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AN OUTBREAK OF FOOD POISONING APPARENTLY CAUSED BY A NEW SEROLOGIC TYPE OF SALMONELLA (S. PANAMA)

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In January 1931, about forty men belonging to two batteries of American soldiers (Companies B and C, 65th C.A.) stationed at Fort Amador, Panama Canal Zone, became ill at about the same time with dizziness, headache, nausea (rarely vomiting), followed later by diarrhea and fever. Approximately thirty-five of them were received at the Gorgas Hospital, Friday, January 16, with the provisional diagnosis of "intestinal flu." Most of the patients were seen and questioned by me Saturday morning, January 17, when the occurrence first came to my knowledge. In addition to the symptoms noted, some degree of leukocytosis was observed in many cases (12,750; 15,000) and leukopenia (3,900; 4,750) in several others. A number of the patients during their first twenty-four hours at the hospital had temperatures ranging up to 103 F. or higher (in one case complicated with malaria, 105 F.). In most instances the illness did not last more than two or three days, and the men promptly returned to their companies. There were no fatalities. I am particularly indebted to Dr. H. C. Clark, director of the Gorgas Memorial Laboratory, Panama, for the opportunity of making these observations.

The men affected in this way belonged to two different batteries but ate at a common mess. I have been greatly helped by Major John R. Hall in getting information about the foods that were eaten. Men eating at other messes at Fort Amador were not ill. Both the affected and the unaffected men in the implicated mess seemed to have eaten practically all the foods supplied so that it was not possible to fix on the responsible article of diet by any process of exclusion. Reliable information about the foods eaten was difficult to secure since contradictory stories were told at different times by one and the same patient. In nearly all cases the first symptoms of illness were noticed on the afternoon or early evening of Thursday, January 15. Two men did not feel ill until early Friday morning, January 16. Inquiry was made especially with reference to the evening meal on Wednesday and breakfast and luncheon on Thursday. Two men who did not eat

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luncheon at the mess were ill Thursday evening at the same time as the majority, and two others complained of being nauseated before the Thursday luncheon; it seems reasonably certain, therefore, that this meal can be ruled out as the main source of trouble. This inference is supported by the circumstances that several men were definitely ill very early (1:00-1:30) Thursday afternoon.

The particular food on which suspicion came to rest most strongly was a meat hash served at breakfast Thursday morning, January 15. The hash consisted of freshly ground beef, together with the remnants of a ham served the previous evening (Wednesday, January 14) and "about a vegetable dish full" of the remains of a meat loaf (beef) originally served Tuesday evening (January 13). The variegated composition of the hash and especially the use of meat loaf that had been kept for over thirty-six hours suggest the hash as the culpable dish, but no particle of the hash or of its ingredients remained at the time the outbreak became known to me. The absence of any opportunity to examine possibly incriminated articles of food and the lack of any clearcut epidemiologic history attaching suspicion to a particular article leave the precise origin of the outbreak quite indefinite. From analogy with similar outbreaks it might be conjectured that bacterial multiplication had occurred in the small remnant of the meat loaf held over from Tuesday evening to Thursday morning, and that this ingredient of the hash served at breakfast Thursday was the responsible factor. The relatively small number of men affected favors this supposition as do the time element and the nature of the specific organism (Salmonella) isolated from the patients.

It may be noted that, as in many similar outbreaks, meat that was eaten in a fresh condition without causing any illness apparently became noxious after standing. Whether contamination occurred in the mess kitchen from human carriers or from house vermin or some other source could not be determined. Extensive tests of the serums and examinations of the stools of the kitchen personnel were made but gave no clue.

Samples of the stools were obtained on January 17 from thirty-one of the patients in the hospital and plated on Endo and eosin-methylene blue medium. Organisms of the group Salmonella were isolated from eight of these samples. In no instance were large numbers of suspicious colonies observed on the plates, and in many cases not a single paratyphoid-like colony could be discovered.

Agglutination tests of the strains of Salmonella isolated were made as soon as practicable after isolation (thirteen days) using (*a*) the serums of four of the men who had been ill and (*b*) as controls the serums of four men from another company with no recent illness. The results were as shown in the table.

No relation appeared to exist between the severity of the symptoms or the time of appearance of symptoms and the successful isolation of Salmonella from the stools. In two instances in which a positive result was obtained on the stools of January 17, platings made of samples of stools from the same patients three days later (January 20) failed to yield Salmonella. Two weeks later (February 4) an examination of stools from all eight patients who originally had had Salmonella in their stools gave completely negative results. The excretion of these organisms, therefore, apparently did not continue very long. The examination of four other stools obtained on dates ranging from three to eleven days after an originally negative result on January 17 did not bring to light any Salmonella. The negative results obtained from the

Results of Agglutination Tests with Strains of Salmonella

	797			798			799			
Serum	1:20	1:40	1:100	1:20	1:40	1:100	1:20	1:40	1:100	
M — (797)	++	++	+	++	++	+	++	++	+	Ill
F —	++	+	—	++	+	+	++	+	—	Ill
B —	++	+	tr	++	+	—	+	+	—	Ill
H —	+	tr	—	tr	tr	—	tr	+	—	Ill
N —	++	—	—	+	—	—	+	—	—	Not ill
S —	—	—	—	—	—	—	+	—	—	Not ill
M —	+	tr	—	tr	—	—	+	tr	—	Not ill
P —	tr	tr	—	—	—	—	—	—	—	Not ill

examination of the stools of sixteen food handlers on January 20, five days after the outbreak, therefore, may not have any very great significance.

The eight strains of Salmonella isolated from eight different patients agreed in all their essential cultural characteristics: being motile, gram-negative rods; fermenting, with gas production, within twenty-four hours, dextrose, mannitol, sorbitol, rhamnose, maltose, xylose, arabinose and trehalose; not liquefying gelatin or producing indol; not fermenting within fourteen days lactose, saccharose, inosite or salicin. Two strains showed slight gas production in dulcitol at the end of fourteen days; the others were negative. All strains produced hydrogen sulphide and gave acid in tartrate medium.[1] These characters are similar to those of Salmonella enteritidis and some closely related organisms. The Moscow strain of the S. enteritidis group (group D) described by Hicks[2] is stated to ferment dulcitol slowly (in from three to four

1. Jordan, E. O., and Harmon, P. H.: J. Infect. Dis. **42**:238, 1928.
2. J. Hyg. **29**:446, 1929.

days), but the Moscow strain received by me through the kindness of Dr. W. M. Scott fermented within twenty-four hours; six of the eight Panama strains show no evidence of fermenting dulcitol in fourteen days.[3]

Agglutinatively, the Salmonella isolated from these cases has the somatic antigen ("O") of the S. enteritidis type; it seems to be monophasic with the flagellar antigen ("H") of the "L" or London type studied by White [4] and originally isolated from the feces of a patient with food poisoning. Since this combination of agglutinative and cultural characters appears to be different from those of any Salmonella yet described, I venture to suggest for this organism the name "Salmonella panama," of the subgroup S. enteritidis.

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3. Besides these eight strains that proved identical in their cultural and agglutinative characteristics, another strain (800) with indefinite classificatory characters was isolated. This strain resembled Salmonella in its cultural and biochemical behavior except that it fermented salicin and produced indol, both reactions that rule it out of this genus. It also differed from the eight strains in fermenting dulcitol within twenty-four hours and in blackening lead acetate. It did not agglutinate with antiserums for S. enteritidis, Salmonella aertrycke or Salmonella cholerae-suis.

4. Medical Research Council, Spec. Rep. Ser. no. 91, London, His Majesty's Stationery Office, 1933, p. 37.