacin,

ciprofloxacin, norfloxacin, oxolinic acid, and sulfonimides. Nitrofurans and chloramphenicol are the common antibiotic residues detected by EU in shrimp shipment from Southeast Asian region.

Majority the shrimp farmers in all countries are aware of the banned antibiotics in aquaculture activities. However, some of the farmers, especially small scale farmers and new farmers are not aware of the risks. Thus, dissemination of information on the consequences of using chemicals needs to be intensified among fish and shrimp farmer, drug manufactures and suppliers. Intensive campaign on the carefulness and restricted use of chemicals is also needed for all countries.

In terms of antibiotic usage and recommendation dosage, most farmers follow the instruction recommended, as reported by Malaysia, Brunei, Singapore, Japan and Vietnam. In other countries, some farmers do not follow the instruction recommended. Farmers under supervision or registered with governmental fisheries related agencies usually use the chemicals according to the recommendation dosage. Some farmers in Thailand just rely on the information from feed and chemical suppliers, which sometimes is incorrect. In case of the Philippines, farmers do not follow the recommendation dosage more often, hence has caused mortality and morphological deformities in the host and development of antibiotic-resistant bacterial strains.

Almost all shrimp hatchery operators in the Philippines use antibiotics. In Thailand, most of shrimp farmers are intensive operations and 80% of them use antibiotics in their operation. In 2001, Vietnam had 450,000 ha of shrimp culture (including about 15,000 ha of intensive and semi-intensive farming) and 50% of the intensive-farming stakeholders used antibiotics/chemicals in their culture. Since January 22, 2002, when the Ministry of Fisheries banned ten antibiotics/chemicals, the number of farmers using antibiotic is decreasing in Vietnam. Other countries also reported certain percentages of the total farmers using antibiotic in their operation like Cambodia (70%), Brunei (68% for all types of aquaculture mainly for fish cage culture), Malaysia (10%) and Japan (20%). Important to note, this information is not based on official statistics for this issue.

All countries have their own programs in monitoring the usage of chemicals in aquaculture activities. DOF of Thailand already started implementing the Control and Monitoring Program on the Use of Drugs and Chemicals Agents in Fish Culture since 1997. Farm inspections are also being carried out to ensure that approved operational procedures and standards are properly implemented. This program significantly reduced the chances of rejection by importing countries. The program needs to be reviewed since it was initially targeted for limited antibiotics such as oxolonic acid, oxytetracycline and sulphonamide. Chloramphenicol, nitrofurans and other new drug are not included in the previous monitoring plan. Meanwhile, Vietnam has the monitoring Program Plan on certain substance residues in aquaculture products. The plan does not work well with antibiotic since the sample collection methods and tests are not standardized. In the Philippines, the Bureau of Animal Industry (BAI), through the Animal Feeds Standard Division (AFSD), formulates regulations on chemicals intended for veterinary animals. The Bureau of Fisheries and Aquatic Resource (BFAR) has been authorized to monitor the effect of using antibiotics in shrimp culture by determining the antibiotic residues in shrimp tissues. However, despite all these regulations, the fishpond operators and hatchery owners in the Philippines still continue to use the prohibited chemicals due to lack of effective and cheaper alternative compounds. Malaysia has Feed Act which can control the content of feed and action will be

taken accordingly. Japan has monitoring program by checking the sample of the products before entering to the market.

DOF of each country have developed their respective programs as alternative to antibiotic usage. DOF Thailand is implementing the Code of Conduct for the benefit of Thai shrimp industry in terms of sustainability and food safety. The Code of Conduct for Marine Shrimp Culture Industry of Thailand was agreed and signed by several stakeholders in 1999. One of the activities of the program is to put up operating guidelines and manual procedure on various aspects such as Good Aquaculture Practices or COC at Farm Level, Good Practices for Feed/Drug and Chemical supplies, Good Practices for Harvesting, Marketing and Processing and finally Certification and Labeling for COC shrimp. The aims of this program are to ensure safe and good quality products, in environmental friendly way while being economically viable.

The Philippines has an environment-friendly scheme in shrimp farming. This project is the joint mission Nationwide Technology Transfer Accelerated Project and implements by SEAFDEC-AQD and the Bureau of Fisheries Aquatic Resources (BFAR). DOF Malaysia has introduced guidelines to educate the concept of sustainable aquaculture development such as Guidelines for Good Aquaculture Practices, Code of Practice for Marine Prawn Culture, Code of Practice for Fish Cage Culture, Code of Practice for Cement Tank Culture, and Code of Practice for Fish/Prawn Fry Hatchery. Vietnam is also implementing some programs like Organic Aquaculture and Cleaning/Hygiene Aquaculture, Study on Herbal Drug for treating fishery diseases, Application of GAP and HACCP on aquaculture, and Certifying the clean aquaculture.

In Japan, research and development of vaccination practices has been carried out as alternative to antibiotics. Otherwise, improvement of farming environment is promoted. Brunei Darussalam disseminates the information through seminar and talk on program alternative for antibiotic usage. Likewise, Myanmar encourages the shrimp farmers through demonstrating biomanipulation system. Cambodia does not have any program yet to be implemented for shrimp farmers.

#### **4. CONCLUSION**

Based on Thailand and Vietnam experiences in handling antibiotic residues issue of farmed shrimp, other countries can learn and take necessary action. For example, action being taken by Vietnam Government in dealing with antibiotic residues of farmed shrimp is fast and effective, starting with the clear decision to ban a list of prohibited antibiotics. Listed antibiotics are prohibited in all sub-sectors of fisheries activities as early as seed production, farming, processing and trading. At the same time, information on safe and effective use of chemicals is well disseminated throughout the country. Training courses on shrimp farming and workshops, for processing plant, were organized in collaboration with local authorities and agencies. In addition to the first list of banned chemicals, a new list was made, which about six months after the first list. As a result of mentioned actions being implemented in Vietnam, positive results on antibiotic analysis were revealed for shrimp from Vietnam.

Based on Vietnam and Thailand experience, the region can come out with appropriate programs to ensure that the other countries within this region do not have to face the same difficulties in future. In addition, some of the countries among ASEAN-SEAFDEC member countries are also facing similar problem but not really as a serious issue since their total

shipment are not really in large number. Regional program can come out with Standard Methods for detecting antibiotics residue of aquaculture products with similar standard as imported countries. Other related programs are also needed in order to guarantee that trade of fisheries products from this region are safe and well accepted all over the world.

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