

division as the left method does to the right in an ordinary multiplication, *e.g.*

(1)	(1)	(2)	(2)
321	321	321	24171'3
753	241713(753	753	
2247	2247	963	96
	1701		407'5
1605	1605	1605	160
963	963	2247	224'7
241713	963	241713	224
		

Anfield Road, Liverpool. ROBT. W. D. CHRISTIE.

Earthquake in North Britain.

It may be of interest to you to note that on Wednesday, February 16, at about 1.35 p.m., a sharp shock of earthquake was felt here. Houses were shaken, dishes rattled and tumbled, and much alarm was created, though no damage was done. At the time mentioned there was a loud report, as if of a heavy shot fired underground: earth movements—such as would result from violent concussion—immediately followed, lasting for about two seconds; the character of the movements then seemed to alter from vertical to horizontal, the latter being sustained for nearly four seconds. About two minutes after the first report a second was heard, louder and sharper than the first, but no tremors were felt. Judging from the sounds, it would appear that the wave travelled from west to east.

I may state that within recent years several shocks of earthquake have been felt in the district.

Kilsyth, N.B., February 18.

JAMES M'CUBBIN.

ON THE USE OF GLYCERINATED CALF LYMPH FOR PROTECTIVE VACCINATION AGAINST SMALL-POX.

THE terms of the Report of the Royal Commission on Vaccination, published towards the end of the year 1896, made it evident that there was a general feeling on the part of the Commissioners that the use of calf lymph should be encouraged as far as possible; and it was patent to those who grasped the full significance of the Report, that in order to fall in with popular sentiment, even apart from other considerations, some effort would be made by those in authority to examine carefully into the claims advanced on behalf of calf lymph vaccination as carried out at home and in European countries. For some time past it has been recognised by those who have been cognisant of Dr. Monckton Copeman's work on the "glycerination" of vaccine lymph, and especially of that derived from the calf, that the advantages connected with the use of this lymph are of such a nature that many of the objections that have been urged against the use of calf lymph are practically eliminated. Although this work has been going on in our midst, it appears that, in order to obtain any knowledge of the practical outcome of Dr. Copeman's investigations, we are compelled to turn our attention to the large vaccine establishments of France, Germany, Belgium and Switzerland, where, under State control, the use of glycerinated calf lymph has now come to be recognised as the method, of all others, which is attended with the greatest success.

The addition of a certain bulk of glycerine to vaccine material does not at first sight appear to be a very important matter, but, as Dr. Copeman has demonstrated, this glycerine does exert an extraordinary influence.

Taking the method employed in the Institute in Berlin as an example, we find that the vesical pulp collected from a single calf weighs from 10 to 15 grammes; to this is added a mixture of glycerine and water of equal parts, fourteen times the bulk of the vesicular pulp; it then, if used carefully, forms a sufficient volume to vaccinate 15,000 individuals.

All this we learn from the Report drawn up by the

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Medical Officer of the Local Government Board, in conjunction with Dr. Monckton Copeman, published in "The Supplement containing the Report of the Medical Officer for 1896-97 to the Twenty-sixth Annual Report to the Local Government Board."

The advantages early claimed by Dr. Copeman for this method are:

(1) That the addition of glycerine in this diluted form has the effect of ensuring the destruction of micro-organisms that are sometimes found even in the calf lymph collected under the very best conditions. It has been maintained that certain of the cases of erysipelas that have followed vaccination with calf lymph have been due to the accidental presence of certain of these organisms. Again, the possibility of infection with tubercle has sometimes been raised, though there is very little evidence of such infection being conveyed by vaccination; still the point has been raised, and it is right that it should be considered as a possibility. Glycerination of the lymph entirely does away with any danger from either of these or other allied sources. The addition of the glycerine kills off not only non-pathogenic microbes, but such pathogenic organisms as are ever likely to be found in vaccine lymph. This in itself, then, is a forward step of vital importance to those who, whilst fully convinced of the advantages of vaccination, and of the enormous preponderance of these over the possible disadvantages, are desirous that such disadvantages as there are shall be removed, and that every cause of objection should be done away with for those who have conscientious, even though unfounded scruples, against the use of lymph taken from the child, or from the calf under ordinary conditions.

(2) The dilution with glycerine appears to have absolutely no effect in diminishing the specific activity of the lymph, although it affects the bacterial flora of the lymph in such a marked degree. It is even maintained that such specific activity is actually increased, though it is difficult to see how this can be the case. It is possible, however, that various changes set up by bacteria are inhibited, and that in consequence the active elements in the lymph remain in a stable and unaltered condition for a longer period.

It is interesting to note in this connection that, although the lymph is diluted some fourteen or fifteen times, it remains sufficiently active at the end of three or four weeks to produce a good crop of vesicles when the same amount of the dilute fluid is used as is ordinarily employed of the undiluted vaccine. It is evident, therefore, that the amount of active principle present in ordinary vaccine is far in excess of what is necessary. That being the case the amount of available fluid is multiplied by fifteen, and to that extent the production of a good supply of trustworthy calf lymph is facilitated, and it becomes a comparatively easy matter to supply a pure lymph at a small cost. Hitherto at the animal vaccine establishment in Lamb's Conduit Street the amount that could be obtained from a single calf was, at the outside, only sufficient for the vaccination of some 200 to 400 patients, and this had to be done under somewhat unfavourable conditions—namely, directly from the calf to the arm of the patient—in order that there might be as few organisms in the lymph as possible, as naturally any organisms would multiply comparatively rapidly in stored lymph to which antiseptics could not be added. With the lymph from a single calf, used according to the new method, 4000, 6000, or even 15,000 vaccinations may be carried out, of course not at once from calf to arm, as the lymph may be kept under observation for some time, during which test-plate cultivations may be made, and the presence or absence of micro-organisms demonstrated. The glycerine does not kill certain organisms instantaneously. Consequently test-plates, made immediately after the emulsion has been prepared, may

contain a number of organisms. In such a case the vaccine would be left to mature—*i.e.* to get rid of these organisms—which it will do in a few days at the outside. As soon as such organisms can no longer be demonstrated in plate cultures, or as soon as the exact period at which they disappear has been absolutely determined, the glycerinated vaccine may be used by the operator, who may have full confidence that no secondary or untoward conditions, which can in any way be attributed to impurity of the vaccine lymph, will arise.

In view of these facts, and of the splendid results that have been obtained in Paris, Brussels, Berlin, Cologne, Dresden and Geneva—the vaccine Institutes in which cities were specially visited and reported upon by Sir Richard Thorne Thorne and Dr. Monckton Copeman—and in view, also, of the recommendation of the Royal Commission on Vaccination, all who take an interest in this question (and the number of these is far greater than many people imagine) will hail with delight any measure brought forward by the Government to facilitate the preparation and encourage the use of glycerinated calf lymph, especially wherever it is found necessary to apply the compulsory clauses of the Vaccination Act, and also for vaccination generally.

Perhaps one of the main advantages adduced in favour of vaccination with calf lymph is that the animals may in the first instance be carefully selected, so that only such as are of sound constitution and good family history need be employed; but even then, under the old system, owing to the outlay involved if the calves were killed at once and not used for food, a post-mortem examination could not be obtained, or thorough inspection of the organs made. It was, therefore, not possible for the vaccinating officer to state that there was no disease in the animal. Now that such a large amount of lymph can be obtained from a single calf, it would scarcely be justifiable to neglect this post-mortem inspection; consequently, as the lymph should not be used for a few days after it has been taken and made into an emulsion, the medical officer is able to assure both himself and his clients, that the animal from which the special lymph he is using has been taken is absolutely free from flaw or blemish, whilst the after-treatment of the lymph with glycerine enables him to certify that the effects of accidental contamination from outside are completely neutralised.

It is somewhat humiliating to us as a practical nation to find that a method worked out theoretically by an Englishman should have received attention, and been applied practically in almost every important European country before it has been thought necessary to draw attention to it at home. Still, we are glad that at last Government has been brought to see its duty in this matter, and to make preparations for acting up to the light it has received.

For the information of our readers we may quote Sir Richard Thorne Thorne's conclusions, drawn up after visiting the establishments to which reference has already been made:—

“(1) It is desirable that vaccination, both primary and secondary, carried out under the auspices of the Government, should be performed exclusively with vaccine lymph direct from the calf.

“(2) There will probably be advantage in retaining, for a time at least, the system of calf-to-arm vaccination at the Board's Animal Vaccine Station for such parents and others as may specially desire it, and for the purposes of comparing its results with those following the use of calf lymph preserved in one or another way.

“(3) The distribution of calf vaccine from the National Vaccine Establishment should be limited to glycerinated or similar preparations of lymph and pulp material, in air-tight tubes, or other glass receptacles.

“(4) To give effect to the above it will be requisite

that the Board's Animal Vaccine Station should be re-organised, both as regards construction and administration. Notably will it be requisite that it should include a properly equipped laboratory, under the direct supervision of a bacteriological expert.”

It is to be hoped that in any legislative measure which may be formulated and passed, due effect will be given to each of these four conclusions, although from many points of view it would appear desirable that the second recommendation should be made to cover a comparatively short period, as most people who have studied the question are now fully of the opinion that calf-to-arm vaccination has no advantages over vaccination with glycerinated lymph, and few parents who are likely to express any opinion at all, may be expected to ask for calf-to-arm vaccination of their children.

We look upon this document as one of the most important that has been published from the Department for some time, and we heartily recommend a perusal of its contents to those who are in any way interested in the study of the vaccination question.

NOTES ON SOME VOLCANIC PHENOMENA IN ARMENIA.

AS we descended from the central mountains of Armenia towards the south along the road from Akstafa to Erivan, we suddenly came upon a beautiful sheet of water lying glassy and restful in the lap of the mountains. Those on the left, sloped down to its shore with every diversity of valley, creek and headland, and with gently moulded outlines which told of subaerial waste, and gave the impression of a mountain land the base of which the waters had but recently begun to bathe. From the heights on which we stood the lake seemed to follow a somewhat narrow sinuous course, which suggested the idea that we were looking on a dammed-up valley. But it could not be the submerged end of a long valley invaded by the sea, for we were still between 6000 and 7000 feet above sea-level. On the right, beyond the lake, conical hills, often nicked at the summit, with long ridges radiating from them, rose in strong contrast to the more ancient rocks of the northern slopes, and suggested plainly by their geographical outline a volcanic region which had been so recently active that there had not yet been time for its distinctive features to have been obliterated.

Soon we wound our way round the north-western end of the lake, and found that we had to cross its principal outlet, and then immediately descend rapidly into the valley of the Araxes. Here, then, we might hope to see some reason for this strange holding up of such a vast body of water on the edge of the mountain land.

As we turned round to the right beyond the little village of Elenofka we found the passage barred by long moraine-like ridges. We had just seen snow-covered summits and glaciers in the Caucasus, a little further north, and moraines, telling of the former much greater extension of those glaciers. We asked ourselves whether similar conditions might not have produced glaciers and moraines here also on the slopes of the Armenian mountains? But when we reached the first of the ridges we found that it was not a moraine at all, but a lava-flow with scoriaceous surface and more solid rock within. The stream with its equalised flow had cut but a very small gap in these barriers, one after another of which had been thrown forward, and had built up a mass which, from the physical geography of the country, we inferred must be thousands of feet in thickness. What the depth of Lake Gokcha was we were not able to ascertain, but it runs for forty-three miles along the base of the mountains and widens out in places to a breadth of twenty miles. To save room our diagram (Fig. 1) is taken across the narrow western end, so that it does not indicate the proportion this enormous body of water bears to the size of the valley