THE RESULTS OF PROTECTIVE INOCULATION AGAINST INFLUENZA IN THE ARMY AT HOME, 1918-1919.

BY

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THE BRITISH MEDICAL JOURNAL was good enough to publish, on October 26th, 1918, the proceedings of a conference of bacteriologists, summoned by the D.G.A.M.S. to consider the advisability of employing in the army a preventive vaccine against influenza. This conference, of which I had the honour to be chairman, agreed that such a vaccine might be expected to be of service, and made recommendations as to its constitution and use.

The vaccine recommended was accordingly prepared at the Royal Army Medical College, and, in certain commands, used on a considerable scale.

In view of the opinion, widely expressed in both medical and lay journals, that we are threatened with another epidemic wave of influenza, it is felt that the results obtained in the army commands at home last winter with the vaccine in question should be made known; not only

because it is proposed to advocate its employment again in the army, if we should be so unfortunate as to find ourselves in the presence of a serious recrudescence of the disease, but also because the modified vaccine now in army use has, I understand, been adopted by the Ministry of Health for employment in the civil community.

The vaccine formula recommended by the conference mentioned above was as follows:

	Millions.
<i>B. influenzae</i>	60 in 1 c.cm.
Streptococci	80 "
Pneumococci	200 "

Several strains and types of each organism were used, all comparatively freshly isolated from cases of the disease. Two doses were recommended, the first 0.5 c.cm., and the second, given after ten days' interval, 1 c.cm. The statistical results recorded below apply solely to the vaccine prepared in accordance with the above formula.

As was naturally to be expected, in view of the divergent views held as to the bacteriology of the epidemic, the proposed constitution of the vaccine was subjected to a certain amount of criticism in subsequent issues of the medical press, and the points made in these communications, many of them most valuable and helpful, were duly noted. One of the principal criticisms was concerned with the dosage which had been agreed on as appropriate for

Table of Results of Influenza Inoculations in the Home Commands, 1918-1919.

	Period Covered by Return.	Average Strength during Period. All Ranks.	Number Inoculated.		No. of Cases of Influenza during Period.		Incidence of Attack, per 1,000.		No. of Cases in which Pulmonary Complications Occurred.		Deaths.		
			One Dose only	Two Doses.	Inocu- lated.	Non- inocu- lated.	Inocu- lated.	Non- inocu- lated.	Inocu- lated.	Non- inocu- lated	Inocu- lated.	Non- inocu- lated	
NORTHERN COMMAND.													
1. Crumlington	31/12/18-28/ 2/19	1,000	20	230	4	40	16.0	53.3	—	—	—	—	
2. Wallsend	1/11/18-30/11/18	2,149	774	591	1	5	0.7	6.4	—	1	—	1	
3. Forest Hall	1/11/18-30/11/18	841	30	57	—	17	0.0	22.5	—	1	—	2	
4. Seaton Delaval	1/11/18-30/11/18	1,100	109	94	3	24	14.7	26.7	—	—	—	—	
5. York	1/ 2/19-30/ 4/19	3,100	1,450	50	9	240	6.0	150.0	1	65	—	25	
6. Newcastle	1/11/18-30/11/18	2,794	324	41	1	62	3.0	25.5	1	16	—	5	
7. Catterick	1/ 3/19-30/ 4/19	3,352	78	395	4	76	8.4	26.3	—	—	—	—	
8. Ripon (Reserve Centre) ...	1/ 4/19-30/ 4/19	1,824	71	1,174	1	3	0.8	5.1	—	—	—	—	
9. Ripon	1/11/18-30/11/18	5,246	363	408	4	81	5.1	18.0	1	12	1*	3	
10. Alnwick	1/11/18-30/11/18	668	25	175	—	20	0.0	30.0	—	—	—	—	
11. Bradford	1/11/18-30/11/18	643	31	170	—	5	0.0	11.3	—	—	—	—	
12. Tyne Garrison	1/11/18-30/11/18	5,270	1,048	765	6	79	3.3	12.8	—	2	—	3	
13. 3rd Cheshires	1/11/18-30/11/18	2,180	222	412	12	48	19.0	31.0	—	25	—	5	
14. West Hartlepool	1/11/18-30/11/18	670	127	60	—	30	0.0	62.0	—	5	—	2	
15. Clipstone	1/11/18-30/11/18	11,509	525	1,734	38	228	16.8	24.6	—	2	—	4	
16. Bagthorpe	1/11/18-30/11/18	800	121	31	14	6	92.0	9.4	4	2	—	2	
EASTERN COMMAND.													
17. Maidstone	9/11/18-30/ 4/19	4,197	80	410	1	504	2.0	135.9	—	403	—	41	
IRISH COMMAND.													
18. Finner	1/11/18-30/11/18	760	79	559	55	36	86.0	295.0	7	11	1	2	
19. Charles Fort	1/11/18-30/11/18	1,453	380	191	4	7	7.0	7.6	—	—	—	—	
20. Cahir	1/11/18-30/11/18	526	38	318	4	16	11.2	94.1	—	—	—	—	
21. Ruttevant	1/11/18-30/11/18	835	126	423	—	7	0.0	24.8	—	1	—	3	
WESTERN COMMAND.													
22. Prescot	1/11/18-30/11/18	4,151	489	100	1	21	1.7	5.1	—	—	—	—	
SCOTTISH COMMAND.													
23. 4th Seaforths	1/11/18-30/11/18	2,326	500	—	—	102	0.0	55.0	—	2	—	—	
LONDON DISTRICT.													
24. Battersea	1/11/18-30/ 4/19	1,750	—	221	59	402	267.0	263.0	12	35	—	—	
Totals			59,144	7,010	8,614	221	2,059			26	583	2	98

* One dose only.

Summary of Table.

							Inoculated.		Non-inoculated.
Strength	...	...	...	...	...	...	15,624	...	43,520
Incidence of attack, per 1,000	...	...	...	...	...	...	14.1	...	47.3
Incidence of pulmonary complications, per 1,000	...	...	...	...	...	...	1.6	...	13.3
Deaths, per 1,000	...	...	...	...	...	...	0.12	...	2.25

the *B. influenzae* moiety of the vaccine, it being urged that a considerably larger dose of this might be given with safety and with the prospect of an enhanced degree of immunity. In view of this, and also of the fact that, as the bacteriological experience of the epidemic extended, the etiological rôle of Pfeiffer's bacillus came more and more into prominence, I consulted my colleagues of the original conference afresh upon this point and found them all in agreement with an increased dose of Pfeiffer's bacillus, which I proposed should be raised from 60 millions to 400 millions in 1 c.cm., it being understood that the strains employed should not have been so cultivated or so recently derived from cases as to be unduly toxic in their action.

The formula of the vaccine as thus revised, and as now employed in the army, is therefore:

				Millions.
<i>B. influenzae</i>	...	...	...	400 in 1 c.cm.
Streptococci	...	...	...	80 "
Pneumococci	...	...	...	200 "

From the first it was desired that every attempt should be made to secure clear statistical evidence of the results of the inoculations with the vaccine, and the necessary instructions to this effect were circulated by the War Office; returns, in accordance with a simple *pro forma* being called for at regular intervals. In theory, such clear evidence should have been easy to collect through the workings of official machinery; in practice, it has been very difficult. Only those familiar with the strain thrown on the medical personnel by the addition of a severe and widespread epidemic to the already sufficiently arduous labours of those days of urgent and wholesale demobilization can appreciate the difficulties of collecting and recording, in accurate detail, the information required for the returns. In spite of these difficulties, which unfortunately vitiated some of the returns, a considerable number of inoculations were carried out and the records were received and analysed at the War Office.

Although it is very far from my intention to make any claim that the figures here presented are conclusive and free from all or even, in some cases, from possibly large fallacies, they serve, I think, to show at least the general trend of the inoculation results, and they have encouraged the hope that, with the larger dose of Pfeiffer's organism now employed, the vaccine, should it be needed, may prove a powerful reinforcement to other measures of protection.

A few words are called for in explanation of the table. The individual returns are shown under the name of the unit or the principal station in or near which the soldiers in question were located. The period covered by each return is shown in a separate column. The "strength" is the "average strength" of the unit or station; no other method was possible in view of the fluctuations of the population. The "inoculated" include those inoculated before the period in question, as well as those done during it, while the "uninoculated" are arrived at by deducting the inoculated from the average strength. The number of cases, complications, and deaths are, of course, not averages but actual figures derived from the hospital records. The recording of pulmonary complications is probably lacking in uniformity, since different medical officers may have taken different views as to the degree of bronchial or pulmonary involvement which should be taken as a complication.

The returns, all of which lie within the period between November, 1918, and April, 1919, comprise all those relating to this period which conformed to the following requirements:

1. That the vaccine used was that prepared at the Royal Army Medical College, according to the original formula.
2. That influenza should have been present in the unit during the period under review. In many stations where inoculation had been largely carried out there was a rapid cessation of the epidemic. Such returns would have swelled the total of the inoculations without throwing any light on their protective effects.

3. That only such returns are included as showed that at least one-tenth of the average strength had been inoculated, whether with one dose or two.

Periodic returns have continued to be received since the period dealt with in the table, but these have been either negative altogether as regards incidence of the disease, or show so few cases of influenza in either group as to be valueless from a statistical standpoint.

Information was asked for as to the interval occurring between inoculation and a subsequent attack of influenza, but the figures in response to this are too few to be worth analysing; it need only be said that they furnish little or no evidence of any increased susceptibility in the days immediately following inoculation, and that they throw no light of any value on the duration of the immunity conferred by the inoculations. The figures bearing on the latter point would, in any case, have been exposed to the fallacy that the epidemic was rapidly declining throughout the forces, and that the inoculated population was drifting, with increasing rapidity, out of our control into civil life.

No bad effects were reported from the inoculations, and the reactions, in the overwhelming majority, were trivial or non-existent.

It will be noted from the table that nearly one-half of the inoculated had received only the first dose of the vaccine—that is, one-third of the amount which we considered essential to effective protection. It is reasonable to assume that, had all received the full dosage, the protective results would have been still more evident. No statistical evidence bearing upon this point is, however, available.

The table had best be left to speak for itself, but it will, I think, be admitted that in general the results are encouraging, and that they tend to confirm and even strengthen our original anticipations, which were, briefly, that at least a moderate degree of protection against infection might be expected, while more decidedly beneficial effects might be hoped for in a diminution of both the frequency and the gravity of the pulmonary complications.

OBSERVATIONS ON THE X-RAY TREATMENT OF NEOPLASMS.

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WHEN we are able in all cases to diagnose malignant disease early the use of x-ray therapy will be limited to those cases only in which mechanical and physiological considerations prevent operation. Until this be attained we have to deal with a large number of tumours which, because of their size and position, forbid the use of the knife.

This paper is not a criticism; it gives the result of observations of facts and deductions, I believe logical, which have been forced upon me during the past three years. Thanks to the kindness of my former chief, Dr. J. H. Sequeira, many cases came partly under my care and observation.

My object in investigating them was not only to obtain successes, but also to inquire why we succeeded in some and failed in others, for upon this knowledge depends future success and the alleviation of much suffering.

R. G. was sent by Dr. Lack as being beyond operative treatment with sarcoma of the tonsil. The right side presented a large growing tumour, obviously quite vascular. Before November 22nd, 1915, attempts at removal when small had been made, but the tumour recurred, and on that date she was, under Dr. Sequeira's direction, submitted to x-ray treatment, the dose being a weekly one of Sab. B₄ pr 1½ mm. to outside of tumour and Sab. B₃ pr. 1 mm. of aluminium to the nasopharynx. In January, 1916, she was very much better, and the glands were going down. She had more x rays on February 7th, 1916. On February 28th Dr. Lack saw her and reported, "Much better—