

Salmonella

By F. E. Nelson

HAZARD TO FOOD

Bacteria of the genus *Salmonella* are one of the causes of intestinal disease in man and animals. Some of these bacteria cause disease in only a very limited host group. As an example, *Salmonella typhosa* is the cause of typhoid fever in man and is not a cause of illness in other animals. *Salmonella gallinarum* is the causative agent of pullorum disease in poultry and is of very limited importance among other animals, including humans.

The present discussion will be confined to those *Salmonella* bacteria which have a considerably wider host range and are important causes of so-called "food-poisoning" in man. The more proper name is salmonellosis. The symptoms are an abrupt onset of diarrhea, nausea, abdominal pain, prostration, chills, fever and vomiting, although all of these do not always appear in any one case. These symptoms usually develop in varying degrees in 12 to 24 hours after ingestion of contaminated food or beverage, although onset may be as early as 7 hours or be delayed as long as 72 hours. Recovery usually is within 1 to 3 days after onset. Only rarely is the disease fatal and then mostly among small children or the aged. In some countries with poor sanitation standards, salmonellosis is an important cause of infant mortality.

Salmonellosis usually results from consumption of foods in which these organisms have grown to populations of hundreds of thousands to millions per gram. The number needed to cause illness varies with the organism strain, the food in which the organism has grown and the susceptibility of the individual human to this disease. More than 1200 types of *Salmonella* bacteria have been recognized by laboratory technics. Recognition of the type(s) involved is much more important in tracing the source of contamination than in any other aspect.

The foods most frequently found contaminated with *Salmonella* bacteria are those of animal origin or

containing material of animal origin. Eggs and products made in whole or in part from eggs, meats and products containing meats, raw milk products and fish (especially shellfish from contaminated waters) are the foods that have been involved most frequently in outbreaks. Since these organisms are not particularly resistant to heat, normal temperatures used for pasteurization of milk or egg products or customary for the thorough cooking of foods will destroy them.

Some of the major sources of the isolations from non-human sources during July, 1967, as reported in the Salmonella Surveillance Report of the U. S. Public Health Service, are shown in the following compendium:

Source	No. of Strains Isolated
Chickens	17
Turkeys	100
Horses	5
Cattle	40
Hogs	15
Dogs	4
Eggs	21
Powdered eggs	2
Frozen eggs	15
Dry milk	57
Milk plant environment	8
Bone meal/meat scraps	50
Animal feeds	56
Rendering plant environment	3
Frozen pie	9
Candy	10
Egg noodles	14
Yeast	13
Vitamins	21
Animal protein	21
Glandular material	33
Turtles	6

During this same period, 1,875 isolations were made from humans. Recent reports indicate these organisms are found in the run-off from feedlots. With the wide distribution of *Salmonella* bacteria in materials of animal origin, all food-handling operations should be carried out as if these organisms were known to be present. Adequate heat treatment, either by proper pasteurization or by thorough

cooking, will kill these bacteria, if they are present.

Handling of products at all times should be such as to minimize possibilities for contamination. Especially should cooked or processed foods be protected from *Salmonella* organisms associated with the raw products. Hands, utensils and work surfaces should be washed thoroughly after handling raw food, so that cooked food will not become contaminated when it contacts these same surfaces. Foods should be protected from growth of these bacteria by being held at temperatures below 50° F. at all times. All portions must be at or below this temperature a condition frequently not achieved when large quantities which cool slowly at the center of the mass are placed in the refrigerator. Hot foods should be kept above 140° F., as this will kill *Salmonella* bacteria. The food processor must make sure that the products which he markets have been so treated and protected that they are free from *Salmonella* bacteria when they reach the ultimate consumer.

The processor can ill afford to have his product seized because, in the words of the Food and Drug Administration, "when shipped, the article contained an added and deleterious substance, *Salmonella* micro-organisms, which may have rendered it injurious to health." Even the presence of one such organism in an ounce or more of food may lead to seizure, since this organism could increase in numbers to a level which could cause "food-poisoning" if the conditions were right.

Animal feeds should be processed in such a manner that *Salmonella* bacteria are destroyed and should be protected from recontamination after processing. This will help prevent spreading the disease from one group of animals to another. The Food and Drug Administration feels this is so important that *Salmonella*-contaminated feeds are being seized when found in interstate commerce.

With proper understanding of the problem and the taking of adequate precautions by all concerned, the incidence of salmonellosis can be reduced markedly.

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