Isolation of *Salmonellae* from Clinically Normal Cattle and Pigs in Indonesia in 1986 and Detection of Plasmids in the Isolates

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There have been some reports concerning the isolation of *Salmonella* organisms from cattle, buffaloes, pigs and goats [6, 7] in Indonesia. It is important to investigate the drug resistance of these *Salmonella* strains because any incidence of drug-resistant *Salmonella* strains will create serious problems not only for animal hygiene but also public health [11]. However, tests for drug resistance and conjugative R plasmid in these isolates have not been carried out. Therefore, we attempted to isolate *Salmonella* organisms from rectal contents or fresh feces of clinically normal cattle and pigs, and to investigate their drug resistance. Together with this study, plasmid detection was also carried out because plasmid profiling analysis is being applied to epidemiological investigations [5].

Rectal contents or fresh feces from 249 apparently healthy dairy cattle, 77 beef cattle, 14 buffaloes and 236 fattening pigs were collected at farms in 7 districts or at a slaughterhouse in West Java Province and Medan in North Sumatera Province in 1986. One-gram samples were used for the isolation of *Salmonella* organisms. Isolation of salmonellae and tests for drug resistance and detection of conjugative R plasmids were carried out according to the methods previously reported [3]. Plasmid detection was also performed by the rapid method [4] based upon the procedure of Kado and Liu [2].

Table 1 shows the data concerning the isolation of salmonellae from rectal contents or feces of apparently healthy animals. Eighteen strains (7.2%) of *Salmonella* were isolated from 249 dairy cattle raised on farms. These belonged to 4 serovars, *Salmonella enterica* subspecies *enterica* serovar Newport (*S. newport*), *S. amsterdam*, *S. javiana* and *S. paratyphi-B*. Three strains of *Salmonella* (9.4%) were isolated from 32 beef cattle raised in Central Java and then kept at the slaughterhouse. These all belonged to *S. para-*

typhi-B. No *Salmonella* organisms were isolated from 45 beef cattle raised on farms. Five strains (35.7%) of *Salmonella* were isolated from 14 buffaloes which were raised in Central Java and then kept at the slaughterhouse. These belonged to *S. dublin* and *S. lexington*. Twenty-six strains of *Salmonella* (11.0%) were isolated from 236 pigs raised on farms. These belonged to 9 serovars. *S. paratyphi-B* was isolated most frequently and *S. agona*, *S. amsterdam*, *S. london*, *S. lexington*, *S. weltevreden*, *S. typhimurium*, *S. enteritidis* and *S. chincol* were also isolated. All of these strains of *Salmonella* were susceptible to oxytetracycline (25 µg/ml), chloramphenicol (25 µg/ml), dihydrostreptomycin (25 µg/ml), kanamycin (25 µg/ml), ampicillin (25 µg/ml), and sulfadimethoxine (400 µg/ml), and carried no conjugative R plasmids. As shown in Table 2, all strains of *S. dublin*, *S. typhimurium*, *S. enteritidis*, *S. lexington* and *S. weltevreden*, and few strains of *S. paratyphi-B* and *S. newport* harbored plasmids.

Poerunomo *et al.* [7] reported the isolation of *Salmonella* from feces and mesenteric lymph nodes of cattle and buffaloes kept at the same slaughterhouse in Indonesia in 1984. They isolated 55 strains of *Salmonella* (6.8%) from 806 mesenteric lymph nodes and 36 strains (4.1%) from feces of 881 cattle and buffaloes. The most common serovars among the strains isolated from cattle and buffaloes were *S. lexington*, *S. weltevreden*, *S. emek* and *S. paratyphi-B*. *S. agona* and *S. derby* were most common among strains isolated from pigs. Accordingly, some of the serovars of *Salmonella* strains isolated from cattle and buffaloes were found to be similar to those in our survey. In Japan, *S. typhimurium*, *S. dublin*, *S. naestved* and *S. enteritidis* are predominantly isolated from diseased cattle. *S. derby*, *S. typhimurium* and *S. london* are serovars commonly encountered in carrier pigs, and *S. choleraesuis* is mostly associated with enteritis in pigs [9]. From healthy cattle and pigs, *S.*

Table 1. Isolation of salmonellae from rectal contents or feces of clinically normal domestic animals in Indonesia

Animal	No. of animals examined	No. of positive animals	Serovar ^{a)}
Dairy cattle	249	18(7.2%)	S. newport(14) S. amsterdam(2) S. paratyphi-B(1) S. javiana(1)
Beef cattle	32 ^{b)}	3(9.4%)	S. paratyphi-B(3)
	45	0(0%)	
Buffaloes	14 ^{b)}	5(35.7%)	S. dublin(4) S. lexington(1)
Pigs	236	26(11.0%)	S. paratyphi-B(10) S. agona(3) S. amsterdam(3) S. london(3) S. lexington(2) S. weltevreden(2) S. chincol(1) S. enteritidis(1) S. typhimurium(1)

a) Figures in parentheses show numbers of strains.

b) Kept at the slaughterhouse.

Table 2. Detection of plasmids and their sizes from *Salmonella* strains isolated in Indonesia

Serovar	No. of strains examined	No. of strains carrying plasmid	Size (megadaltons)
S. dublin	4	4	50
S. typhimurium	1	1	60
S. enteritidis	1	1	58,4.2,3.8
S. lexington	3	3	100
S. paratyphi-B	14	3	16
S. newport	14	1	16
S. weltevreden	2	1	60
		1	55

typhimurium is isolated relatively frequently [3]. Therefore, some of the serovars of *Salmonella* strains in Indonesia had also been isolated from domestic animals in Japan.

In our experiments, no *Salmonella* strains were resistant to the drugs used and carried conjugative R plasmids. It has been reported that *Salmonella* strains isolated from chickens in Indonesia are sensitive to tetracycline [8]. These results suggest that antibiotics might be used only rarely on farm animals in Indonesia.

We have previously applied plasmid profiling

analysis to epidemiological investigations of *Salmonella* infection [5]. As Table 2 shows, all strains of several serovars contain various sizes of plasmid. The fifty megadalton (MDa) plasmid in *S. dublin* and the 60-MDa plasmid in *S. typhimurium*, respectively, are the same size as those previously reported [1, 12], and a 100-MDa plasmid was demonstrated in all strains of *S. lexington*. These results suggest that the presence of these plasmids is a useful bacterial trait for epidemiological studies of *Salmonella* infection caused by these serovars in Indonesia.

We have previously demonstrated that a 36-MDa plasmid of *S. enteritidis* is the virulence plasmid conferring increased mouse lethality upon the organism [4, 10]. In the present study, *S. enteritidis* was shown to harbor a 58-MDa plasmid. Our preliminary study suggested that this plasmid also conferred increased mouse virulence upon the host strain, and that the 36- and 58-MDa plasmids identified in *S. enteritidis* shared some restriction fragments of the same size. The relationship between these two plasmids is presently under investigation.

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要 約

インドネシアにおける健康な牛、豚の糞便からのサルモネラの分離(短報)：中村政幸・Istiyarningsih¹⁾・中島直彦・梶 隆²⁾・佐藤静夫³⁾(動物医薬品検査所, ¹⁾インドネシア動物医薬品検査所, ²⁾拓殖大学, ³⁾全農家衛研)——インドネシアの健康な牛、豚の糞便から分離したサルモネラの血清型は、牛では *S. newport*, *S. dublin*, 豚では *S. paratyphi-B* が多く、他に *S. lexington* (牛, 豚), *S. typhimurium* (豚), *S. enteritidis* (豚) 等も分離された。これらの分離株はすべて薬剤感受性であり、プラスミドは *S. typhimurium*, *S. dublin*, *S. enteritidis* 等において検出された。