A NEW SALMONELLA TYPE: SALMONELLA NAGOYA

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The present paper is dealing with a new *Salmonella* type isolated from three cases of acute gastroenteritis occurred in a family. The organism has typical cultural and biochemical characteristics of the members of *Salmonella* group and is considered to be a new type belonging to C₂ group.

CASE REPORT

A 44 years old female and a 20 years old male were admitted to the Joto Hospital, Nagoya, on September 28, 1951, complaining of general malaise, high fever, anorexia, abdominal pain and diarrhea.

Pus, mucus and blood were observed in the stool of the male patient, and yellow mucus in the watery stool of the female patient.

Their general condition appeared serious.

A type of *Salmonella* strain was isolated from the stool. As both patients were from the same family, we examined the remaining members of the family, and isolated from a 7 year old girl a *Salmonella* strain on October 2nd.

The fever was 38.0°C to 39.5°C at onset of the disease.

Laboratory findings of the first 2 cases:

Blood: hemoglobin (12.4–11.7g/dl) and erythrocyte (4.47–3.43 million/mm³), were within normal limits. Leucocyte counts were 4380/mm³ in one case and 9300/mm³ in the other. Eosinophiles were not seen, immature neutrophils (15.0–37.5%) and monocytes (14.5–15.5%) were increased. Lymphocytes decreased 13.0–26.5% and plasma cells were seen (0.5–1.0%).

Salmonella was negative by blood cultures in bile medium.

Urine: Both were diazo-reaction positive and one showed protein positive with sulfosalicylic acid. *Salmonella* was negative in Kauffmann's medium.

Feces: *Salmonella* was positive on S. S. agar and B. T. B. Drigalski's medium.

Clinical course of the disease:

Remittant fever continued for 3 to 4 days, then gradually declined.

At the beginning, there were frequent discharges of stool (7 to 10 times daily), but after the 7th day one motion daily.

It required 7 to 9 days for the feces to become normal in appearance.

This *Salmonella* isolation from the cultures of the feces was positive until the 24th day of illness in all the patients.

As to the source and spreading of infection, it was not determined.

Isolation of the same *Salmonella* organism from all three patients and the clinical findings mentioned above, indicate that the organism should be the causative agent of these acute gastroenteritis.

BEHAVIOR OF THE ISOLATED ORGANISM

Three strains isolated from three patients were numbered 1785, 1786 and 1787 respectively. They were all the same in biological and serological characteristics.

Cultural and biochemical behavior:

Gram negative, motile rod-shaped organism. No fermentation of lactose, sucrose, salicin, adonitol and inositol. Production of acid and gas from glucose. Production of acid from mannitol, dulcitol, sorbitol, maltose, arabinose, rhamnose, xylose, and trehalose. No production of indole. Methyl-red positive but Voges-Proskauer negative. Growth on Simmons' citrate-medium. Production of H_2S . No coagulation of milk and no liquefaction of gelatin. No decomposition of urea. Positive in Stern's glycerol fuchsin broth. Rhamnose, glucose and arabinose are decomposed but dulcitol is not in Bitter's medium. Growth in Simmons' rhamnose, glucose, arabinose and dulcitol.

Serological behaviour:

The organism in question was agglutinated by O serum of C_2 group (VI, VIII), and of C_1 group (VI, VII), and furthermore, by the O factor serum containing only VIII, but not by the serum containing only VII. The O serum against *Salmonella glostrup* (VI, VIII) was entirely absorbed by the organism in question and vice versa. The result of these tests indicates that the O antigen pattern of this organism is VI, VIII.

The organism in question was agglutinated by the H serum (b) of *Salmonella paratyphi B* var. *java* (IV, V, XII:b:—) and by the H serum (1, 5) of *S. thompson* var. *berlin 2988* (VI, VII:—:1, 5), and furthermore, by the second phase H serum (1, 2, 3) or (1, 2) of *Salmonella newport* var. *puerto-rico* (VI, VIII:—:1, 2, 3) or *Salmonella paratyphi B 8006* (IV, V, XII:b:1, 2). It was agglutinated further by the H factor serum (3), or (5), but not in the H factor serum (2), (6) or (7). This organism removed all the agglutinins from the H factor serum (b) and the H serum (1, 5). This experimental result suggests b for the first phase, and 1, 5 for the second phase of this organism.

The first phase H serum of the organism agglutinated *S. paratyphi B* var. *java* and the second phase H serum agglutinated the second phase cultures of *S. thompson* var. *berlin 2988*, *S. newport* var. *puerto-rico*, *S. paratyphi B 8006*.

S. paratyphi B var. *java* removed all the agglutinins of the first phase H serum of this type of organism. All the H agglutinins were removed from the second phase H serum of the organism by absorption with both *S. thompson* var. *berlin* 2988 and *S. newport* var. *puerto rico*, while *S. thompson* var. *berlin* 2988 alone could not completely absorb the second phase H serum of the organism in question. From the above mentioned, H antigenic formula of this organism is considered to be b:1, (3), 5.

Pathogenicity for mice:

Five mice fed with the organism all remained normal three weeks after feeding. Intraperitoneal inoculation of 0.01mg and over (about 10,000,000 of organisms) of the organism suspended in saline killed mice but 0.001mg (about 1,000,000) failed.

Table 1. Agglutinin titers of the patients' serum against the organism in question

Serum	date of taking blood	Agglutininogen		
		1785	1786	1787
Patient No. 1	4	80	80	40
	9	640	640	640
	14	1,280	640	640
	20	5,120	1,280	2,560
	26	5,120	1,280	1,280
Patient No. 2	4	0	0	0
	9	160	160	160
	14	640	640	640
	20	2,560	2,560	1,280
	26	1,280	1,280	1,280
Patient No. 3	5	0	0	0
	9	80	80	40
	14	640	640	640
	20	1,280	1,280	1,280
	26	320	640	320

AGGLUTININ TITERS IN THE SERUM OF THE PATIENTS

Table 1 shows the agglutinin titers of the serums of the patients taken on 5 different occasions during the course of the disease for the isolated cultures. As seen in the table, the agglutinin titer of the serum rose in the second sera (9 days after onset) and thereafter. The highest titer was observed in the blood taken on the fourth time (20 days after onset). Some of the blood taken on the fifth time already suggested the fall of the titer.

The agglutinin titers of the serum (20 days after onset) of the patient No. 1 were 1:2,560 for *S. thompson* var. *berlin* 2988 and *S. newport* 563; 1:5,120 for *S. newport* var. *puerto-rico*; and 1:320 for *S. paratyphi B* 8006 and *S. anatum* 293. *S. thompson* var. *berlin* 2988, *S. newport* 563 and *S. newport* var. *puerto-rico* absorbed a part of the agglutinins from this serum, but *S.*

paratyphi B 8006, *S. anatum* 293 scarcely absorbed while the organisms (1785, 1786, and 1787) absorbed all the agglutinins from it.

DISCUSSION

The organism in question is considered to be the causative agent of the acute gastroenteritis described above on the basis of the following reasons:

- 1) It was isolated from all three patients in that outbreak of acute gastroenteritis.

- 2) The agglutinin titer rose during the course of the disease.

The antigenic formula of this organism was found to be as VI, VIII:b:1, (3), 5 which indicates that the organism isolated is a new *Salmonella* type. The authors propose to call it as *S. nagoya* because it was isolated in Nagoya City, Aichi Prefecture, Japan.

SUMMARY

A description is given to a new *Salmonella* type, isolated from acute gastroenteritis outbreak: *S. nagoya* VI, VIII:b:1, (3), 5.

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