FOODBORNE SALMONELLOSIS: AN UPDATE

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ABSTRACT

Salmonella are the common naturally occurring bacteria in the intestinal tract of birds, anim including reptiles, turtles, insects, and farm animals, human. The lack of host specificity is one the important characters of this organism. Bacteria of this genus are very much wide spre and important cause of food borne outbreak in man. It can be transmitted both from animal human and vice versa.

Keywords: Food-borne, Salmonella, Transmission

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INTRODUCTION

Salmonella is a member of family Entero bacteriaceae, gram negative, motile, non spore forming; facultative anaerobes that can grow at temperature range of 5- 45^0 C with optimum temperature of 35- 37^0 C. They are readily killed by heat (e.g., 71^0 C for 15 sec) and acid (e.g., 1.4% acetic acid at pH 4.0 within 72 h, and are resistant to both freezing and drying.[1]

CLASSIFICATION

Salmonella generally divided into 2 categories.[2]

A.TYPHOIDAL GROUP: Causes typhoid fever and includes Salmonella typhi and S.paratyphi which is carried only by man.

B.NON-TYPHOIDAL GROUP: These are most common and carried by both human and animals. This group causes food borne infection. It contains 2200 serotypes all of which have their primary reservoir in animals.

e.g. S. enteritidis and S. javiana

SALMONELLA ANTIGEN AND NOMENCLETURE

Kauffmann-white scheme is used for identification of salmonella according to their antigenic properties. It acts as a tool for tracing epidemiological outbreaks. There are over 60 somatic or O antigen and these occur characteristically in groups. Within each group, differentiation of serotypes is by identification of flagellar antigen. Most salmonella have 2 kinds of flagellar antigen. A culture may be composed of organisms all of which have same antigen or a mixture of both. The alternative sets of antigens are called as phase. So a culture may be in phase 1 or phase 2 or in both phages simultaneously. Another antigen Vi antigen found in S.typhi and it is a surface polysaccharide that envelops O antigen. It is heat labile and organism that are not agglutinable with the O antisera become agglutinable after boiling or heating at 60^0 C for 1 hour.[3]

On the basis of DNA hybridization genus salmonella were divided into two species.

1. Species enterica- It is further divided into 6 subspecies of s. enterica: enterica which includes the mammalian pathogens and salamae, arizonae, diarizonae, houtenae, indica, all five of which are found in the cold blooded animals. It is the most common food borne bacteria in the world.

2. Species bongori-All these species are further divided into more than 2500 serovars. In food borne outbreaks S. typhimurium is predominant.

SOURCE OF INFECTION

Infection is mainly a fecal-oral infection. Contaminated food of animal origin like meat, egg or vegetable origin like lettuce, sprout, leafy vegetables, seeds all are sources of infection. Another source is contact with infected animal such as reptiles or small birds. Poultry are a major source of human food borne salmonellosis due to high density farming operations which allow colonized birds to quickly

spread salmonella to others in a flock. Consumption of foods from animal origin such as contaminated eggs, unpasteurized milk, cross-contaminated foods and drinking water.[4]

Eggs are reservoir of salmonella particularly S.enteritidis as this organism colonizes in the ovary of laying hen. and transmitted vertically from breeding flocks to laying hen. As a result eggs stored at room temperature contains high concentration of salmonella (1011 per egg).[4]

PATHOGENESIS

The organism enters to human food chain through egg or carcass contamination. 1st it goes to stomach then to intestinal tract where it interacts with intestinal mucosa. Within the intestine there is a specialized follicle associated epithelium (FAE) that contains supporting M Cell in addition to enterocytes. Salmonella attaches this enterocytes and thus there is manifestation of a no. of effects including tissue necrosis, thickening, inflammatory response, and fluid secretion that leads to diarrhea. Besides this there is ruffling of cell membrane. This facilitates uptake of bacteria in the membrane bound vesicles. The organism replicates in these vesicles and are eventually released from the cells that sustain only mild damage.[5]

CLINICAL SIGNS IN HUMAN:

The symptoms are not very characteristics. Mortality is also low. Acute abdominal pain called as pseudo appendicitis, diarrhea, fever, nausea, sometimes vomiting may be seen. Although the acute stage of illness passes fairly rapidly, the carrier state can last for more than 3 months and sometimes there are complications. Deaths are rare. Sometimes as a complication reactive arthritis is seen where there is an immune reaction that gives joint pain and fever. Also, there may be damage to the mucous membrane of the small intestine and colon, which leads to malabsorption and nutrient loss; allergies and severe illness are more likely in malnourished individuals.[6]

In human another important sign called as enteric fever caused by S typhi, S paratyphi A, S paratyphi B, and S.paratyphi C. The incubation period is 7-28 days (on average 14 days), depending on the infective dose. The principal features are malaise, headache, high and persistent fever, body aches, general weakness, and abdominal pains; nausea, vomiting, coughing, sweating, chills, and anorexia may also occur. The gall bladder is the usual seat of infection in the carrier state, although other organs, such as the liver, may be involved.[7]

Salmonellosis in animals:

In animals three forms of salmonellosis are found.

Primary salmonellois: Here salmonella acts as the sole source of infection causing serious pathological condition. It includes abortion in horse, bacillary white diarrhea in chicks.

Secondary salmonellosis: It originates due to any like virus or parasite or any stress condition causing immunosuppression of host.

Symptomless salmonellosis: Seen in clinically healthy animals often in the lymph nodes, especially the mesenteric ones, in the liver and gall bladder, and sometimes in other organs (kidneys, spleen).[8]

DIAGNOSIS[9-11]

Laboratory confirmation is required for salmonellosis. The organism is excreted in feces of infected animal for many days which can be detected by culture methods in laboratory.

Detection of salmonella requires a 3 stage procedure.

Pre -enrichment in non selective broth (lactose and brilliant green): The main aim is to allow the injured cells to resuscitate.

b .Enrichment in selective Media: 0.1ml in 10 ml Rappaport Vasiliadis broth (42.5^0 C for 24 h) or 1ml in 10 ml selenite broth(37^0 C for 24 h); the main purpose is to suppress the growth of other micro flora.

Subsequent detection in selective and differential agar media: Brilliant green agar or XLD (37^0 C, 24hrs), this is done to differentiate salmonella from other micro flora like Proteus spp, Citrobacter spp and E.coli so that isolated colonies of salmonella can be found. Then the colonies can be subjected to further biochemical test and confirmed as salmonella using commercially available salmonella antisera. This procedure is applicable to most environmental and food samples and also from fecal and organ samples from animals without any symptoms of the disease. There are various serological techniques used for detection of salmonella particularly host-adapted species such as S. pullorum in birds. The agglutination test is most commonly used test for mass screening.

TREATMENT[12-14]

In severe cases, symptomatic electrolyte replacement and rehydration.

Routine antimicrobial therapy is not recommended for mild or moderate cases in healthy individuals as R-plasmid coding for multiple resistance are comparatively common in salmonella. Also antimicrobial may not completely eliminate the bacteria and may select for resistant strains which subsequently lead to the drug ineffective.

Besides these antimicrobials prolongs the bacteria in stool. This asymptomatic persistence of bacteria in the gut likely results from a suppression of gut micro flora that normally competes with nutrients for salmonella. In severe cases antimicrobials can be prescribed.

PREVENTION AND CONTROL[15]

Control of salmonella infection is based on reducing the risk of exposure to infection by implementing a closed herd policy and purchasing animals from a reliable source. The application of the hazard analysis critical control point (HACCP) system throughout the food chain to identify the best places (critical control points) to eliminate or control growth or contamination with salmonella is a pre-requisite for the effective and economic

control of human and animal salmonellosis. Animals should be given salmonella free feed, fresh water, good husbandry practices along with daily cleaning and disinfection of farm can reduce infection. Clinically infected animals should be isolated from the rest in the herd. Foot bath containing suitable disinfectant should be located at strategic location to limit the spread of the disease. Contaminated carcass and bedding should be disposed properly. "Competitive exclusion", principle can be adopted in which flora from the intestinal tract of a mature animal is used to infect a very young animal, may be 1-day-old chick to establish a protective flora, that prevents infection of salmonella. This method is widely practiced on poultry farms in Scandinavian countries. Herd vaccination may be followed to limit the spread in case of outbreak. Hygienic abattoir practices should be done to prevent any contamination of meat with salmonellosis. Anti mortem and postmortem inspection should be done to prevent diseased animals entering into food chain.

MEASURES FOR ZOONOTIC SALMONELLOSIS[16]

Cook meat and eggs thoroughly until they reach an internal temperature of 160^0 F.Do not eat foods containing raw eggs or milk. Avoid cooking raw meat in microwave as it may not reach a high internal temperature. Wash hands with soaps after handling reptiles or animal faces. Basic food hygienic measures such as "COOK THOROUGHLY" are recommended as a preventive measure against salmonellosis. Besides this, national and international surveillance systems are important means to detect and respond to salmonellosis in early stages and thus to prevent them from further spread.

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