

# Fried Chicken from a well-known fast food brand are tasty and crispy but their lack of hygiene is a threat to our health: Human feces on food brings the bacteria *Salmonella* and *E.coli* 0157:H7

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**ABSTRACT:** Fried chicken from well known brands of fast food can be very crispy, tasty and delicious but also represent high risk to the health. Apart from their high oil and fat content, they also are food that have high risk of containing bacteria *Salmonella* and *E.coli* 0157:H7. These bacteria are not killed when the chicken are fried. When the public eat those contaminated fried food, they can get infected by the bacteria *Salmonella* and *E.coli* 0157:H7. This paper examines what are those bacteria, the symptoms of infections, the danger they represent for human health and also ways to avoid such risk. Avoiding eating fast food itself is a solution but better hygiene of these fastfoods can also reduce the risk of infections and contaminations. Symptoms vary from bloody diarrhea to stomach cramp and can lead to other health complications. *Salmonella* infection (salmonellosis) is a bacterial disease that affects the intestinal tract. *Salmonella* bacteria typically live in animal and human intestines and are shed through stool (feces). Most infections are due to ingestion of food contaminated by animal feces, or by human feces, such as by a food-service worker at a commercial eatery. *Escherichia coli* (*E. coli*) bacteria normally live in the intestines of healthy people and animals. Most types of *E. coli* are harmless or cause relatively brief diarrhea. But a few strains, such as *E. coli* 0157:H7, can cause severe stomach cramps, bloody diarrhea and vomiting.

**KEYWORDS:** fried chicken, health, *Salmonella*, *E.coli* 0157:H7, contamination

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## I. INTRODUCTION

### Fried chicken

Fried chicken is a very popular fastfood that is commonly sold in many food areas and there are even brands of fried chicken around the island. The recipe is basically chicken slices mixed with species, sometimes eggs added and then fried in hot oil.

### What is are salmonella ?

*Salmonella* infection (salmonellosis) is a bacterial disease that affects the intestinal tract. *Salmonella* bacteria typically live in animal and human intestines and are shed through stool (feces). Humans become infected most frequently through contaminated water or food. Some people with salmonella infection have no symptoms. Most people develop diarrhea, fever and stomach (abdominal) cramps within 8 to 72 hours after exposure. Most healthy people recover within a few days to a week without specific treatment. In some cases, diarrhea can cause severe dehydration and requires prompt medical attention. Life-threatening complications also may develop if the infection spreads beyond the intestines. The risk of getting salmonella infection is higher with travel to countries without clean drinking water and proper sewage disposal. *Salmonella* infection is usually caused by eating raw or undercooked meat, poultry, and eggs or egg products or by drinking unpasteurized milk. The incubation period — the time between exposure and illness — can be 6 hours to 6 days. Often, people who have salmonella infection think they have the stomach flu. *Salmonella* is a genus of rod-shaped (bacillus) Gram-negative bacteria of the family Enterobacteriaceae. The two known species of *Salmonella* are *Salmonella enterica* and *Salmonella bongori*. *S. enterica* is the type species and is further divided into six subspecies<sup>2 3</sup> that include over 2,600 serotypes<sup>4</sup>. *Salmonella* was named after Daniel Elmer Salmon (1850–1914), an American veterinary surgeon. *Salmonella* species are non-spore-forming, predominantly motile enterobacteria with cell diameters between about 0.7 and 1.5 μm, lengths from 2 to 5 μm, and peritrichous flagella (all around the cell body, allowing them to move)<sup>5</sup>. They are chemotrophs, obtaining their energy from oxidation and reduction reactions, using organic sources. They are also facultative anaerobes, capable of generating ATP with oxygen ("aerobically") when it is available, or using other electron acceptors or fermentation ("anaerobically") when oxygen is not available<sup>5</sup>.

Salmonella species are intracellular pathogens,<sup>6</sup> of which certain serotypes cause illness. Most infections are due to ingestion of food contaminated by animal feces, or by human feces, such as by a food-service worker at a commercial eatery. Salmonella serotypes can be divided into two main groups—typhoidal and nontyphoidal. Nontyphoidal serotypes are zoonotic and can be transferred from animal-to-human and from human-to-human. They usually invade only the gastrointestinal tract and cause salmonellosis, the symptoms of which can be resolved without antibiotics. However, in sub-Saharan Africa, nontyphoidal Salmonella can be invasive and cause paratyphoid fever, which requires immediate treatment with antibiotics. Typhoidal serotypes can only be transferred from human-to-human, and can cause food-borne infection, typhoid fever, and paratyphoid fever. Typhoid fever is caused by Salmonella invading the bloodstream (the typhoidal form), or in addition spreading throughout the body, invading organs, and secreting endotoxins (the septic form). This can lead to life-threatening hypovolemic shock and septic shock, and requires intensive care including antibiotics.

### **What are Escherichia coli (E. coli) and E. coli O157:H7<sup>1</sup>**

Escherichia coli (E. coli) bacteria normally live in the intestines of healthy people and animals. Most types of E. coli are harmless or cause relatively brief diarrhea. But a few strains, such as E. coli O157:H7, can cause severe stomach cramps, bloody diarrhea and vomiting<sup>1</sup>. You may be exposed to E. coli from contaminated water or food — especially raw vegetables and undercooked ground beef. Healthy adults usually recover from infection with E. coli O157:H7 within a week. Young children and older adults have a greater risk of developing a life-threatening form of kidney failure. Escherichia coli (E. coli) is a bacterium that is commonly found in the gut of humans and warm-blooded animals. Most strains of E. coli are harmless. Some strains however, such as Shiga toxin-producing E. coli (STEC), can cause severe foodborne disease. It is transmitted to humans primarily through consumption of contaminated foods, such as raw or undercooked ground meat products, raw milk, and contaminated raw vegetables and sprouts. STEC produces toxins, known as Shiga-toxins because of their similarity to the toxins produced by Shigella dysenteriae. STEC can grow in temperatures ranging from 7 °C to 50 °C, with an optimum temperature of 37 °C. Some STEC can grow in acidic foods, down to a pH of 4.4, and in foods with a minimum water activity ( $a_w$ ) of 0.95. STEC is destroyed by thorough cooking of foods until all parts reach a temperature of 70 °C or higher. E. coli O157:H7 is the most important STEC serotype in relation to public health; however, other serotypes have frequently been involved in sporadic cases and outbreaks.

## **II. DISCUSSION**

### **Pathogenicity of Salmonella**

Salmonella species are facultative intracellular pathogens<sup>6</sup>. Salmonella can invade different cell types, including epithelial cells, M cells, macrophages, and dendritic cells<sup>7</sup>. As facultative anaerobic organism, Salmonella uses oxygen to make ATP in aerobic environment, when oxygen is available. However, in anaerobic environment (i.e., when oxygen is not available) Salmonella produces ATP by fermentation; by substituting one or more of four less efficient electron acceptors than oxygen at the end of the electron transport chain: sulfate, nitrate, sulfur, or fumarate<sup>8</sup>. Most infections are due to ingestion of food contaminated by animal feces, or by human feces, such as by a food-service worker at a commercial eatery. Salmonella serotypes can be divided into two main groups—typhoidal and nontyphoidal. Nontyphoidal serotypes are more common, and usually cause self-limiting gastrointestinal disease. They can infect a range of animals, and are zoonotic, meaning they can be transferred between humans and other animals. Typhoidal serotypes include Salmonella Typhi and Salmonella Paratyphi A, which are adapted to humans and do not occur in other animals<sup>9</sup>. Salmonella pathogenicity and host interaction has been studied extensively the last years. Most of the important virulent genes of Salmonella are encoded in five pathogenicity islands, the so-called Salmonella pathogenicity islands (SPIs). These are chromosomal encoded and have significant contribution to bacterial-host interaction. More traits like plasmids, flagella or biofilm-related proteins can contribute in the infection. SPIs are characterised to be regulated by complex and fine-tuned regulatory networks that allow the gene expression only in the presence of the right environmental stresses<sup>10</sup>.

### **Impacts of salmonella**

Possible signs and symptoms of salmonella infection include: Diarrhea, Stomach (abdominal) cramps, Fever, Nausea, Vomiting, Chills, Headache and Blood in the stool. Signs and symptoms of salmonella infection generally last a few days to a week. Diarrhea may last up to 10 days, but it may take several months before bowels return to usual stool habits. A few varieties of salmonella bacteria result in typhoid fever, a sometimes deadly disease that is more common in developing countries. Salmonellosis is known to be able to cause back pain or spondylosis. It can manifest as five clinical patterns: gastrointestinal tract infection, enteric fever, bacteremia, local infection, and the chronic reservoir state. The initial symptoms are nonspecific fever, weakness, and myalgia among others. In the bacteremia state, it can spread to any parts of the body and this induces localized infection

or it forms abscesses. The forms of localized Salmonella infections are arthritis, urinary tract infection, infection of the central nervous system, bone infection, soft tissue infection, etc<sup>11</sup>. Infection may remain as the latent form for a long time, and when the function of reticular endothelial cells is deteriorated, it may become activated and consequently, it may secondarily induce spreading infection in the bone several months or several years after acute salmonellosis<sup>12</sup>.

A 2018 Imperial College London study also shows how salmonella disrupt specific arms of the immune system (e.g. 3 of 5 NF-kappaB proteins) using a family of zinc metalloproteinase effectors, leaving others untouched<sup>13</sup>. Salmonella thyroid abscess has also been reported in infected patients<sup>14</sup>.

### **Symptoms of E.Coli infections <sup>1</sup>**

Signs and symptoms of E. coli O157:H7 infection usually begin three or four days after exposure to the bacteria. But you may become ill as soon as one day after exposure to more than a week later. Signs and symptoms include:

Diarrhea, which may range from mild and watery to severe and bloody, Stomach cramping, pain or tenderness and Nausea and vomiting, in some people. Symptoms of the diseases caused by STEC include abdominal cramps and diarrhoea that may in some cases progress to bloody diarrhoea (haemorrhagic colitis). Fever and vomiting may also occur. The incubation period can range from 3 to 8 days, with a median of 3 to 4 days. Most patients recover within 10 days, but in a small proportion of patients (particularly young children and the elderly), the infection may lead to a life-threatening disease, such as haemolytic uraemic syndrome (HUS). HUS is characterized by acute renal failure, haemolytic anaemia and thrombocytopenia (low blood platelets). It is estimated that up to 10% of patients with STEC infection may develop HUS, with a case-fatality rate ranging from 3 to 5%. Overall, HUS is the most common cause of acute renal failure in young children. It can cause neurological complications (such as seizure, stroke and coma) in 25% of HUS patients and chronic renal sequelae, usually mild, in around 50% of survivors. Persons who experience bloody diarrhoea or severe abdominal cramps should seek medical care. Antibiotics are not part of the treatment of patients with STEC disease and may possibly increase the risk of subsequent HUS.

### **How Do You Get Infected from E.Coli ?<sup>1</sup>**

Sources of infection includes :

Ground meat: You eat ground meat that carries E. coli, and the meat wasn't cooked enough to kill the bacteria. When meat is processed, sometimes bacteria from the animals' intestines make their way into the meat. This happens more with ground meat because it comes from more than one animal.

Untreated milk: You drink unpasteurized milk, which hasn't been heated to kill bacteria. E. coli can get into the milk from the cow's udder or from milking equipment.

Vegetables and fruit: Infected bazaar area, you might eat fresh vegetables or fruit that's been tainted by water that has the bacteria. This happens most often when manure from nearby animals mixes with the water supply. Other foods and beverages: You might also get E. coli from unpasteurized fruit juices and yogurt and cheese made from raw milk.

Water: Drinking water that contains E. coli, perhaps while swimming in a pool, lake, or pond.

Other people: You might get E. coli from another person who has it, such as a child. The bacteria can be passed to you if you clean up after an infected person and then don't wash your hands really well before you touch your mouth.

Animals: It can be found at Animal parks, petting zoos or animal exhibits at fairs.

You can also contaminate food in your own kitchen if you allow a knife or cutting board that has touched uncooked meat (like chicken) to come into contact with food that will be eaten raw (like a salad). The reservoir of this pathogen appears to be mainly cattle. In addition, other ruminants such as sheep, goats, deer are considered significant reservoirs, while other mammals (such as pigs, horses, rabbits, dogs, and cats) and birds (such as chickens and turkeys) have been found infected. E. coli O157:H7 is transmitted to humans primarily through consumption of contaminated foods, such as raw or undercooked ground meat products and raw milk. Faecal contamination of water and other foods, as well as cross-contamination during food preparation (with beef and other meat products, contaminated surfaces and kitchen utensils), will also lead to infection. Examples of foods implicated in outbreaks of E. coli O157:H7 include undercooked hamburgers, dried cured salami, unpasteurized fresh-pressed apple cider, yogurt, and cheese made from raw milk. An increasing number of outbreaks are associated with the consumption of fruits and vegetables (including sprouts, spinach, lettuce, coleslaw, and salad) whereby contamination may be due to contact with faeces from domestic or wild animals at some stage during cultivation or handling. STEC has also been isolated from bodies of water (such as ponds and streams), wells and water troughs, and has been found to survive for months in manure and water-trough sediments. Waterborne transmission has been reported, both from contaminated drinking-water and from recreational waters. Person-to-

person contact is an important mode of transmission through the oral-faecal route. An asymptomatic carrier state has been reported, where individuals show no clinical signs of disease but are capable of infecting others. The duration of excretion of STEC is about 1 week or less in adults but can be longer in children. Visiting farms and other venues where the general public might come into direct contact with farm animals has also been identified as an important risk factor for STEC infection.

### III. CONCLUSION

#### Preventive methods against Salmonella

To prevent salmonella infection, make sure to handle, store and cook food safely. Avoid high-risk foods such as: raw or incompletely cooked chicken, cracked or dirty eggs, unwashed fruits and vegetables, unpasteurised milk products, good hand hygiene is especially important to prevent salmonella. You should wash your hands: after going to the toilet, after changing nappies, after touching animals, before and after preparing food, before eating.

#### Prevention methods against E.Coli infections

The prevention of infection requires control measures at all stages of the food chain, from agricultural production on the farm to processing, manufacturing and preparation of foods in both commercial establishments and household kitchens.

In industries : The number of cases of disease might be reduced by various mitigation strategies for ground beef (for example, screening the animals pre-slaughter to reduce the introduction of large numbers of pathogens in the slaughtering environment). Good hygienic slaughtering practices reduce contamination of carcasses by faeces but do not guarantee the absence of STEC from products. Education in hygienic handling of foods for workers at farms, abattoirs and those involved in the food production is essential to keep microbiological contamination to a minimum. The only effective method of eliminating STEC from foods is to introduce a bactericidal treatment, such as heating (for example, cooking or pasteurization) or irradiation.

At home : Preventive measures for E. coli O157:H7 infection are similar to those recommended for other foodborne diseases. Basic good food hygiene practices, as described in the WHO "Five keys to safer food", can prevent the transmission of pathogens responsible for many foodborne diseases, and also protect against foodborne diseases caused by STEC.

The five keys to safer food are: Keep clean., Separate raw and cooked, Cook thoroughly., Keep food at safe temperatures and Use safe water and raw materials.

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