that the general tendency to disease is due to the influence of artificial culture.

As the physiology of plants turns on the investigation of the life of a single cell, if it is to be worked out with any degree of success, so also in pathological researches we must direct our attention exclusively to the alterations which the individual cells exhibit. In every living cell the substances proper to it are arranged on one simple plan. The wall of the cell is formed of firm, perfectly insoluble cellulose, which, after it has been penetrated with this or that matter, and has in consequence lost its purity, is in a condition to exhibit different appearances on the application of re-agents, but abstractedly always the same, and that a non-nitrogenous substance remains, in which, along with carbon, hydrogen and oxygen are present in the proportions in which they constitute water. This cell-wall is lined within by a coat of greater or less thickness, either yellowish or free from colour, consisting of a semi-fluid, somewhat coagulated, gelatinoso-granular substance, which is formed of a proteinous matter rich in nitrogen, and called by H. v. Mohl the primordial sac. Finally, the inner cavity of the cell contains a highly mixed fluid, the medium of whose fluidity is water, in which a few nitrogenous, proteinous compounds are present, together with many which are non-nitrogenous, as gum, sugar, pectin, &c., soluable salts, and in a fixed form starch, inulin and crystals.

The relation of the greatest consequence as regards the life of the cells seems to be that of the nitrogenous lining to the other substances, especially the non-nitrogenous, and the vigorous health of the cells depends entirely on the normal condition of the stratum. When the cell is old and begins to perish (as for instance in the wood cells), this coat gradually disappears, or is so closely united with the cell-wall that it becomes inseparable, while at the same time it penetrates it in a soluble state, and thus by degrees the original reaction on the cellulose is perfectly masked by the constantly increasing re-action on the proteinous combinations.

If we now examine the first deviations from normal phenomena which are exhibited in the occurrence of internal diseases, as for instance in smut (*Uredo segetum*), in decay, as in the stems of Cacti, juicy fruits, &c., or in the potato murrain, we find in every case that the nitrogenous lining of the cell first becomes discoloured, assumes a darker tint, a firmer consistence, a more evident granulation, and that it begins at the same time to percolate and saturate the cell-wall, so that it ceases to exhibit its pure reaction on the cellulose. These phenomena are so general that we may well suppose that all inward diseases of plants actually derive their origin from an abnormal condition of this coat, and inasmuch as the peculiar power of the chemical process in the cells is apparently concentrated there, its depravation first calls into existence the symptoms of disease which are perceptible at a later period in the other portions of the cells. The comparative luxuriance of plants depends upon the inorganic matters presented to them in the soil.

The proportional rarity of phospates in most geological formations, and also in the soils which are wholly or principally formed from them, is well known; on the contrary, they are accumulated in soils principally formed of decomposed vegetable matter after being slowly collected by the plants. Animal excrements are very rich in these salts, and therefore manured fields, and especially gardens, contains a greater proportion than is normally present in plants, or can be consumed by them. But the influence which inorganic substances in the soil exercise on vegetation depends upon their being generally present. For since plants have not the power of choosing their own nutriment, and since the proportions in which soluble substances present themselves for absorption can be altered by endosmose within very narrow limits, it is equally important that the substances which are requisite for plants should be contained in the soil in something like the proper proportions, since the plants are otherwise compelled to receive matters in greater quantities than is agreeable to their normal structure, and in consequence inevitable anomalies take place in their vital action.

The sum of what has been said may be stated thus:—The more phosphates are relatively increased in any soil in consequence of its mode of formation or cultivation, the more will the plants which it sustains have a tendency to deviate from their original type, to form sub-species and varieties, and finally to be attacked and destroyed by internal disease.

THIRD REPORT OF THE CATTLE PLAGUE COMMISSIONERS.

Symptoms and Course of the Disease.

We were anxious to ascertain, in the first place, what are the earliest signs which can be relied on as indicating the existence of the disease. As to this point, the inquiries set on foot in this country, first by Professor Gamgee and then by Dr. Sanderson, establish this fact, that a rise of temperature precedes any other symptom. Within a period ranging from 36 to 48 hours after an animal has taken the cattle plague by inoculation the natural temperature rises from 102° Fahr., or a little above, to 104°, or even 105½°. This occurs at a time when the animal appears to be in no way ill. It follows therefore that the length of the inoculative period, that is, of the time when the disease is hatching in the body, is less than was supposed. The disease can be detected at least two days earlier than has been hitherto believed, and the duration assigned to the incubative period must be reduced by that time.

This discovery has practical importance. It may and ought to lead to an earlier separation of sick from sound animals, and may also render it possible to shorten the period of quarantine.

Two days after the perceptible rise of temperature has begun, the next sign occurs, namely, a peculiar condition of, or eruption on, the lining membrane of the mouth. It resembles at first sight the appearance in the foot-and-mouth disease, but can readily be distinguished from it by a practised eye. Dr. Sanderson has found it in every case (80 in all) seen by him, and in every instance he has been able to recognise the disease from this sign alone. It has been stated, however, that in rare instances it has been absent. Almost simultaneously there occurs a very distinctive appearance on the mucous membrane of the vagina. It appears that one or other of these signs is very rarely absent; so that when they are taken in connection with the elevation of temperature, the diagnosis of the disease can be made with certainty.

On the day following the appearance of the eruption, or about 72 hours after the first elevation of the temperature, the animal may be observed to be a little ill, to have less appetite than usual, and to ruminate irregularly. Even at this time, however, the pulse may be unaltered.—On the following day, the fourth from the first rise of the temperature, the animal for the first time shows marked symptoms of illness, and this period, which may be 110 hours after the real commencement, is usually considered by superficial observers as the beginning of the disease.

The seriousness of this oversight is obvious, not only on account of the great importance of the earliest possible separation and isolation, but in regard to treatment. The very earliest recognition of the disease is essential, if a remedy is to be discovered, for it is within the first four days that any remedy is most likely to be efficacious.

After the fourth day is over the constitution is thoroughly invaded. Then ensue the urgent symptoms—the drooping head, the hanging ears, the distressed look, the failing pulse, the oppressed breathing, the discharge from the eyes, nose, and mouth, the eruption of the skin, the fœtid breath, and the other well-known signs of the disease.

During the sixth day there occurs a great diminution of the contractile force of the heart and voluntary muscles, the