other factors besides the replacement of the missing vitamins will have any influence on the course of the disease. The addition of more calcium or phosphorus to the diet has little effect, unless these elements are already deficient; but V. Korenchevsky and M. Carr (*ibid.*, 1925, vol. 19, p. 101) have found that the subcutaneous injection of calcium glycerophosphate may improve the calcification of the animals on the deficient diet; the injection of sodium phosphate alone was almost without effect. Apparently only a certain maximum amount of calcium can be absorbed from the digestive tract; but that this is probably not due to the absence of the vitamins from the diet is shown by the results of some experiments by Katharine M. Soames (*ibid.*, 1924, vol. 18, p. 1349); the intraperitoneal injection of cod liver oil in rats afforded some protection against rickets; presumably these vitamins exert their influence on the tissues after absorption and do not facilitate the absorption of other elements of the diet. The same author in collaboration with R. Robison (*ibid.*, 1925, vol. 19, p. 153) has investigated further the cause of the deficient calcification of the bones in rickets. They find no deficiency in the blood of the phosphoric ester hydrolysable by the bone enzyme or of the enzyme itself in the bones. The administration of cod liver oil has no effect on this ester or on the enzyme, but increases the organic phosphorus present in the blood. It only influences the inorganic phosphorus of the blood when the diet is deficient in this element. The inference from their results is that the deficient calcification on a diet deficient in the fat soluble factor alone is due to a deficiency of calcium ions; deficiency of phosphorus only plays a part when the diet is deficient in this factor also.

A further factor in the cure or prevention of the effects produced by a diet deficient in fat soluble vitamins has been found within the last few years in the influence of ultra-violet rays. In the earlier observations children suffering from rickets were exposed directly to the source of light, with the result that the bone lesions were healed; the subject was taken up experimentally later and it was found that the growth of rats could also be stimulated by ultra-violet light when the animals were fed on a diet deficient in fat soluble vitamins. Later work has suggested that the ultra-violet rays may cause a synthesis of the antirachitic factor, but only a mobilisation of the body's store of vitamin-A without a true synthesis. This agrees with the results of Luce and Maclean mentioned above, who conclude that light plays no part in the formation of vitamin-A. Some of the other effects of irradiation have recently been referred to in these pages (December 20, 1924, p. 901, and May 2, 1925, p. 642).

A further step from this work was the examination of the effects of the ultra-violet rays upon the *food* given to the animal; and S. J. Cowell (*Brit. Med. Jour.*, 1925, vol. 1, p. 594) has tried the effect of feeding irradiated milk to rickety children; his paper also gives a brief account of some of the earlier work on irradiation. He has found that the irradiated milk has produced a great increase in the calcification of the bones of two children with rickets, whilst a third fed on the same milk without irradiation showed very much less improvement. It appears then that the antirachitic factor can be synthesised outside the body under the influence of ultra-violet light; this conclusion is of great importance, since it implies that a further method is available for the improvement of a ration which we may suspect to be deficient; it also opens up the way to a knowledge of the chemical constitution of the antirachitic factor and possibly its supply in some convenient and more palatable form than cod liver oil.

Further information as to the use and effects of light treatment in disease, together with accounts of the physiological actions of ultra-violet radiations, may be found in articles by J. H. Sequeira and W. J. O'Donovan (*Lancet*, 1925, vol. 1, p. 909) and F. H. Humphris (*ibid.* p. 912).

Power Alcohol from Root Crops.

THE third memorandum of the Fuel Research Board on fuel for motor transport[1] deals with the production of power alcohol from tuber and root crops in Great Britain. Potatoes, mangolds, and Jerusalem artichokes are the only practicable raw materials which could be grown for this purpose, but it seems unlikely that potatoes would prove of economic value in this respect. One ton of potatoes produces 20 gallons of 95 per cent. alcohol, so that every pound sterling it costs to grow a ton of potatoes is equivalent to 1*s.* on a gallon of alcohol for raw material alone. Co-operation between the potato grower and distiller has been suggested as a means of utilising the distillery residues for cattle-feeding, and so reducing the net cost of the power alcohol. In the southern counties the mangold is superior to the potato in that it is easier to grow, harvest, and store, and is less liable to disease and failure, while the manufacture of alcohol from it is simpler as the carbohydrates are in the form of sugar. The comparative cost per gallon for the raw material works out at 7*s.* for potatoes and 3*s.* 9*d.* for mangolds. The latter cannot, however, be grown in the north of England and Scotland owing to its susceptibility to frost. The distillation residues would appear to have considerable value as an ingredient in a feeding material rich in carbohydrates but poor in protein.

The Jerusalem artichoke will grow in almost any well-drained soil, and as it is difficult to clear the ground completely when harvesting, no replanting is needed for many years when once a plot is well established, the cultivation being thus reduced to a minimum. The crop yields are very variable, probably being about 10-12 tons per acre in England, and 15-25 gallons of 95 per cent. alcohol per ton of tubers have been produced. Experiments also indicate that by using an organism of the *Bacillus butylicus* group, about 12 gallons of mixed butyl alcohol and acetone can be obtained. The simultaneous fermentation of the tubers by yeast and the same organisms yielded a liquor consisting of 70 per cent. of ethyl alcohol, 10 per cent. of acetone, and 20 per cent. of butyl alcohol. The sun-dried artichoke stalks can be so treated as to give a pure resistant cellulose at the rate of about ½ ton per acre, of a type that would be very suitable for certain purposes.

The memorandum concludes with a series of tables setting forth the results of cultivation experiments together with various analytical figures.

[1] Department of Scientific and Industrial Research: Fuel Research Board. Fuel for Motor Transport: Third Memorandum. Power Alcohol from Tuber and Root Crops in Great Britain. Pp. vi+37. (London: H.M. Stationery Office, 1925.) 9*d.* net.