RADIATION AND RAY THERAPY.

(*Continued from page* 311, *Vol.* 83.)

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In the last issue of this journal there appeared a short account of some of the properties of radiation, of which light is one manifestation. This month a few of the therapeutic uses of light and various types of radiation will be mentioned.

SUNLIGHT.

The light of the sun comprises rays, the wave-lengths of which vary from about 2,900 A.U. to far into the infra-red region. Rays as short as 2,800 A.U. can penetrate the atmosphere of countries such as Switzerland where the altitude is great and the air free of dust, but in our smoky cities often only the visible and thermal rays reach the earth. Of solar radiation which penetrates the atmosphere to sea level about 80 per cent. is of the infra-red variety, 13 per cent. goes to the production of light and only 7 per cent. is ultra-violet. It must be remembered that a beam of sunlight is very complex, comprising all types of radiation between widely different wave lengths, therefore if a patient is exposed to sunlight he will show the effects of all the different types of radiation at the same time. The infra-red rays, if the sunlight is at all bright, will produce a primary erythema and a slight rise in temperature and the ultra-violet rays will give rise to the secondary erythema which appears some hours after exposure and to the pigmentation which follows it. The exact effect of the light rays, besides the sensation of light, is not yet completely discovered, although experiments with different coloured filters are being carried out to determine the value of these individually. It is unlikely, however, that we will see this "selective ray therapy" applied to sunlight in this country on account of the uncertainty of the weather. Heliotherapy is necessarily combined with open air treatment, therefore it is not always possible to state whether improvements in some respects are due to the cool air or to the sunlight; some authorities say that the speeding up of metabolism seen in so many cases is due rather to the air than to the light. In certain hospitals, also, sun and air treatment are combined with sea bathing, it being claimed that the combination of treatments is most successful.

The disease that seems to derive the most benefit from heliotherapy is tuberculosis of the bones and joints. The exposures to sunlight must be carefully graded, only a small portion of the body being uncovered for a short time at first and both time and exposed area being gradually increased if the patient shows no ill effects. At any sign of headache, malaise, or any rise in temperature the treatment must be stopped and recommenced with great care. In some sanatoria the ambulant patients suffering from pulmonary tuberculosis, are treated with heliotherapy, but it is necessary that a very strict watch should be kept on these people, for an overdose of light is apt to reduce the phagocytic power of the body and so convert a latent into an active infection. Rachitic children also derive benefit from sunlight, but this disease seems to respond more quickly to ultra-violet radiation as supplied by the quartz mercury vapour lamp, the reason being that there is a much greater output of the vital rays between 2,900 and 3,100 A.U. from this source. Another complaint which can be attributed directly to lack of sunlight is the osteomalacia so prevalent among the Mahommedan women of India who live in seclusion indoors for a great part of their life. This disease is characterised by softening and deformity of the bones and is considered responsible for the very high maternal mortality. It is due to the inability of the body to absorb calcium in the absence of Vitamin D, which depends greatly upon the presence of ultra-violet radiation. Apart from the specific diseases to which this form of treatment is particularly suitable almost all healthy people are benefited by heliotherapy, but care must be taken that, when sun-bathing, the head is protected from the rays of the mid-day sun and, indeed, the forenoon and late afternoon are the most suitable times for indulging in this practice. Too long exposures may result, not only in painful blistering of the skin, but also in headache, and even heat-stroke.

SOME ULTRA-VIOLET LAMPS AND APPLICATORS.

There is not on the market any form of lamp which gives out only ultra-violet radiation unless filters are used to screen off the visible and infra-red rays, but in general practice it has been found that there is no real objection to the presence of these and in many cases they are auxiliary in effect to the ultra-violet rays. The first source of ultra-violet radiation to be used in the treatment of disease was the carbon arc lamp employed by Professor Finsen in Copenhagen. This gives a large proportion of the "near" ultra-violet rays, that is to say, those which lie closest to the visible rays. Ultra-violet rays are divided into two groups: the "near" group extends from 4,000 to 2,900 A.U., and has a tonic effect and the "far" group reaches from 2,900 to 2,400 A.U. and has the power of destroying bacteria. The carbon arc lamp is a simple device whereby an electric current is caused to bridge a gap between two carbon electrodes. To start the arc the electrodes must be brought into contact, when the intense heat generated at their tapered points causes a little of the carbon to be vaporized. The electrodes are then separated and the current is conducted by the vapour from one electrode to the other. Finsen and Reyn perfected a form of this lamp for local treatment cooled by water flowing between quartz lenses. Quartz is very transparent to ultra-violet rays and water, too, transmits them perfectly. The carbon arc lamp can be worked on either direct or alternating current. Its disadvantage is its lack of the "far" ultra-violet rays. The discovery that metal cored and impregnated carbons give a greater proportion of this type of radiation has favoured the continued use of the carbon arc lamp. Tungsten and titanium alloy electrodes are widely employed also, and it has been found that when the tungsten is used for the positive electrode and carbon for the negative one a very fine source of ultra-violet radiation is obtained. Carbon, tungsten and titanium alloy lamps are all rich in visible and thermal rays as well as the ultra-violet. The most widely used source of ultra-violet light is probably the quartz mercury vapour lamp, which is rich in the "far" rays as well as the "near." Its visible radiation is chiefly

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