**ON THE
PROTECTION AGAINST SMALLPOX
AFFORDED BY
VACCINATION,**

**ILLUSTRATED BY THE RETURNS OF THE ARMY, THE NAVY,
AND THE ROYAL MILITARY ASYLUM.**

**BY
T. GRAHAM BALFOUR, M.D.,
SURGEON TO THE ROYAL MILITARY ASYLUM, CHELSEA.**

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THE national importance of this question will, it is hoped, prove a sufficient apology for laying before the Society the following statistical evidence on the subject.

One of the principal difficulties in the investigation arises from the impossibility of ascertaining what proportion of the general population is unprotected by vaccination, or by a previous attack of smallpox. Our deductions have therefore been founded chiefly on the returns of the Army, the Navy, and the Royal Military Asylum, which contain the requisite information on that head.

I. THE ARMY.

There are no returns which show the actual number of soldiers who have been vaccinated or had smallpox, but a tolerably accurate approximation may be obtained in the following manner :

From returns forwarded annually to the Army Medical Board, it appears that, in the eight years from the 1st of April, 1844, to the 31st of March, 1851, inclusive, out of

90,092 recruits medically inspected at the head-quarters of recruiting districts, and found fit for service, 20,182 bore marks of smallpox; 64,096 had marks of vaccination; and 5864 bore no distinct traces of either. By the rules of the service, the last class would undergo vaccination immediately on joining their regiments, and consequently must be added to the number protected by vaccination; making a total of 69,960, or 78 per cent. of the whole, while 22 per cent. had previously been protected by smallpox. These proportions having been ascertained from such extensive data, may fairly be held to represent the condition of the army as regards protection from this disease.

The question now arises, what has been the number of admissions into hospital and deaths by smallpox among a body of men thus protected? In Abstract No. I, of Appendix, this information will be found, as regards the troops at home for a period of ten years, and in the colonies, of thirty years.

The following summary gives a condensed view of the results:

Among Troops serving in	Aggregate Strength.	Cases of Smallpox.	Deaths by Smallpox.	Annual ratio per 1000 of strength.	
				Cases.	Deaths.
The United Kingdom .	254,597	557	56	2·188	·220
Temperate Colonies . .	557,112	160	29	·287	·052
Tropical Colonies . .	314,131	28	8	·089	·025
Total . .	1,125,840	745	93	·662	·083

This Table shows the proportion of cases to have been only 66 and the deaths 8 in every 100,000 men serving throughout the army. But the prevalence and mortality have varied in different portions of the force. Thus, the deaths have been four times as numerous among troops in the United Kingdom as in temperate colonies, and eight times as numerous as in tropical colonies; while a still greater disproportion is found to exist in the admissions into hospital.

The comparatively large amount of smallpox among

troops at home is, doubtless, attributable to the men being chiefly quartered in the large towns from which it is scarcely ever absent, and also to the number of recruits who join their regiments after having been living in those densely peopled localities where they were most likely to be exposed to the contagion of that disease. This view is corroborated by the fact, that of the 56 deaths noted in the preceding Table, 9 occurred in London, 7 in Dublin, 6 in Glasgow, 5 in Cork, 3 in Manchester, and 2 each in Hull, Devonport, Bradford, Belfast, Newry, and Kilkenny, leaving only 14 for all the rest of the kingdom. Additional proof is afforded by the relative proportion occurring among young soldiers, to which we shall hereafter advert. Even taking the most unfavorable results, however, the mortality has only amounted to 2 in 10,000 of the force annually.

As the lower ratio of cases in the colonies may perhaps be attributed to the men being less frequently exposed to the contagion of the disease, it may not be out of place here to notice a few of the more striking instances in which, from the general prevalence of smallpox in the colony, they must have been so exposed. This is shown for the West Indies in the following Table :

—	Black Troops.			White Troops.			Ratio per 1000 of mean strength.			
	Mean Strength.	Admitted into Hospital for Smallpox.	Died.	Mean Strength.	Admitted into Hospital for Smallpox.	Died.	Cases of Smallpox.		Deaths.	
							Black Troops.	White Troops.	Black Troops.	White Troops.
Trinidad, 1819	603	Not stated,	58	230	Not stated,	0	Not stated,	Not stated,	96·2	0
St.Lucia, 1819	613	ditto	33	131	ditto	0	ditto	ditto	53·8	0
Bahamas, 1829	751	65	12	19	0	0	86·5	0	16·	0

Thus, while smallpox in one instance literally decimated the black troops, not a single death occurred among the European soldiers quartered in the same garrison.

In Malta, smallpox prevailed as an epidemic from March 1830 till August 1831, and again in 1838. The mortality caused by it among the military and civil population, respectively, was as follows :

	Strength.	Deaths from Smallpox.	Annual ratio of Deaths per 1000 of strength.
March, 1830, to } 18 { Civil Population	101,962	1169	7·6 ¹
August, 1831 } months { Military . . .	2299	2	0·6 ¹
April, 1838, to } 12 { Civil Population	105,456	686	6·5
March, 1839 } months { Military . . .	2186	0	0·

While, therefore, the loss by smallpox among the civil population has, on the average of these two epidemics, amounted to 718 in 100,000, among the Military, who, as we have already shown, are a protected class, it has only been in the proportion of 35 out of the same numbers.

In Ceylon 7874 cases and 2945 deaths by smallpox were recorded in 1819, in a population of about a million. In the same year only four cases, of which two proved fatal, occurred among 2863 European soldiers, being in the ratio of 1·58 admissions and 0·8 deaths per 1000 of the strength. Among the native troops, (chiefly Malays, Africans, and natives of the Peninsula of India,) a large proportion of whom were, owing to religious prejudices, unprotected by vaccination, 41 deaths occurred in a force of 4081, being 9·8 per 1000 of the strength.

The principal mortality by smallpox among the troops serving abroad was in Canada, where 23 of the deaths recorded in the preceding Table occurred. During the last ten years of the period over which the returns extend, almost all the cases were in Quebec, Montreal, and Kingston, where the disease prevailed to a very great extent among the civil population. Omitting this Command, the cases in the temperate colonies amounted only to 16¹, and the deaths to 1·5 in every 100,000 men.

If the hypothesis be correct, that the protective power of vaccination becomes gradually weaker and at length dies out, we should naturally expect to find the mortality by smallpox greater among the old soldiers. With a view to

¹ As the period included in this observation is a year and a half, it is of course necessary, in calculating the *annual* ratio of mortality, either to add one half to the strength, or to deduct one third from the deaths.

test this, we have traced the ages of the fatal cases occurring in the United Kingdom, and have also ascertained the numbers living at each age during the ten years, 1837—46, as follows :

	Aggregate Strength at each age.	Died by Smallpox.	Ratio of Deaths per 1000 of strength.
Under 20 .	43,833	15	·342
20 and under 25 .	90,041	28	·311
25 " 30 .	49,285	3	·061
30 " 35 .	37,151	8	·2
35 " 40 .	25,017	1	·0
40 and upwards .	9,270	—	—
Not known .	—	1	—
	254,597	56	·220

Although, probably owing to the limited numbers, there is an irregularity in the progression, the general tendency to diminish with advancing age is very strongly marked.

The fact, established by the recruiting returns, that 6½ per cent. of the recruits are wholly unprotected, affords a melancholy proof of the neglect of vaccination among the lower orders in this country, especially as it may also be inferred that of the 22 per cent. who have distinct marks of having had smallpox, a very inconsiderable proportion could have been protected by previous vaccination.

II. THE NAVY.

We have no means of ascertaining the relative proportions of men bearing marks of vaccination and of previous smallpox in this force; but as it is a standing order that all men and boys entering the service who have not satisfactory marks of either, shall be immediately vaccinated, we may look upon them as a completely protected class. In Abstract No. II of Appendix will be found a detailed statement of the number of cases of smallpox in each of the Naval Commands, and of which the following is a summary:

	Aggregate Strength.	Cases of Smallpox.	Deaths by Smallpox.	Annual ratio per 1000 of strength.	
				Cases.	Deaths.
Home and "various" Force	77,733	105	3	1·351	·038
Foreign Commands . . .	285,637	312	33	1·093	·115
	363,370	417	36	1·148	·099

Thus, it appears that throughout the navy the cases of smallpox have averaged only 115 and the deaths 10 in every 100,000 men.

Considering the manner in which sailors are necessarily crowded on shipboard, and the consequent difficulty of separating the healthy from the sick, their exemption from a disease of so highly contagious a nature affords convincing evidence of the value of vaccination. In the West African squadron, in particular, they are often exposed to the disease, from its breaking out among the natives, who are employed in considerable numbers in working the ship, and who are seldom or never protected by vaccination. Notwithstanding this, only 57 cases and 10 deaths by smallpox occurred in an aggregate force of 24,761 men during the fourteen years 1830—43 inclusive.

III. THE ROYAL MILITARY ASYLUM.

Since the opening of this institution, in 1803, for the reception of orphans of soldiers, the vaccination register appears to have been kept with great care, and shows in every instance whether a boy, on admission into the establishment, bore marks of smallpox or cow-pox, or was subsequently vaccinated. Satisfactory evidence can therefore in this instance be obtained that they were all protected. The cases that occurred among them up to the 31st of December, 1851, were as follows.

Period.	Aggregate Strength.	Cases of Smallpox.	Died.	Ratio per 1000 of strength.	
				Cases.	Deaths.
48 years . . .	31,705	39	4	1·231	0·126

Thus, in a population completely protected, either by smallpox or vaccination, the cases have averaged 123 and the deaths 12½ in every 100,000, being a still lower proportion than in the army serving in the United Kingdom.

But we are enabled from the records of the Asylum to obtain another description of proof of the efficacy of vaccination. Of 5774 boys taken on the strength of the establishment from its opening in August, 1803, to the 31st December last, 1950 are recorded as having marks of smallpox, 3636 marks of vaccination, and 188 no satisfactory mark of either. The last having been all vaccinated on admission, there were 1950 protected by previous smallpox, and 3824 by vaccination. Among these the cases of smallpox above recorded were distributed as follows :

	No. over whom observations extend.	Of whom subsequently		Ratio per 1000.	
		Had Smallpox.	Died of Smallpox.	Cases.	Deaths.
Boys having marks of smallpox	1950	12	4	6·15	2·05
" " vaccination	3824	27	—	7·06	0·00

This Table shows the protection afforded by vaccination against attacks of this disease, to be very little inferior to that afforded by previous smallpox ; the difference in the prevalence among the two classes having been at the rate of only 9 cases in 10,000 boys, while it is remarkable that all the deaths were from secondary smallpox, not one having occurred among the vaccinated.

The preceding facts appear to afford most conclusive proof of the value of vaccination. The length of time and number of persons over whom the observations extend are sufficient to warrant reliance being placed on the results. In the army it has been ascertained that four fifths of the persons entering it are protected by vaccination. The navy being manned from nearly the same class of the population may be inferred to be protected in the same proportion, and two thirds of the boys admitted into the Royal Military Asylum have borne satisfactory marks. In all of them the remainder were protected by previous attacks of small-

pox. The cases of this disease among a population thus protected have been as follows :

Among every 100,000	Soldiers	there have been 66 cases and 8 deaths
" "	Sailors	" 105 " 5 "
" "	Boys of the R.M.Asylum	123 " 12 "

These results are on the whole extremely satisfactory : it may be remarked that the class among whom the largest proportion of cases and deaths occurred was that in which the greatest number was protected by previous smallpox ; and, as before stated, that all the deaths in that class were of boys who had not been vaccinated.

The evidence now laid before the Society appears to have an important bearing on the proposition again to legalise inoculation. The additional chance of exemption from smallpox which would result from having undergone that disease would be very small. But to gain this slight advantage what are the risks we must run ? Even if every person inoculated were previously vaccinated, it cannot be doubted that in some instances the engrafted disease would prove fatal. We should consequently reduce to a certainty that which at present is contingent on the chance of the individual being exposed to contagion. Again, while so large a proportion of the population is unprotected by vaccination, it appears most unjustifiable, for the very slight advantage to be gained from it, to legalise a practice which must to a certainty perpetuate and spread a loathsome and, in unprotected persons, a very fatal disease.

The results, however, not only point out what is inexpedient, but suggest what is advisable. They show the great exemption (not amounting, however, as was at one time anticipated, to absolute immunity,) enjoyed by persons who have undergone vaccination, and thus point out the means of reducing the prevalence and mortality of smallpox to a mere cypher. Why then should not vaccination be made compulsory ? It is true such a measure might be objected to, as interfering with the liberty of the subject, but so, to a certain extent, do all measures relating to public health.

The convenience and prejudices of the few must give way to the interest of the many. The law compels us to carry our drains into the main sewers, forbids us throw rubbish or carry any other nuisance into the streets, as was the custom of our forefathers, puts down or regulates with a high hand any trade supposed to be injurious to the health or admitted to be offensive to the senses of our neighbours, and even compels us in some instances to consume our smoke; why then should it not enforce a measure which must greatly reduce, if not altogether annihilate, one of the most loathsome diseases that flesh is heir to? Why should it not prevent the ignorant and the careless from remaining in a position calculated to spread death and misery not only through the neighbourhood in which they reside, but through the length and breadth of the land. In our Factory Acts the principle is recognised of protecting the young and helpless against an amount of labour likely to prove injurious to them, and it would only be an extension of the same humane principle to afford them protection against a malady of so fatal a character.

To our profession the task appears especially to belong of extending the benefits of one of the greatest discoveries ever made. By our personal exertions in promoting, each in his own sphere, the spread of vaccination, and by using our influence in every quarter, to impress upon Government the necessity for some such sanitary law, we shall best fulfil the highest and most important mission of our profession—the prevention of disease.

ABSTRACT No. I.

Showing the Admissions into Hospital and Deaths by Smallpox in the Army for the following periods:

Stations of the Troops.		Periods of Observation.	Aggregate Strength.	Admitted into Hospital for Smallpox.	Died of Smallpox.
Tropical Colonies Temperate Colonies	United Kingdom { Cavalry . . Foot Guards Infantry . .	10 yrs., 1837-46	54,374	52	2
		do. do.	40,120	133	8
		do. do.	160,103	372	46
	Gibraltar	29 yrs., 1818-46	93,400	14	1
	Malta	30 „ 1817-46	61,998	30	3
	Ionian Islands	do. do.	96,494	6	1
	Bermudas	do. do.	22,945	1	—
	Nova Scotia and New Brunswick	do. do.	73,248	12	1
		do. do.	154,736	96	23
	Cape of Good Hope	29 yrs., 1818-46	54,291	1	—
	Windward and Leeward Command	30 „ 1817-46	121,750	7	1
		do. do.	67,714	3	—
	Sierra Leone	18 yrs., 1819-36	1843	—	—
	Mauritius	29 „ 1818-46	47,848	4	—
	Ceylon	30 „ 1817-46	58,397	12	7
Moelmyne	10 „ 1827-36	6818	2	—	
Madras—Europeans	5 „ 1834-8	45,378	7	2	
Total			1,161,457	752	95

ABSTRACT No. II.

Showing the Number of Cases and of Deaths by Smallpox in the Navy for the following periods:

Naval Commands.	Periods of Observation.	Aggregate Strength.	Cases of Smallpox.	Deaths by Smallpox.
Home Force	14 yrs., 1830-43	57,293	83	2
“Various” Force ¹	do. do.	20,440	22	1
Mediterranean and Peninsular .	do. do.	135,014	161	10
West Indies and North America	do. do.	49,047	22	3
Cape, and West Coast of Africa	do. do.	24,761	57	10
East Indian	do. do.	40,512	43	9
South American	do. do.	36,303	29	1
Total . . .		363,370	417	36

¹ Under this term are included ships, which, “though reckoned on home service are employed occasionally abroad in various detached duties, ships employed in carrying troops, ships fitting out and paying off, and packets while in England,”