LIGHT THERAPY IN MENTAL HOSPITALS.*

By H. Dove Cormac, M.B., D.P.M.,

Lecturer on Psychological Medicine in the University of Manchester.

Introduction.

The value of sunlight in the maintenance of health has been recognized from early ages, and history records sun-worship by many nations in the past as well as at the present time. In Europe records exist of the use of the light of the sun for medical and surgical purposes since before the Christian era, but it was only towards the end of the last century that its possibilities began to be studied and the value of the electric arc lamp as a substitute recognized. In 1893 Finsen demonstrated the value of sunlight and electric arc radiation in the treatment of lupus, and at the beginning of the present century Bernhard of Samaden treated wounds and tuberculous lesions with sunlight. In 1903 Rollier opened his first clinic at Leysin, where he obtained excellent results in the treatment of tuberculosis, especially of the surgical type, by insolation in the brilliant Alpine sunshine. In 1908 Gauvain introduced heliotherapy at Hayling Island and at Alton. Nagelschmidt used the air-cooled quartz mercury vapour lamp for general irradiation in the same year, and in 1913 Reyn commenced the use of the carbon arc for the same purpose. The value of ultra-violet rays in the cure of rickets was not recognized till demonstrated by Huldschinsky in 1918, though Palm (1), as early as 1890, urged that deficiency of sunshine was a cause of the condition.

During the past ten years greater attention has been directed in this country to the investigation of the effects of the actinic rays on the blood, endocrines and other tissues of the body. The medical and the lay press abound with allusions to the therapeutic use of sunlight, and at least two journals are entirely devoted to the subject.

Actinotherapy in Mental Hospitals.

A note in the report of the Board of Control for the year 1925 runs as follows:

"The recognized value of ultra-violet radiation and of 'light'

* A paper read before the Section of Psychiatry, Royal Society of Medicine, on January 8, 1929, and reproduced by kind permission of the author and of the Editors of the Society.

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

baths is prompting the authorities of mental hospitals to introduce this form of treatment into their institutions. While it is believed that treatment by actinic rays has an effective influence in ameliorating cases of neurasthenia, it might be thought premature to assert that it has any specific action in psychotic states. It is, however, only right and in harmony with enlightened opinion that the population of a mental hospital should have such modern facilities as are open to the general public for the treatment of such conditions as malnutrition, tuberculosis, autotoxæmic states, skin diseases, etc. Fortunately the requisite apparatus is not expensive."

The report adds that there were in 1925 one registered and four county mental hospitals provided with installations for this mode of treatment. Twelve months after the publication of that report we find the following statement by Dr. Edwin Goodall (2) in his Maudsley lecture:

"Now that artificial sunlight treatment is being introduced in psychopathic institutions its effect in basal metabolism in suitable cases should be recorded. Indeed, I consider it incumbent on those who have the installation for this treatment to furnish scientific evidence for or against the utility of the treatment in psychopathic cases—evidence based upon tests of function, blood-examination, etc. It will be time enough for mental hospitals in general to make provision when such evidence is forthcoming."

To Goodall's remarks no exception could have been taken if his concluding sentence had been omitted. The suggestion that the study of actinotherapy, in relation to psychopathic cases, should be limited to the staffs of the few hospitals provided with the apparatus is unfortunate. Such an attitude is incomprehensible in one so eminent in research and whose work has been so diffuse. Evidence such as he denotes would be more readily forthcoming if the research were extended to all mental hospitals. A keen spirit of inquiry exists in many medical officers, who would welcome the opportunity of studying the subject, and the cost of the equipment, as the Board of Control states, is not great.

An inquiry addressed by the Actinotherapy Sub-Committee of the Royal Medico-Psychological Association in May, 1928, to 200 mental hospitals elicited forty-seven replies. From these it appeared that only sixteen hospitals had any apparatus, while eight hoped to instal one in the near future—five years after Horton Mental Hospital, the first in the field, was equipped.

In 1924, at Parkside Mental Hospital, enclosures were erected for male and female patients and provided with hammocks where courses of sun-baths could be given. The summer that year provided a minimum of sunshine, so that little experience was gained as to the

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

value of the treatment. It was then decided to instal electrical apparatus for actinic radiation. Adopting the suggestion of Turrell (3) in his book, an 80-ampère cinema arc lamp was obtained and about 50 patients treated during the year. Later additions to our equipment included six of the conventional 25-ampère carbon arcs, in two series of three, for general irradiation of groups of eight to ten patients, and three quartz mercury vapour lamps. The two types of lamp were obtained because of the difference in penetrating powers of their rays; experience showed that alternate use in treatment produced the best results. Details of equipment of a room for actinotherapy can be found in most text-books on the subject, but a rubber carpet is needed for insulation to prevent accidents in treating mental cases.

During 1925 an investigation was undertaken of the results of irradiation of about 50 cases treated for periods varying from two weeks to two months. An 80-ampère carbon arc was used, the electrodes being, in cinema parlance, "high intensity" carbons. These were selected after trial, because the best reaction was obtained by their use; I believe they are impregnated with nickel. Six to eight patients were treated at a time by irradiation of the whole body, all suitable new admissions during the year being chosen. No cases of epilepsy, mania or general paralysis of the insane were included. The dosage was fixed at five minutes for the initial exposure of the front of the body and five minutes for the back, increasing each by one minute daily to the maximum of thirty minutes, at a distance of 3 ft. from the arc. The metabolic rate was taken before, during and after the course of treatment, in each instance before the patient rose from bed in the morning. The blood-pressure was recorded and a full differential blood-count made at the same periods. The body weight was recorded weekly, and regular notes made of mental variations, appetite, sleep, skin condition, etc.

The results showed that there was a marked and general increase of the body weight, averaging $3\frac{1}{2}$ lb. for each patient. The appetite generally improved and most patients showed greater muscular activity, with concomitant exhilaration and cheerfulness. The metabolic rates and blood-counts showed no constant variation. The blood-pressure records indicated a slight average decrease of the systolic pressure.

During the investigation it was early realized that in melancholia with agitation and in cases of hyperthyroidism the condition was aggravated. Manic-depressive cases responded most readily, the period of depression being considerably curtailed, while mild cases of melancholia also benefited. Delusional cases, with much

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

mental irritability due to the delusions, became more amiable, the delusions were less frequently referred to and did not appear to trouble the patient while undergoing treatment. In dementia præcox there was no amelioration of the mental condition, but some cases showed greater motor activity and talkativeness.

Since the above investigation was undertaken the results broadly



PARKSIDE MENTAL HOSPITAL, MACCLESFIELD.

Showing Q.M.V. Lamp, Time Clock, Thermometer, Weighing Machine. Above couch a 1000 Watt Tungsten Filament "Vita" Glass Lamp. At end of couch a Cinema Arc (Carbon) Lamp.

det. l have been confirmed. In addition, treatment of cases of confusional insanity, some cases of dementia præcox and anergic stupor have yielded good results.

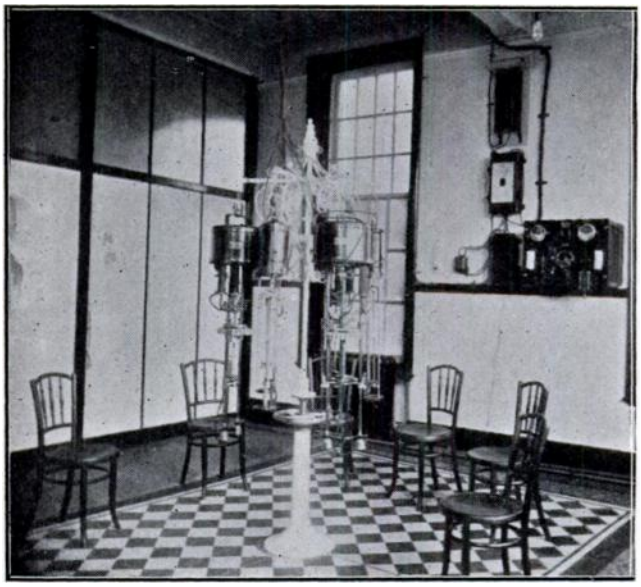
K. K. Drury (4) records similar conclusions as to the types of mental disorder that appear to benefit, and states that in acute

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

mania the patient becomes quieter during exposure, but immediately afterwards grows more and more restless and noisy. In epilepsy he found that the physical condition improved, but that the number of fits increased by from 20% to 150%.

Physiological Action of Actinic Radiation in Relation to Psychopathic States.

Actinic radiation effects a general improvement of the physical condition, increases body weight and improves muscle tone (Rollier



Parkside Mental Hospital, Macclesfield.

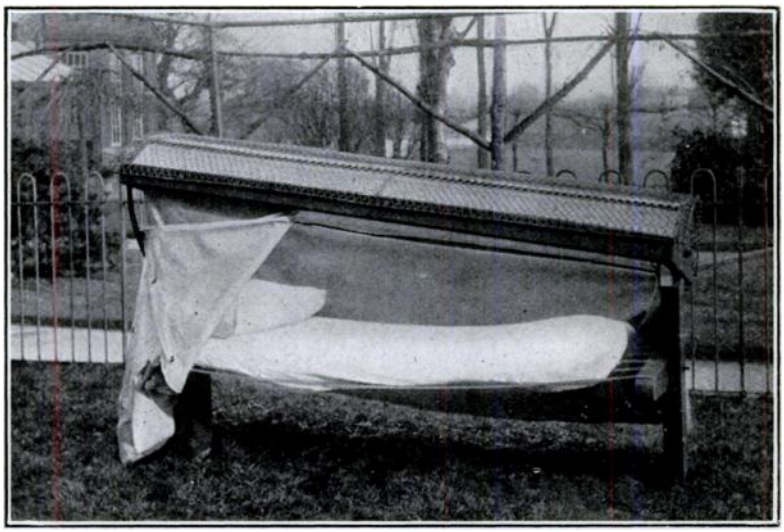
Showing Battery of Six Carbon Arcs (25 Ampère) in two series of three, Ammeter, Voltmeters, etc.

refers to sunlight as the "best masseur"). Colebrook, Eidinow and Hill (5) and others have shown that the bactericidal power of the blood is augmented, and Humphris (6) states that the immunizing power of the body is increased. These effects must materially assist in the therapeutic value of local treatment directed to eliminate sources of infection, in those cases which Cotton (7), Wm. Hunter (8) and others ascribe to a toxæmia derived from a focal sepsis or intestinal absorption. These cases, which they would group under "septic psychoses," include dementia præcox, manic-depressive insanity, paranoid conditions, psychoneuroses

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

and toxic insanities, in most of which our best results have been obtained by irradiation.

Saleeby (9) states that actinic irradiation raises the iron content of the blood and the iodine content of the thyroid, and I have noted an increased thyroid activity in cases of hyperthyroidism and agitated melancholia. This action indicates the benefit to be expected in exposure of those dull and lethargic cases which are often due to thyroid insufficiency. Grant and Gates, of the Rockefeller Institute (quoted by Howard Humphris (6)) recorded that the weights of the endocrine glands were all increased in experimental



PARKSIDE MENTAL HOSPITAL, MACCLESFIELD.

"Vita" Glass Canopy over Hammock. The canopy can be tilted towards the east or west on its long axis. The water-proof curtain affords privacy as well as protection against the weather.

rabbits. The parathyroids showed the greatest hypertrophy, and the calcium content of the blood was increased. T. C. Graves (10) treated with calcium lactate cases of excitement in epilepsy, all forms of mania, and agitated melancholia, with satisfactory results. His treatment was based on the assumption (from Bayliss's view that calcium is necessary for the normal effect of adrenaline on sympathetic endings) that, though there could be no lack of adrenaline in the body in these cases, there was an absence of its "fixation ion."

Levick, quoted by Edgar Mayer (11), noted that the neurasthenic symptoms often accompanying rickets were the first to clear up under ultra-violet ray treatment. E. H. and W. K. Russell (12)

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

state that they have treated many cases of neurasthenia and that all but two have benefited greatly. Humphris (6) states that there is no disease in which greater benefit may be derived from ultra-violet radiation than in this condition, and that the benefit may be due to alteration in the blood chemistry or the endocrine balance or to the bactericidal improvement in the blood, or to all three. We should remember that many cases of so-called neurasthenia are early cases of melancholia with hypochondriacal tendencies.

The action of the rays on the endocrines should be of interest to that school of thought which holds that most kinds of mental disturbance are a direct result of faulty functioning of the endocrine system, and it cannot be denied that there is a close relationship between the internal secretions and the mental state. But where there is a disturbance of the endocrine balance, it has yet to be determined whether irradiation will tend to restore that balance or to accentuate the disturbance. My experience goes to show that only when the disturbance is slight can any improvement be expected.

Many observers have noted a marked reduction of high blood-pressures, which may give rise to certain psychotic states, and that in this respect the carbon arc was more effective than the mercury vapour lamp. They also noted that when the blood-pressure was previously normal no decrease could be demonstrated.

It is generally held that the ultra-violet rays affect not only the vasomotor system but also other parts of the vegetative nervous system, such as those controlling the pigmentation of the skin, the fibres supplying the hair-follicles, and those which affect muscle tone.

I have been able to trace few references to work on the action of actinic radiation directly on the nervous system, but that of J. D. Achelis and H. Rothe (13) appears of sufficient importance to be noted. They investigated the state of excitability in the external cutaneous nerve before and after irradiation of the arm below the site of experiment and used the other arm as a control.

The result of seventeen tests showed that:

(1) The sensory nerve which innervates a radiated region goes through a variation of excitability during the latent period.

(2) Four phases could be distinguished: (*a*) A small increase of excitability; (*b*) a short variable period; (*c*) a strong, slowly increasing diminution of excitability; (*d*) a fairly rapid return to normal when the erythema appears.

This rhythm in variation might be continued for some time with gradually decreasing intensity. The phases (*c*) and (*d*) were constant but the phase (*a*) was not always observed.

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

They comment on the marked and constant reduction of excitability, which is not limited to the place of irradiation, but can be shown along the course of the nerve below and above the stimulated area. They conclude that the whole neuron is implicated in the change, and it would seem to be justifiable to infer that the whole of the sensory division of the nervous system is influenced by general irradiation. This reduction of sensitivity is to me analogous to the action, in small quantities, of the large group of anæsthetic and hypnotic drugs, including alcohol, which produce at first a feeling of exhilaration and mental vigour, with corresponding removal of care and annoyance. Hirschfelder and Serles (14) showed that these drugs, in spite of their chemical diversity, possess an important physico-chemical property in common. When added to an emulsion of oil and water they convert the oil-in-water phase into the water-in-oil phase. The effect of this is greatly to raise the electrical resistance of the emulsion.

The *Lancet* editorial of December 17, 1927, commenting on the above, states: " It seems a justifiable hypothesis that these drugs act in the same way in the body, and that, by altering the phase of the emulsion of lipoids, which constitutes the cell membranes of the neurones, they reduce the electrical conductivity in the nervous system, possibly at the synapses."

This leads to the question whether the action of the actinic rays on the sterols has any affinity with the above reactions.

The action of ultra-violet radiation, then, in reducing the conductivity of the sensory nerves, produces a sensation of well-being with mild excitement and freedom from care and annoyance, and may be said to paralyse certain inhibitions. Thus its beneficial action in neurasthenia, mild melancholia and the depressed stage of manic-depressive insanity may be understood, as well as the aggravation of excitement in cases of mania. Here we find the explanation of its analgesic action also.

It has been suggested that the change in the excitability of the nerve may be due to direct action of sunlight on the nerve-endings, or to some chemical substance produced in the epithelial tissues or to a hormone secreted by the skin.

Sensitizers.

Certain dyes and other substances can sensitize tissues to a radiation which would otherwise be without action. These have been termed " sensitizers," and they include eosin, methylene blue, iodides, bromides, hæmatoporphyrin, etc. Coal-tar products, such as sulphonal, may produce a temporary hæmatoporphyrinuria

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

in certain people who would at these times be extremely sensitive to the action of light. Beri-beri, an avitaminosis due to a diet of polished rice, is probably partly due to the action of sunlight on the sensitized individual. Pellagra, attributed by some to an avitaminosis, by others to the eating of corn or maize infected or altered in some way by the method of preparation, is also suggested to be due to sensitization. Drury (4), on the other hand, has reported a case of pellagra in which irradiation resulted in considerable improvement.

Hypersensitiveness to the light may occur as an idiosyncrasy in some people. This possibility should be remembered in deciding the dosage for any particular case. E. H. and W. K. Russell (12) give a fairly long list of drugs as well as certain articles of diet which enhance the effects produced by ultra-violet radiation.

"*Vita*" *glass.*—A discussion on actinotherapy in mental hospitals would be incomplete without allusion to glass which is partly penetrable by the actinic rays, the best known being "vita" glass. Ordinary window glass cuts out most of the rays, but "vita" glass, "sun-ray" and other varieties of this type are said to have the property of transmitting rays up to 2,750 Å.U., and are thus freely transparent to all the ultra-violet rays which occur in sunlight. This glass is being largely used in schools, hospitals and private houses as well as at the London Zoological Gardens and for cattle-sheds, stables, etc., with beneficial results.

As it is considerably more expensive than ordinary glass many hesitate to recommend it for verandahs without actual experience of the results of its use. To these I would suggest the erection of a small "vita" glass canopy, with side curtains, over a hammock for experimental purposes. Such a structure should entail a cost of no more than £10 or £12.

Conclusion.

Actinotherapy has been practised at Parkside Mental Hospital for nearly four years, and, from my experience, is a very necessary adjunct to the treatment of mental cases. It is employed as a routine for convalescent cases, whose recovery is thereby hastened.

Care is necessary in the choice of cases for treatment, the type who benefit to the greatest degree having already been indicated. Mention should, however, be made of the excellent results obtained in dementia præcox of the simple type, and also in the hebephrenic after the acute phase has passed.

It is my opinion that every mental hospital should be equipped with ultra-violet ray apparatus for the treatment of mental disorders,

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press

as well as for the many physical diseases which are ameliorated by its use. Opportunity would also be given for more extensive study of this subject, which would give scope for wider research into its physiological relation to the psychoses and the nervous system generally.

References.—(1) Palm, T. A., *Practitioner*, October and November, 1890.—(2) Goodall, E., *Journ. Ment. Sci.*, 1927, lxxiii, p. 373.—(3) Turrell, W. J., *Principles of Electrotherapy*, 1922.—(4) Drury, K. K., *Journ. Ment. Sci.*, 1927, lxxiii, p. 200.—(5) Colebrook, L., Eidinow, A., and Hill, L., *Brit. Journ. Exper. Path.*, April, 1924, v, p. 54.—(6) Humphris, H., *Artificial Sunlight and its Uses*, 1925.—(7) Cotton, H. A., *Journ. Ment. Sci.*, 1923, October.—(8) Hunter, Wm., *ibid.*, October, 1927.—(9) Saleeby, C. W., *Sunlight and Health*, 1924.—(10) Graves, T. C., *Journ. Ment. Sci.*, 1919, lxv, p. 109.—(11) Mayer, E., *Clinical Application of Sunlight and Artificial Radiation*, 1926.—(12) Russell, E. H., and W. K., *Ultra-Violet Radiation and Actinotherapy*, 1928.—(13) Achelis, J. D., and Rothe, H., *Arch. f. d. Physiol.*, 1927, ccxviii, p. 427.—(14) Hirschfelder, A. D., and Serles, E. R., *Journ. Pharm. and Exper. Therapeutics*, 1927, xxix, p. 441.

https://doi.org/10.1192/bjp.75.310.410 Published online by Cambridge University Press