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### Clinical and microbiological characteristics of typhoid fever in northern Taiwan, 2001-2014

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**Background:** Typhoid fever, caused by *Salmonella enterica* serovar typhi (S. Typhi), was rarely identified in Taiwan and approximately one third of the cases were imported from Southeast Asia. The transmission source of the indigenous cases and their relatedness to the imported cases remained unknown. The study was aimed to delineate the demographics and clinical features of typhoid fever in Taiwan and clarify the relatedness between the imported and the indigenous cases.

**Material/methods:** Patients with sterile site culture positive for S. Typhi were identified in a teaching hospital in northern Taiwan during 2001 and 2014. The demographic data, clinical manifestations and outcomes were collected by chart review. Imported case was defined if the isolate was recovered from patients within 90 days of their arrival at or returning to Taiwan. The isolates, if available, were determined for antibiotic susceptibilities and pulsed-field gel electrophoresis (PFGE) types.

**Results:** A total of 64 patients were identified. Female accounted for 31 (48.4%) cases and the mean age was  $28.8 \pm 18.9$  years (range, 1 – 77 years). Seventeen cases (26.6%) were considered imported. Of them, 11 (68.8%) were from Indonesia. The indigenous and imported cases did not differ in age and gender distributions, and clinical presentations including fever, diarrhoea, abdominal pain, nausea or vomiting, myalgia, hepatomegaly and splenomegaly ( $P > 0.05$  for all). Intestinal haemorrhage and shock occurred respectively in 20.5% and 4.5% of indigenous cases, which were not significantly different from those in imported cases (12.5%, and 0%, respectively,  $P > 0.05$  for both). The antibiotic

susceptibilities were similar between the indigenous and the imported isolates, except for ciprofloxacin to which the indigenous isolates were more frequently susceptible (93.0% vs. 68.8%,  $P = 0.028$ , Table 1). The PFGE patterns were indistinguishable between the imported and indigenous isolates (Figure 1).

**Conclusions:** The indigenous cases of typhoid fever in northern Taiwan shared similar clinical manifestations and indistinguishable bacterial genotypes as the imported cases. Migrants and travellers from Southeast Asia, especially Indonesia, can be an important source of *S. Typhi* transmission in this region.

Table 1. Susceptibilities of antibiotics in *Salmonella* Typhi isolates from imported cases and indigenous cases in Taiwan, 2001 – 2014.

Antibiotic	Susceptibility (%)			P
	All isolates N = 61*	Indigenous isolates N = 43	Imported isolates N = 16	
Ampicillin	55 (90.2)	40 (93.0)	14 (87.5)	0.606
Chloramphenicol	55 (90.2)	40 (93.0)	14 (87.5)	0.606
Cefixime	61 (100.0)	45 (100.0)	16 (100.0)	...
Ciprofloxacin	52 (85.2)	40 (93.0)	11 (68.8)	0.028
Ceftriaxone	61 (100.0)	45 (100.0)	16 (100.0)	...
Flomoxef	61 (100.0)	45 (100.0)	16 (100.0)	...
Imipenem	61 (100.0)	45 (100.0)	16 (100.0)	...
Trimethoprim- Sulfamethoxazole	55 (90.2)	40 (93.0)	14 (87.5)	0.606

\*Including 2 cases of unknown travel history

Figure 1.

Pulsed-field gel electrophoresis patterns of *S. Typhi* Isolates in northern Taiwan, 2001-2014

