fertile, and very unhealthy. After heavy rain the whole valley becomes a bog, there being apparently no adequate means of escape for the water. This valley is known to have been a lake, and to have been drained in order that the alluvium, which almost filled it, might be cultivated. The volcanic soil holds water like a sponge, and only when it is saturated does the water issue from the hill-sides as springs, and then chiefly because it has met a layer of hard tufa, which stops its downward course. Good examples of this are to be seen near Tre Fontane. Some idea of the water-holding capacity of this volcanic soil may be gathered from the following facts:

In 1876 the water in the torrents in the district of Velletri began to show an increase about October 20th; the total amount of water which had fallen over the drainage-area since the first rains of September was equal to a depth of 25 centimètres, and represented a total of 34 millions of cubic mètres of water.

In 1877 the flow did not begin till even later, namely, in the first fortnight of November, after a rainfall of 17 centimètres, or a total volume of 23 millions of cubic mètres of water. The Travertine area below Tivoli is very interesting as an example of an exceedingly malarious district, covered to a varying depth with a calcareous stone, excellent for building purposes, and on the top of which the soil is often so thin as to render cultivation impossible.

Altitude.—The general fact that malaria diminishes and finally disappears as we ascend is undisputed. The remarkable fact about it is that a very small elevation above a malarious soil affords very efficient protection to the inhabitants. The practice in such countries of building the houses on poles, on the tops of tombs, and similar places is evidence of this; but it would also appear that there is an undoubted difference, as far as the risk of acquiring the disease is concerned, between a house at the bottom of one of the valleys already described and one built on the top of the hills which bound them—a difference in altitude often not more than 30 mètres. The neighbourhood of the Basilica of San Paolo fuori le Mura, to the south of Rome, affords a very curious example of this.

Cultivation.—The ancient cultivation and the present state of the Roman Campagna have been already discussed. The relation of malaria to trees is of great interest, though but little understood. The case of Cisterna will serve as an illustration. In 1714 it was proposed to cut down a large area of *macchia* which lay between the town of Cisterna and the Pontine Marshes. Lancisi, the Papal sanitary adviser at the time, resisted it successfully, on the ground that these trees opposed a barrier or filter to the malarial emanations from the Pontine region; this idea constituting what is known as the "*prejudizio palustre*." Cisterna at the time was very unhealthy, and had a rapidly-diminishing population. About a hundred years later these woods were cut, and since that time the health of the place has improved, and the population almost trebled.

The attempts made at Tre Fontane to improve the locality by planting eucalypti hardly admit of discussion. The plantations are too small and too young to enable any decided opinion to be formed; still there is considerable evidence that good has been done. We may state generally that the effect of plantations, well kept and of suitable trees, is to drain the soil and distribute the water; while the *macchia* before mentioned near Cisterna, consisting of stunted brushwood, undrained and boggy, was rather a means of collecting stagnant water near the town, and its removal exposed the soil to the light and air, and so without artificial drainage what was practically a bog was got rid of.

Population.—The condition of the moving population of the Roman Campagna is a very serious question; they are ill-fed, ill-clothed, and worse housed, and generally are placed in circumstances which render successful resistance to the violence of the climate almost an impossibility. Density of population undoubtedly drives away malaria, and we need go no further than Rome itself for a conclusive example. Since the entry of the Italians in 1870 the city has extended enormously, and parts which at that time were something more than unhealthy are now built over, and fast becoming the fashionable quarter. The areas within the walls, particularly on the south, near the Porta San Sebastiano, which are unbuilt on, have a very evil reputation.

Drinking Water.—Is the malarial infection capable of being caused by water? This is a question which is naturally of the very first importance. The evidence, such as it is, would seem to point to an emphatic negative as the answer. The healthiest parts of the city of Rome are supplied by water admittedly the best in the world, and which rises—to take the Acqua di Trevi or Acqua Vergine as an example—on unenclosed land, in springs which bubble up and cover the surface in a locality so unhealthy that to pass several nights there in August might involve risk to life, and certainly to health. There

seems to be but little doubt that a supply of good drinking-water is of importance in malarious localities, but it has yet to be shown that, in exchanging pond and ditch water for that of springs, the inhabitants of these places cease to take a poison into their bodies. The evidence points rather to the fact that by so doing they raise their general health, and so become less liable to the disease—at all events, proof that the malarial infection can be conveyed by water is wanting, though very largely credited by the natives of countries where the disease prevails.

Meteorology will be considered in the next lecture in connection with the circumstances under which the disease is acquired.

We may conclude from the facts above quoted, and numberless similar ones which might be quoted did space permit, that the malarial infection is neither wind nor water-borne, that it is extraordinarily local, and dependent upon local conditions for its intensity to an extent not readily believed, and that the local conditions which appear to favour its development are precisely those which affect local climate.

COINCIDENT VACCINATION AND SMALL-POX.

By BRINSLEY NICHOLSON, M.D. EDIN.,
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YOUR notice of M. P. Pourquier's inoculation of vaccine of different degrees of attenuation brought to my mind three cases of the character above-named seen by me. I now narrate them because they furnish succinct and direct evidence of the value of vaccination at once comprehensible by the ordinary unlearned and non-medical man, who looks upon statistical evidence as tedious and confusing, and before whom such evidence can be so manipulated as to more than bewilder him, and apparently prove the very opposite of what it really asserts.

In the fourth year of my studentship I took, as was required of me by the Edinburgh University, six months' dispensary practice, and there then happened to be an epidemic of small-pox, chiefly showing itself among the Irish in the Old Town. Almost coincidentally—indeed I was called to the third while still visiting the first—I visited three cases where the circumstances were exceedingly alike. Three young labouring men, each of good make and constitution, had been attacked; each had not long been married; and each had a newly-born babe, of ages varying from four days to a fortnight, in a cradle on the floor of the one room of their respective "closes," in which each with his family lived. On each of my second visits I vaccinated the infant, but what I had feared came to pass—each child was attacked with small-pox. In one the vaccine distinctly showed that it had taken on the morning of the attack, and both affections progressed normally and together. In the second case as I would call it, the attack of small-pox coming on relatively a day earlier, the vaccine looked likely to take, but no more, and here the small-pox ran its course, and then the hitherto stationary vaccine took up the running and pursued it normally. In the third case, where nothing—at least nothing to an anxious and careful student's eye—could be predicted as to the taking or not of the vaccine when the small-pox fever showed itself, I can only at this distance of time remember that the respective courses ran differently from the other two, though both completed their courses.

These noteworthy facts, however—those for which I narrate these cases—occurred in all: 1. In all, the small-pox ran its modified course as after vaccination, and this though the latent small-pox must have been in the system prior to the vaccination, and though this vaccination had only in two cases commenced to run its visible course, and in a third case had not even done this. 2. As by modified course I mean that there was no exacerbation on the eighth day, but that the disease practically declined on that day, and that there was no formation of pus, there was, therefore, no symptom of danger nor cause of anxiety throughout. 3. Except the vaccine scars, not a single scar was left on the bodies of these infants, nor even on their faces. I know that such cases are not unique, for I instantly sought for and found notices of similar ones, but I narrate them thus simply for the reasons mentioned, saying no more, because I feel that any further words will only weaken, in the minds of others, facts which were and are to me of irresistible force.

Per contra, however, I would add that when in Tien-tsin, during and after the war, the estimate of all the medical officers there was that at least one-fourth of the males showed evidence of small-pox, and in by far the greater number of instances evidence of deep, universal and close pitting over the face. For myself, the strongest impression on my mind was the unsolved question—What a mortality there must have been to leave this one-fourth residuum.