Salmonella and common food poisoning biology essay

ASSIGN BUSTER

Food poisoning is a common problem that affects millions of people in the United States and throughout the world. Food poisoning can cause distressing and sometimes life threatening problems in humans. People that have eaten contaminated food may be symptom-free or have symptoms ranging from intestinal discomfort to severe dehydration and bloody diarrhea. The following bacteria can cause food poisoning; Campylobacter, Shigella, E. Coli, and Salmonella.

The Salmonella family contains over 2, 300 serotypes of bacteria. A serotype is a group of microorganism, viruses, and cells classified together based on their cell surface antigens. Salmonella is a Gram-negative, rod-shaped, flagellated and motile bacterium. Salmonella is found in the gastrointestinal tract of fish, turtles, snakes, lizards, gerbils, hamsters, other rodents and humans. Infection can also be spread from person-to -person. Salmonellosis is a zoonotic disease that can spread from animals to humans. Salmonellosis can be spread by eating uncooked pork, chicken, beef, and fish. Salmonellosis can also be spread by eating contaminated food with Salmonella. Symptoms are bloody or watery diarrhea, stomach cramps, throwing-up, fever, head-ache, chills, sweats, fatigue, and a lack of appetite. If the infection is severe the individual might be given antibiotics. The risks of Salmonellosis are the loss of body fluids, dehydration, shock, and death. Remedies for Salmonellosis depend on symptoms. Remedies are antibiotics, rest, eating a bland diet, and drinking plenty of fluids. There are three high risk groups: infants, people above the age of 60, and people with compromised immune systems.

Salmonella bacteria can also cause Typhoid Fever. Typhoid Fever can be cause by two types of Salmonella bacteria: Salmonella typhi bacteria and Salmonella paratyphi. Typhoid Fever is contracted by the ingestion of the Salmonella bacteria in contaminated food or water. Patients with acute illness can contaminate the surrounding water supply though stool. The stool contains high concentration bacteria. Patients can be classified as Long-Term Carriers if they have a mild infection and it go unrecognized. The bacteria replicates in the gallbladder, bile ducts, or liver and passes into the bowel. The bacteria can survive for weeks in water or dried sewage. Symptoms of Typhoid Fever are high temperature, chest discomfort, abdomen discomfort, headaches, lethargy, poor appetite, ad diarrhea. Typhoid Fever is determined through a stool culture. Typhoid Fever is treated with Antibiotics.

There are several scientists doing research on the Salmonella bacteria. There are a series of experiments that are being conducted abroad the International Spaceship that may lead to vaccine against Salmonellosis from Salmonella bacteria. Scientists at the USDA Agricultural Research Service have developed a poultry vaccine for some strains of Salmonella in poultry. The study of how Salmonella contaminates powder infant formula has helped them to create quality assurance procedures, to help prevent contamination of Powder Infant Formula. Scientists are trying to use Salmonella as remedy for hypoxia to help the in treatment of cancer. There are a group of scientists in Morocco that did a study on food samples from Morocco to determine if the food they were eating contained Salmonella.

There are a series of experiments that are being conducted abroad the International Space that may lead to vaccine against Salmonellosis from

Salmonella bacteria. Dr. Cheryl Nickerson has produced studies that have shown that Salmonella becomes more virulent in weightlessness environment. Salmonella's virulence can be controlled like an on and off switch. NASA started these studies because they were concerned about their astronauts being more susceptible to food poisoning due to their weakened immune systems. Weakened immune systems are due to microgravity. Researchers discovered that microgravity changes Salmonella. The scientists can use this information from space on Earth because the environment inside the intestines is similar to the weightlessness in space. Another Scientist, Professor Timothy Hammond, is pursuing a vaccine based on the genetic changes seen in the space-borne bacteria. There are a series of experiments that are being conducted abroad the International Space that may lead to vaccine against Salmonellosis from Salmonella bacteria. (Klotz, 2009)

Scientists at the USDA Agricultural Research Service developed a poultry vaccine to reduce the spread Salmonella enteritidis (S. enteritis) infection among flocks. S. enteritis is a serotype of Salmonella . This current epidemic is caused by egg-borne Salmonellosis. Egg-Borne Salmonellosis is caused to intact and disinfected grade A eggs because S. enteritidis infects the ovaries silently. This contaminates the hen's eggs. The vaccine reduces shedding ten to forty percent more effectively than the three commercial vaccines that are currently being used. The vaccine reduces the amount of S. enteritidis that is located in the bird's digestive tract that helps eliminate the pathogen shedding in the bird's feces. The vaccine also eliminates the pathogen invasion of the bird's internal organs. The vaccine is an experimental oil

emulsion vaccine. This vaccine is different from commercial preparations because it increases specific levels of antibodies in the digestive tract which reduces the Salmonella in the hen’s intestinal tract and prevents infection of eggs and disease of transmission. In this research study, the vaccine was administered to the birds subcutaneously in two doses four to six weeks apart before exposing the birds to S. enteritidis. Researchers performed strict measures to ensure that there are no other pathogens were present in the hens before and during the investigation. In the 1970s, meticulous procedures for cleaning and inspecting eggs were implemented to reduce Salmonellosis. Salmonellosis is caused by the external fecal contamination of egg shells. S. enteritidis became a public health concern in the 1980s. The pathogen invades poultry which can cause harm to the reproductive organs that can lead to contamination of the eggs. In the 1990s, scientists started to develop poultry vaccines against S. enteritidis. Currently, twenty-five million doses of S. enteritidis vaccine are used annually. (Smith, 2006)

Powdered Infant Formula (PIF) is not a sterile product and may be contaminated with pathogens that can cause serious illness in infants (children aged <1 year). One pathogen that has been found is Salmonella. In the United States, the incidence of Salmonellosis among infants are 121. 6 laboratoryâ€ confirmed infections per 100, 000 infants in the United States, 181 cases per 100, 000 infants in the United Kingdom, and 92. 8 cases per 100, 000 infants in Israel. Salmonella that has contaminated dried milk products have cause documented outbreaks since the early 1950s in the United Kingdom and Bulgaria. In 1966, there was a multistate outbreak of Salmonella infection which primarily affected infants. The outbreak

investigation linked the illness consumption of dried milk to one manufacturer. The contaminations occurred in the spray driers. In 1973, Salmonellosis occurred in Trinidad which infected 3, 000 infants. The investigation linked the illness to the consumption of seven brands of powdered milk that where packaged at the same processing plant. In 1977, there was another outbreak of Salmonella in Australia that was linked to contaminated PIF. Theses outbreaks were caused by contaminated spray driers. These incidents led to the implementation of preventative measures which reduced Salmonella contamination from 1. 9% in 1976 to 0. 01% in 1988. There were six more outbreaks of Salmonella infection associated with PIF during 1985 to 2005. These outbreaks occurred in United Kingdom (1985), United States and Canada (1993), United Kingdom and France (1996-1997), Korea (2000), United States (2001), and Asia, Africa, Oceania, and other European countries (2007). In the outbreak of Salmonella in the United Kingdom (1985), the contamination was traced to problems in the spray drier and a very low concentration of salmonellae was found in the powder. The outbreak of Salmonella in United States and Canada (1993) was caused by lactose fermenting strains of Salmonella. The outbreak of the United Kingdom and France (1996-1997) was caused by molecular subtyping was used to specifically identify the epidemic. The outbreak in Korea (2000) was caused by spore contamination. It was too difficult to determine if the spore contamination occurred before or after opening the container. The outbreak that occurred in United States (2001) was difficult to determine how the contamination occurred. The contamination occurred in the preparation room of the hospital. The outbreak of Asia, Africa, Oceania, and other European countries (2007) was caused by Salmonella Agona. Currently, the

PIF industry cannot produce sterile PIF. There are quality assurance procedures that have been established to help prevent contaminated PIF. The following are some procedures that might prevent Salmonella contamination: not allowing entry of Salmonellae in the manufacturing environment, avoiding replication of Salmonellae in case of entry, creating hygienic equipment and hygiene zones, and only using dry-mixed ingredients that are free of Salmonellae. Care givers need to be cautious when storing and feeding PIF to infants. (Cahill, 2008)

Hypoxia is a common characteristic of human tumors. It can affect the prognosis of cancer patients. Hypoxia is when the body as a whole or a certain region on the body is deprived of adequate oxygen supply. If a remedy for hypoxia is found this could improve cancer treatment. A vaccine strain of Salmonella choleraesuis was used as a live vector for carrying DNA vaccines. In the study, S. choleraesuis was used to carry a eukaryotic expression vector encoding TSP-1 as a tumor targeted anticancer agent for primary and metastatic tumors of B16F10 melaoma. The results propose that the dual effect of tumoricidal ad antiangiogenic activities caused by S. choleraesuis carrying TSP-1 gene. These results may have therapeutic potential for the treatment of primary and metastatic melanomas. In the research study, the TSP-1 expression vector pTCYTSP-1was used under the control of the rat -actin promoter. It was created by cloning the 3. 7-kb cDNA fragment of mouse TSP-1 into the HindIII/SmaI sites of pTCY. Murine B16F10 melanoma and human A549 lung adenocarcinoma cells were cultured in Dulbecco’s modified Eagle’s medium (DMEM). Human HMEC-1 microvascular endothelial cells were cultured in EGM endothelial growth medium. Male

mice (6-8 weeks) were used in the experiment. On Day 0, B16F10 cells (106) were inoculated subcutaneously into the flank of C57BL/6 mice. On day 8, mice with tumor nodules ranging from 50 to 100 mm3, the mice were injected intraperitoneally with 2 106 colony-forming units (CFU) of S. C. /Luc. At various intervals after bacterial inoculation, groups of 7-8 mice were killed. Their tumors, livers, spleens, and whole blood were collected, weighed, and homogenized. Bacterial counts were taken. Tissue homogenates were lysed and studied for luciferase activities by a luciferase assay kit using a luminometer. On Day 0, in the experimental murine model for pulmonary metastatic melanoma, eight mice were injected with B16F10 cells (5 104) at the tail vein. At day 15, these mice were inoculated injected intraperitoneally with S. C./LacZ (2 106 CFU) or PBS. Their lungs, livers, and spleens were obtained at day 20 for quantification of S. C./LacZ numbers. Assay of endothelial cell proliferation was performed on A549 cells. In the primary melanoma model, groups of 7-8 C57BL/6 mice that had been inoculated subcutaneously with B16F10 cells (106). Every three days, palpable tumors were calculated by two perpendicular axes with a tissue caliper and the tumor volume. The mean tumor volumes were obtained while all of the mice were alive. The total number of the mice that were still alive was noted daily. On Day 15, in the experimental metastatic model, groups of 7-8 C57BL/6 mice were injected with B16F10 cells (5 104) at the tail vein and at day 0 were injected intraperitoneally with 2 106 CFU of S. C./TSP-1 or S. C./VO, or with PBS. The survival of the mice was observed daily. The quantify tumor burden in the lungs was enhanced, by inducing pulmonary metastasis. On Day 20, the wet lung weight and -gal activity of the lungs from these mice were determined. Lung homogenates were lysed and observed for -gal

activities. This research team has shown that tumor targeted TSP-1 gene delivered by attenuated S. choleraesuis carries a eukaryotic expression vector endcoding murine TSP-1. The results of this experiment, inhibit tumor growth and enhance the survival in established murine melanoma models. S. choleraesuis carrying TSP-1 gene appears to be treatment of melanoma or other solid tumors. (Che-Hsin, 2005)

Brahim Bouchrif and his team of researchers tested their hypothesis on the occurrence of Salmonella in food in Morocco. There were three different parts in the experiment: Food Samples Collection, Microbiological Analysis, and Antibiotic Sensitivity Test. The first part of the experiment was the Food Sample Collection. From March 2002 to December 2005, a total of 11, 516 different food samples were collected from slaughtered houses in Rabit City and from hotels, restaurants, snack bars, and public and private business in cities around Morocco. Food Samples from slaughterhouses were beef samples. About 50 grams of each sample was collected in a sterile plastic pouch and transported to the laboratory refrigerated at 0-10 Degrees Celsius no later than 24 hours after collection. Samples were stored at -20 degrees Celsius until analysis. The second part of the experimental was the Microbiological Analysis. Twenty-five grams of each sample was blended in 225 ml buffered peptone water, Bio-Rad homogenized I Colworth Stomache and incubated at 16-20 hours at 37 degrees Celsius as pre-enriched for Salmonella. o. 1 ml of the pre-enriched sample was to be inoculated with 10 l of Rappaport Vassiliadis medium, and 1 ml of the pre-enriched sample was use to inoculate 10 ml of the selenite-cystidine medium. Samples were incubated for 7 hours at 42 degrees Celsius and 37 degrees Celsius.

Bacterial isolation occurred on EKM and XLD media at 37 degrees Celsius for 24 hours Bio-Rad. Lactose -negative colonies were kept for future studies. Salmonella was identified using the AP120E. The dependent variable is if the sample has Salmonella bacteria or no Salmonella bacteria. The independent variable is the amount of the ingredients being added to the samples to determine if the food has Salmonella or no Salmonella. The control variable is that from every food sample, . 25grams are being tested. Serotypes were identified by aglutination tests. The third part of the experiment was the Antibiotic Sensitivity Test. In this test, each of the Salmonella isolates was tested for its susceptibility to antimicrobials on Muller-Hinton agar which followed the disc diffusions. E. coli and each Salmonella that is being tested. Some of the antimicrobials are ampicillin, amoxicillin and clavulanic acid, ceftazidim, cefotaxime, chloroamphenicol, cefazolin, cefamandol, gentamycin, mecillinam, trimethoprim/sulphameltoxazole, trimethoprim, streptomycin, ciprofloxain, and nalidix acid. The controlled variable is E. Coli . The independent variable being used is the type of antimicrobials being used. The dependent variable is if the bacterium is resistant or not resistant to the antimicrobial. These tests procedures helped provided data for the hypothesis proposed. There were three different results that were produced from the experiment: if Salmonella was present in food sample, serotypes of Salmonella being produced, and if the sample is resistant to antimicrobials. Ninety-one percent of the food samples examined contained Salmonella bacteria. Seventy-five percent of the meat being examined had Salmonella and nine and half percent of the seafood being examined had Salmonella poisoning. There were two subspecies: I enterica and I salamae. There were 15 different serotypes of I enterica. The table located on page 9, display the

different serotypes I enterica and I salamae. The table also displays the industry for which each serotype came from. Drug susceptibility assay showed that seventy-one percent of the samples that contained Salmonella were susceptible to all fifteen antimicrobials. Twenty-nine percent of the isolates were resistance to at least one antimicrobial. Fifteen percent of the isolates were resistant to two or more antimicrobials. The overall prevalence of Salmonella was lower than other countries. This information can be interpreted as better hygiene practices in Morocco. The sampling procedures and storage, and bacterial isolation might have altered the results of the experiment. The analysis of the isolated Salmonella strains showed different types of serotypes. Drug resistance in zoonotic microbes has made therapeutic intervention in humans. Antimicrobial resistance in food-borne pathogens is public concern. Food-borne pathogen can become resistant in response to antimicrobial drug use in food animals. Contaminated food products at the time of slaughter can transmit the resistance genes to humans. (Bouchrif, 2008)

Cooked Meat

Sausage

Chopped Meat

Seafood

Pastry

Chicken Meat

Spices

Slaughterhouse

Water

N

%

Anatum

1

1

2

4

3. 8

Bareilley

1

1

0. 95

Berta

2

2

1. 9

Blokey

1

5

3

2

11

10. 4

Bovismorbificans

2

2

1. 9

Braenderupll

7

7

6. 6

Bredneney

1

12

13

12. 3

Enteritidis

1

2

3

2. 8

Hadar

3

1

4

3. 8

Infantis

1

1

22

1

25

23. 8

Kiambu

6

6

5. 7

Labadi

1

1

2

1. 9

Mbandaka

8

8

7. 6

Montevideo

4

4

3. 8

Typhimurium

1

1

1

5

9

8. 5

Other Serotypes

1

1

2

3

2. 8

Salamae (type II)

1

1

0. 95

Total Number of Isolates (%)

1. 9

1. 9

3. 8

9. 5

4. 7

4. 7

0. 95

71. 4

105

100

Salmonella bacteria can be good and bad bacteria. There are a lot of scientists doing research on the Salmonella bacteria. It can be extremely harmful because it can make individual extremely sick or cause death. Salmonella can be a good bacteria too because scientist are doing research on it to see how it can help shrink tumors in cancer. There are two research teams on the International Spaceship doing research on a Salmonella Vaccine. If a Salmonella Vaccine could be produced this would not make the symptoms of Salmonellosis not as severe and

prevent people from dying of Salmonellosis. Scientists at the USDA Agricultural Research Service developed a poultry vaccine to reduce the spread Salmonella enteritidis (S. enteritis) infection among flocks. Powdered Infant Formula (PIF) is not a sterile product and may be contaminated with

pathogens that can cause serious illness in infants (children aged <1 year). One of these pathogens is Salmonella. It is good to study how Salmonella contaminates a product because then we can find ways on how to prevent contamination. It also brings an insight how to improve other quality assurance issues in other products. It is important for regions to take samples of their food products and test them for Salmonella bacteria. This allows us to know if businesses are following the proper hygiene practices. It also tells companies if they need to improve on certain hygiene practices, if their food is found contaminated. If the food is found contaminated it is good to know the serotype of bacteria found in the food and if a particular food that is contaminated. Foods that have a tendency to be contaminated with bacteria have a different types of antimicrobials injected in to them. Industries need to test the food products to see if the bacteria have become resistant to that type of microbial. If the bacteria have not become resistant that is good because the microbial will help prevent bacterial contamination. If the bacteria has become resistant this is not a good thing because the food would be contaminated and cause illness. If the bacteria have developed a resistance to a microbial then contaminated food products at the time of slaughter can transmit the resistance genes to humans. There is still a lot more research that scientists can do on the Salmonella bacteria. Scientist might be able to use the Salmonella bacteria as a vector to help cure some incurable disease. Maybe, one day instead of Salmonella being our enemy, it will be our friend!!!