VACCINATION AGAINST TYPHUS FEVER

BY

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The incidence of agglutinins for *Proteus* OX 19, OX 2, and OXK in the British population has rarely been investigated. It was reported in the Monthly Bulletin of the Emergency Public Health Laboratory Service (Aug., 1942, p. 6) that in 100 "normal" sera no agglutination was obtained with any of the three suspensions above 1/128 dilution. The titres for OXK were approximately double those found for OX 19 and OX 2, and it was suggested that titres of 1/80 or over with OX 19 are unlikely "in the absence of exposure, either recent or remote, to typhus infection." Approximately nine-tenths of these sera showed a titre of 1/16 or less with the OX 19 and OX 2 suspensions.

There is only one report from this country on vaccination against typhus fever and its effects on the Weil-Felix reaction. Felix (1942), in a report to the Medical Research Council, gave briefly the alterations in the OX 19 agglutinin titre evoked by various vaccines. Considering 100% or greater increase in agglutinin titre as significant, very variable results were found with both the type and the batch of vaccine used. With vaccines of the Cox type the proportion showing a significant rise in titre varied with the batch of vaccine from approximately 5 to 50%.

The Present Investigation

In the investigation now reported a vaccine prepared by the Connaught Laboratories, Toronto, from a European louse-borne strain of *Rickettsia prowazeki* grown in the yolk-sac of chick embryos (Cox, 1938) was used. It was issued on Nov. 4, 1941, and with a batch of vaccine of the same date Felix obtained a significant increase in OX 19 agglutinin titre in about half of those inoculated. Twenty-three public health workers were vaccinated and their Weil-Felix and clinical reactions were investigated. At weekly intervals each received 0.25 c.cm., 0.5 c.cm., and 1 c.cm. of vaccine subcutaneously, and three months later a fourth dose of 1 c.cm. Samples of blood were obtained on four occasions: (1) before the first injection; (2) a fortnight after the third injection; (3) before and (4) a fortnight after revaccination; these were tested for OX 19, OX 2, and OXK agglutinins. The method used in the Weil-Felix test was as follows:

Concentrated suspensions of OX 19, OX 2, and OXK, prepared at the Standards (M.R.C.) Laboratory, Oxford, were diluted 15 times and added in equal quantity to serial serum dilutions, the final dilutions of serum being 1/5, 1/10, 1/20, 1/40, 1/80, 1/160, 1/320, and 1/640, while that of the suspension was 1/30. All tubes were incubated at 56° C. for 4 hours, and the test was read after standing at room temperature overnight; the last tube showing standard agglutination was taken as the titre.

Before vaccination the titres for OX 19 and OX 2 in the 23 cases were all 1/20 or less, the majority showing no agglutination at 1/5. With OXK, 20 out of the 23 showed titres ranging from 1/20 to 1/160, the commonest being 1/40. No higher titre was observed.

Relation of Agglutinin Titres at Various Stages to the Number of Cases

Suspensions	Titre	Before Vaccination	Number of Cases		
			2 Weeks After Vaccination	3 Months After Vaccination	2 Weeks After Revaccination
OX 19	0 to 1/10	20	10	15	4
	1/20 to 1/160	3	13	8	19
OX 2	0 to 1/10	22	13	21	11
	1/20 to 1/80	1	10	2	12
OXK	0 to 1/40	15	1	21	18
	1/80 to 1/640	8	22	2	5

Vaccination in the majority of cases resulted in an increase in titre of the three agglutinins. Three months later they had decreased, but not to the pre-inoculation level. After revaccination the OX 19 and OX 2 agglutinin titres rose again, the

former above and the latter to the level recorded after primary vaccination, while the OXK titres were not appreciably altered. These results are tabulated below by correlating the number of cases with the agglutinin titres of their sera.

Even after revaccination the highest OX 19 agglutinin titre was 1/160 (1 case), and OX 2 was 1/80. If more than 100% increase in OX 19 agglutinin titre is taken as significant, 14 cases out of 23 (61%) showed it after primary vaccination and 17 (74%) after revaccination.

Reactions to the injections were as a rule quite slight, and diminished in severity with each additional injection. General reactions, such as occasional malaise, headache, drowsiness, and muscular pains, were less frequent than local reactions, which presented as areas of erythema, swelling, and stiffness, usually starting 12 to 24 hours after the injections and lasting a day or two.

Summary

Twenty-three people were vaccinated with a Cox vaccine against typhus fever and revaccinated three months later.

The Weil-Felix reactions on these individuals showed low normal agglutinin titres, which were increased after vaccination, and, in the case of OX 19, after revaccination.

The reactions to the vaccine were slight.

I wish to thank the Medical Research Council for the supply of vaccine and Prof. S. P. Bedson for his helpful advice.

REFERENCES

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TREATMENT OF PEDICULOSIS CAPITIS

BY

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Coincident infestation of the skin by *Sarcoptes scabiei* and of the scalp by *Pediculus humanus capitis* has become more common among patients attending the scabies clinic in Birkenhead. From the table given below one can see the steep rise in lousiness recorded in school-children during routine cleanliness inspection; it also gives a fair indication of the increase in lousiness of many families in the borough. It is not an uncommon sight to find children's scalps in an unbelievably filthy condition, with lice present in thousands.

Results of Cleanliness Inspections carried out by the Health Nurses in the Elementary Schools, 1938-43

Year	No. on School Rolls	No. with Nits	No. with Vermin	Total No. Unclean
1938	20,101	2,499	253	2,808 (13.9 %)
1939	19,519	2,781	89	2,959 (15.16 %)
1940	14,989	1,857	146	2,086 (13.92 %)
1941	11,753	1,863	107	2,141 (18.22 %)
1942	14,398	2,412	115	2,871 (19.94 %)
1943 (Jan.-June 30)	14,999	2,420	388	3,026 (20.17 %)

These figures refer to the number on the rolls of the elementary schools at the end of the December term of each year, except in the case of 1939, the figures for which refer to the number on the rolls at the end of the summer term; all schools were closed in the following September owing to the outbreak of war.

Since the publication by J. R. Busvine and P. A. Buxton (*B.M.J.*, 1942, **1**, 464) of their use of lethane oil as a means of controlling head lice, I have employed it at the scabies clinic with excellent results so far as the killing of lice is concerned, but it leaves much to be desired regarding its effect on nits cemented to the hair. It is unfortunate that scabies seldom, if ever, affects the scalp, except perhaps at the nape of the neck, otherwise it would not have been left to me to draw attention to the clinical finding that an emulsion of benzyl benzoate is the treatment *par excellence* for pediculosis capitis even when complicated by impetigo, etc. Its solvent action on the cement of the nit and its lethal action on the louse make it a very quick and effective remedy in "delousing."

One must emphasize that it is necessary to use a non-irritating formula of benzyl benzoate emulsion, as the majority