

The immunity produced by a rough *Salmonella dublin* variant against *Salmonella typhimurium* and *Salmonella choleraesuis* infection in guinea-pigs

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In a recent study (Smith, 1965) vaccination with a rough variant of *Salmonella dublin*, vaccine 51, produced a high degree of immunity in mice against oral infection with *S. typhimurium* and *S. choleraesuis*, the immunity being of the same order as that obtained against *S. dublin* itself. Vaccination with this variant did not protect against *Erysipelothrix rhusiopathiae* and *Escherichia coli* infection. However, since the vaccinal mortality in the mice was 33–45 %, it was felt that the protective effect against *S. typhimurium* and *S. choleraesuis* would be even more convincing if it could be demonstrated in an animal species in which vaccination had no apparent ill-effect. Such a demonstration is reported in this paper.

MATERIALS AND METHODS

Guinea-pigs

Young adult guinea-pigs of both sexes, weighing 400–480 g. were used. They were fed on Diet 18 (Oxoid) *ad lib.*

Vaccination

Three weeks before challenge vaccine 51, the rough variant of *S. dublin*, was administered subcutaneously as a single dose of 0.5 ml. of a 24 hr broth culture containing approximately 50×10^7 viable organisms per ml.

Method of challenge

After an overnight fast, guinea-pigs were given, by mouth, 0.25 ml. of an aqueous suspension of an 18 hr. nutrient agar culture of *S. typhimurium* or *S. choleraesuis* var *kunzendorf* to which was added a powder consisting of powdered chalk, 40 %; colloidal kaolin, 43 %; magnesium trisilicate 17 %. Each animal received approximately 5×10^8 viable organisms and 0.2 g. of powder. All those that died were examined for lesions, and the liver, spleen, small intestine and large intestine were examined by direct culture on deoxycholate-citrate agar to confirm that they had died from the particular serotype with which they had been challenged. The experiments were terminated 18 days after challenge when it was apparent from the condition of the guinea-pigs that no more would die.

The examination of faeces for salmonellas

Rectal swabs, taken so as to include a liberal portion of faeces, were cultured on deoxycholate-citrate-agar before and after enrichment in selenite-F medium for 24 hr. at 37° C. The plates were incubated for 24 hr. at 37° C. and then examined for the presence of salmonellas.

RESULTS

Ninety-eight guinea-pigs were used in all. Half of them were vaccinated with the rough *Salm. dublin* variant 51, and half were kept as controls. Four separate experiments were performed at different times, two with *S. typhimurium* as the challenge strain and two with *S. choleraesuis* as challenge strain; in each experiment the number of vaccinated and control guinea-pigs was the same.

Table 1. *The immunity conferred by Salmonella dublin vaccine 51 against challenge in guinea-pigs with S. typhimurium and choleraesuis*

| | Challenge organism | | | |
|--|-----------------------|----------------|------------------------|----------------|
| | <i>S. typhimurium</i> | | <i>S. choleraesuis</i> | |
| | Vaccinated | Non-vaccinated | Vaccinated | Non-vaccinated |
| No. of guinea-pigs | 22 | 22 | 27 | 27 |
| No. that died after challenge | 3 | 15 | 3 | 20 |
| No. of survivors with liver or spleen lesions | 1 | 6 | 4 | 4 |
| No. of survivors in which salmonellas were found in liver or spleen* | 0 | 3 | 3 | 3 |

* By direct culture on deoxycholate-citrate agar.

None of the guinea-pigs appeared unwell as a result of vaccination. On a general health basis the vaccinated groups were indistinguishable from the corresponding unvaccinated control groups. The food consumption of vaccinated and control groups was similar. Eighteen guinea-pigs were weighed immediately before vaccination and 17 days afterwards. On both occasions there was no difference between their weights and those of animals in the corresponding control groups.

The faeces of eleven guinea-pigs were examined 10 days after vaccination and those of another twelve, 3 and 7 days after vaccination. Salmonellas were not found in any of them or in any of the specimens from the corresponding control guinea-pigs.

The results of infecting the guinea-pigs are shown in Table 1; the vaccinated groups had a good immunity against *S. typhimurium* and *S. choleraesuis*.

DISCUSSION

The results confirm the observation made in mice that vaccination with a rough variant of *S. dublin* confers immunity against *S. typhimurium* and *S. choleraesuis*. They provide further evidence for the view that the antigens concerned with the

identification and serological classification of salmonellas are not involved in the immune process. Those that are involved can be common to members of different serological groups.

It is conceivable that the vaccine may have an application in guinea-pigs employed in long-term experiments, principally of a non-infectious nature, and kept under conditions that cannot exclude the possibility of the occurrence of an outbreak of natural salmonella infection.

SUMMARY

Vaccination with a rough variant of *Salmonella dublin* had no observable harmful effect on guinea-pigs. It conferred a good immunity against *S. typhimurium* and *S. choleraesuis* var *kunzendorf* infections.

REFERENCE

SMITH, H. WILLIAMS (1965). The immunization of mice, calves and pigs against *Salmonella dublin* and *Salmonella cholerae-suis* infections. *J. Hyg., Camb.* **63**, 117.