# CHAPTER 1 INTRODUCTION

## 1.1 Background

Enteric pathogens cause millions of illnesses and hundreds to thousands of deaths worldwide each year. The majority of these cases involve three enteric bacteria such as *Salmonella spp.*, *Escherichia coli*, and *Campylobacter spp.* that originate in human, livestock, or wildlife waste. Further, *Salmonella spp.* are a significant cause of avian mortality, leading to additional conservation concerns (Smith, 2020).

*Salmonella* species are recognized as major zoonotic pathogens for animals and humans (Humphrey, T., 2000). Outbreaks of human infections linked to contact with animals and animal products in the United States reported by CDC (Centers of Disease Control and Prevention) shown that *Salmonella* found in poultry, animal product, cattle, dog, small mammals, reptil, and amphibian. *Salmonella* infection cause Salmonellosis.

Salmonellosis is highly contagious zoonosis whether those who infected by *Salmonella* showing any symptoms or not. *Salmonella* spread by the fecal-oral route and can be transmitted by contaminated food and water, contact with animal directly, and person to person. As one of a food-borne disease, Salmonellosis not only harmful to human but also causes economical loss. Food poisoning cases in Indonesia from 2009 to 2013 reported 10.700 cases per year with 411.500 people ill and 2.500 death. Government economical loss around 2,9 billion (Badan POM RI, 2015).

The number of illnesses reported this year exceeds the number reported at the same time of the year in previous outbreaks linked to backyard flocks. Last outbreak on 24th July 2020, 938 reported cases in 48 states with 151 hospitalization and 1 death. Epidemiologic and laboratory evidence shows that contact with backyard poultry (such as chicks and ducklings) is the likely source of these outbreaks. 409 ill people interviewed, 303 (74%) were contact with chicks and ducklings from several sources, including agricultural stores, websites, and hatcheries. Backyard poultry and their environments (such as backyard coops) in Kentucky and Oregon were tested and found three of the outbreak strains (CDC, 2020).

Salmonellosis cases monitoring and surveillance conducted by Laboratorium Balai Besar Veteriner Wates (2017) shown positive result 8/1.079 (1.66%) in 2014 and 5.860/12.513 (46.83%) in 2015. From data above, Salmonellosis cases significantly increased. Badan Standardisasi Nasional Indonesia in Standar Nasional Indonesia (SNI) 7388: 2009 (2009) stated that *Salmonella sp.* in all categories of food must be negative/25 ml or negative/25 g. Based on Peraturan Badan Pengawas Obat dan Makanan Republik Indonesia (BPOM RI) Nomor 13 Tahun 2019 stated zero tolerance for *Salmonella sp*. in all categories of food. Limited amount of salmonellosis research in developing country increase the risk of *Salmonella* infection. Therefore, research for salmonellosis in duck is a necessary to minimize *Salmonella* infection in Indonesia.

According to Bacteriologycal Analytical Manual on Food and Drug Administration (2020) to identify *Salmonella sp.*, sample incubated in pre-enrichment media such as Buffered *Peptone* Water (BPW) and selective enrichment media such as *Selenite Cystine Broth* (SCB). Isolation and identification of *Salmonella sp.* can be done in *Xylose Lysine Deoxycholate* (XLD) agar and further tested in Triple Sugar Iron (TSI) agar. The typical and atypical of *Salmonella* colonies characteristic needed to be tested in another biochemical test or serologycal test. Reagen used in serologycal test such as antiserum is expensive because it is hard to make and hard to find. Therefore, Polymerase Chain Reaction (PCR) assay should be done as a way to validate the result of previous test of *Salmonella sp.* effectively and efficiently.

## 1.2 Problem Statement

1. Does cloacal swab on peking duck for *Salmonella sp.* contamination show positive result in TSIA assay?
2. Does cloacal swab on Mojosari-Alabio duck for *Salmonella sp.* contamination show positive result in TSIA assay?
3. Does PCR assay can detect positive sample for *Salmonella sp.* from TSIA method?

## 1.3 Theoritical Base

In industrialized countries, the main reservoir of nontyphoidal *Salmonella* is the intestinal tract of food-producing animals, leads to contamination of diverse foodstuffs. Foodborne salmonellosis is the most relevant source with a high global

impact in human health following other sources such as contact with animals or reptiles, through environment, or person-to-person (Antunes *et al*., 2015).

According to K.M. Lee *et al*. (2015) on *Salmonella* detection and identification research for food control and safety, *Salmonella* ranks the second or even the first of food poisoning around the worldwide. *Salmonella* is a flagellated rod-shaped Gram-negative facultative anaerobe which infects multiple animal hosts including humans by contaminating a wide variety of foods (Tadepalli *et al*., 2018) (Parry Hanson *et al*., 2018). *Salmonella* consist of two species; *Salmonella enterica* and *Salmonella bongori*. Approximately 99% of the *Salmonella* strains that cause infection in humans or other mammals belong to the *Salmonella enterica* species (Kurtz *et al*., 2017). Based on Jajere S.M. (2019) *Salmonella enterica* reported as the most pathogenic species with more than 2600 serovars characterized.

Indonesia is still trying to develop animal husbandry to fulfil domestic meat needs. Poultry, especially duck farm is a one of the farms that must be continuously developed. Based on Badan Pusat Statistik Provinsi Jawa Timur (2018) duck population was 4.213.379 in 2013, 4.912.393 in 2014 , 4.983.776 in 2015, 5.543 814 in 2016, and 5.600.971 in 2017. Ducks has enormous potential that need to be developed because duck has higher adaptation and easier maintanance compared to broiler, especially from New Castle Disease (ND). Therefore, ducks livestock can increase farmer income. However, ducks livestock are one of the untouched livestock by industry and developed by the community. There are some disease that can infect duck, one of them is Salmonellosis.

*Salmonella* infection cause salmonellosis. Salmonellosis in poultry flocks can cause acute and chronical clinical diseases, also economically significant losses for poultry producers and absorb large investments of goverment private resources for testing and control effort (Gast *et al*., 2020). *Salmonella* causes huge losses to poultry industry by decreasing egg production, reducing growth and increased condemnation at slaughter houses (Shoaib *et al*., 2017). Zhang *et al*. (2019) conducted a research about *Salmonella enterica* serovar Enteritidis infected to ducks (*Anas platyrhynchos*) and found that laying rate and egg quality significantly decreased after *Salmonella* serovar Enteritidis infection.

Poultry harbor *Salmonella* in their gastrointestinal tract and excrete the pathogen through the feces and contaminating the environment (Nair *et al*., 2019). Non-typhoidal *Salmonella* can be transmitted to humans particularly through the consumption of foods of animal origin, including eggs and poultry meat, as well as through direct contact with animals or their environments. Research conducted by Butler *et al*. (2016) in Canada, found that the most common routes for *Salmonella* are to be foodborne (63%), relating to animal contact (13%), person to person contact (10%), and possible sources through water (8%). Within infection by animal contact group, common routes were farm animal contact (53%), household pets (40%), and wildlife (8%).

European Food Safety Authority and European Centre for Disease Prevention and Control (2019) reported *Salmonella* was the most commonly detected agent with *Salmonella enterica* serovar *Enteritidis* causing one in five outbreaks in European Union. *Salmonella* in eggs and eggs product was the

highest risk agent of foodborne route. Salmonellosis outbreaks caused by non-typhodial human Salmonellosis in Australia have been linked with a variety of foods of animal origin, including poultry meat, egg and egg-based products (Sodagari, 2020).

## 1.4 Purpose of the Research

General purpose on this research is to know how to identify and diagnose duck that infected by *Salmonella sp.* Specific purpose on this research are:

1. To determine if cloacal swab on Peking Duck for *Salmonella sp.* contamination show positive result in TSIA assay,
2. To determine if cloacal swab on Mojosari-Alabio Duck for *Salmonella sp.* contamination show positive result in TSIA assay, and
3. To determine if PCR assay can detect positive sample for *Salmonella sp.* from TSIA method.

## 1.5 Outcome of the Research

The results of this study is expected to provide information to farmer, veterinarian, researchers, and general public about isolation and identify *Salmonella sp.* on layer duck such as Mojosari-Alabio Duck and broiler duck such as Peking Duck effective and efficient, also how to prevent *Salmonella sp.* infection for one health purpose.