SALMONELLA IN THE SOIL OF KINDERGARTEN PLAYGROUNDS IN THE KLANG DISTRICT

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SUMMARY

A survey on the incidence of Salmonellae in soil was conducted on 12 kindergartens in the Klang District. The organism was isolated from five (three urban and two rural) kindergartens from one or more soil samples tested. Ten isolates comprising six serotypes, namely, Salmonella bareilly, S.haifa, S.abony, S.weltevreden, S.agona *and* S.stanley, *were encountered. The possible role that these soil isolates may play in the transmission of salmonellae is discussed. The need to use more than one media in the detection of salmonellae is emphasised.*

INTRODUCTION

The exact figures for the incidence of salmonellosis in man in Malaysia is difficult to obtain because only a small proportion of the cases are investigated, confirmed and reported.

However, its importance can be gauged from a study on the bacterial causes of diarrhoea in Malaysia [1] which showed that *Salmonella* accounted for 51% of all isolates obtained from patients with diarrhoea. The isolation rate was higher in children below ten years as compared to older children and adults.

The annual reports of the Institute for Medical Research, Kuala Lumpur, list out the different serotypes encountered and also draw attention to outbreaks. Salmonellosis is seen as sporadic cases of gastroenteritis, common source outbreaks of food poisoning and hospital cross infections in paediatric wards.

The present study to see if there was a potential source of spread of *Salmonella* through contaminated soil in children's playgrounds was stimulated by a finding in Guam (R.L. Haddock, personal communication), which has a very high incidence of salmonellosis, that a high proportion of soil samples collected from children's public play areas have been positive for *Salmonella*.

Accordingly it was decided to survey selected kindergartens, and to process soil samples collected from their play areas for the detection of *Salmonella*.

MATERIALS AND METHODS

The Klang District in Selangor was chosen for convenience and not because it was specially identified as an area with a high incidence of salmonellosis.

A systematic stratified random sampling method was used to select seven urban and five rural kindergartens in the district. Kindergartens within the confines of the Klang Municipality were

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considered urban while those outside as rural.

From each of the selected schools, six soil samples of over 25 g each were collected from the top 1-2 cm of the area beneath swings or other children's play apparatus. The sample was thoroughly shaken and a 25 g portion was placed in 250 ml of selenite broth and incubated at 37°C for 24 hr.

Loops of the enrichment medium were streaked onto brilliant green (BG), bismuth sulphite (BS), MacConkey (Mac), *Salmonella-Shigella* (SS), desoxycholate citrate (DC) and xylose lysine desoxycholate (XLD) agar plates and incubated at 37°C for 24 hr. Suspicious colonies were picked and inoculated on triple sugar iron slants. Cultures with reactions suggestive of *Salmonella* were checked with standard biochemical tests [2] and then serotyped with *Salmonella* agglutinating antisera (Wellcome Diagnostics, England).

RESULTS

The 12 kindergartens were labelled A-L. In five of these, *Salmonella* was isolated from at least one of the six soil samples. The results of these isolations are given in Table I.

TABLE I
SALMONELLA ISOLATIONS FROM SOIL SAMPLES FROM SELECTED KINDERGARTENS IN THE KLANG DISTRICT

Kinder-garten	No. of samples positive		*Salmonella* serotype isolated	Media from which isolate obtained
A(urban)	nil		-	-
B(urban)	1		*S.bareilly*	BS
C(urban)	nil		-	-
D(urban)	4	a)	*S.haifa*	BG,BS,Mac,SS, DC,XLD
		b)	*S.abony*	BS
		c)	*S.bareilly*	BS
		d)	*S.agona*	BS
E(urban)	nil		-	-
F(rural)	1		*S.stanley*	BS
G(urban)	2	a)	*S.haifa*	SS
		b)	*S.weltevreden*	SS,DC,XLD
H(urban)	nil		-	-
I(rural)	nil		-	-
J(rural)	nil		-	-
K(rural)	2	a)	*S.weltevreden*	BS,XLD
		b)	*S.abony*	BS
L(rural)	nil		-	-

Salmonella was isolated from three out of seven urban schools and two out of five rural schools. In one school, it was isolated from four out of the six samples taken; in two schools from two samples: and in the remaining two schools from one sample each, making a total of ten isolates.

Six different serotypes were encountered: *Salmonella bareilly* (two isolates). *S.haifa* (two isolates), *S.abony* (two isolates), *S.weltevreden* (two isolates), *S.agona* and *S.stanley*.

Six out of the ten isolates were obtained from BS agar alone, one was isolated from all six media used, one from SS, DC and XLD, one from BS and XLD, and 1 from SS alone.

DISCUSSION

The finding that, in five out of 12 kindergartens studied, *Salmonella* was isolated from the soil of the children's play areas is a surprising but perhaps significant finding. It points to the fact that such contamination of soil in these areas may indeed play a role in the transmission of *Salmonella* in the community. Children could possibly take the *Salmonella* home in contaminated footwear, hands or clothing. Contamination of the soil may have come from the cats, dogs and crows which were said to have access to most of these play areas.

There is a report of an instance [3] where a hospital outbreak due to *S.typhimurium* was caused by uncovered food in the kitchen being contaminated with wild bird droppings.

It is unlikely, however that the *Salmonella* found in the soil can cause disease directly after intake as generally the infective dose is quite high. But if there is contamination of suitable foodstuff, the organisms could multiply to numbers which could be infective.

However, in the case of newborns, the infecting dose may be much lower than the 100,000 organisms usually needed to infect adults. [4] This may also prevail with debilitated patients and the elderly and there have been instances where healthy adults may be infected directly from the environment. [5]

This is only a preliminary study however, and more work needs to be carried out to substantiate this theory.

It would be interesting to note the relative frequency among gastroenteritis patients of the different serotypes encountered in the study.

S. weltevreden was the most common serotype encountered in 1982 [6] accounting for 19.4% of all serotypes. *S. bareilly* was the fourth most common serotype (6.3%), *S. stanley* fifth (5.8%) and *S. agona* sixth (5.3%). *S. haifa* was not among the leading ten but accounted for 2.7% of all isolates. *S. abony* was a rarely encountered serotype, there being only one isolate in 1982. It can be seen thus that apart from *S. abony*, the other serotypes encountered in this soil survey are relatively frequently isolated from diarrhoea cases in this country, particularly so in the case of *S. weltevreden* and *S. bareilly*.

Six selective media were used in this survey to detect the presence of *Salmonella*. It was found that out of the ten isolates obtained, only one was detected on all the six media used. This emphasizes the need to use more than one media when *Salmonella* is looked for. Six out of the ten isolates were obtained from BS agar alone. This finding supports published reports on the superiority of BS in recovering *Salmonella*.[7,8,9]

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