considered by the advocates of wholesale light therapy. Xeroderma pigmentosum is the worst of all 'light' diseases and, in the unfortunate children affected, manifests itself as a malignant spread of pigmented spots under the influence of light, usually terminating fatally in early adolescence.

Equally rare are those cases of excessive sensitivity to light due to the presence of hæmatoporphyrin in the blood as a congenital abnormality, resulting in an eruption not unlike that of smallpox on the regions of the skin exposed to light.

Probably the greatest danger to the public from careless use of arc lamps is that of damage to the sight, a very real danger which, if not guarded against, may lead to many cases of permanent injury. Exposure of the unprotected eye to intense sources of light such as the tungsten or mercury vapour arc leads to acute conjunctivitis within a few hours, an experience that would probably induce greater caution on subsequent occasions, as few conditions are more painful. Deliberate staring at powerful sources of actinic light may lead to permanent blindness, or short of this to restriction of the visual field, the so-called 'ring scotoma.' There is a good deal of evidence that repeated exposure to unscreened arc lamps may lead to the development of cataract, and this is not surprising, since it is the lens of the eye that absorbs most of the ultra-violet rays.

If the dangers of this form of treatment have been rather stressed, it is only with the idea of emphasising that means of protection should never be neglected by anyone frequently exposed to the rays. As regards the skin, over-exposure is not as a rule followed by any permanent damage, though very painful burns and blisters are the penalty of careless handling of the lamps.

As there is no restriction of the supply of arc lamps or other apparatus for the production of ultra-violet rays to the public, the position is similar to that of patent medicines other than those scheduled under the Dangerous Drugs Acts. Inevitably, as in the case of proprietary drugs, a certain amount of amateur experimental medicine would follow the installation of arc lamps in private houses, and it cannot be too strongly pointed out that these rays are not to be regarded as practically foolproof, and should be treated with as much respect as a redhot poker or a loaded firearm.

Those who install lamps and wish to take regular doses of ultra-violet rays, would be well advised to begin by being medically examined and passed as fit for such treatment. Lamps should never be switched on until the eyes have been protected by goggles, which should be of glass tested and certified as cutting out the ultra-violet rays, and these should not be removed until the lamp has been turned off again. The technique of treatment does not come within the scope of this article, but it may be remarked that individual susceptibility varies greatly, and that this should be tested cautiously before starting general irradiation, otherwise extensive light-burns may result. The best thing would be for those who contemplate the installation of a source of ultra-violet rays to ascertain in the first instance whether they really benefit from such treatment, as by no means everyone is obviously improved by it.

One cannot help wondering whether the people who can afford to install arc lamps in their homes are those who would derive most benefit from the rays, since they are probably taking ample vitamins in their diet and live in relatively open and healthy neighbourhoods.

For the poor, whose diet is short of butter, eggs, milk, and fresh foods generally, there are already a number of clinics where they can be treated, with the best results, under proper medical supervision.

Extension of such clinics would appear to be the safest way of overcoming the defects of the rather sunless climate of Great Britain, though the intelligent use of artificial 'sunlight' in the home may be a means of improving the national health.

Lamps for Light-Baths.

By T. C. Angus.

ULTRA-VIOLET light between well-defined wave-lengths is one of the necessary accompaniments of primitive life in natural surroundings the tonic effects of which the human body is not only able to withstand, but without which it suffers a definite want. There can be no objection, therefore, to town-dwellers, during a European winter, who, while not being 'ill,' are still often in need of light and its good effects, making use of occasional light-baths from sources which emit ultra-violet light of moderate intensity. In fact, many such persons have followed this course for some time with considerable benefit, and there is little doubt that others will follow their lead.

A *practical biological measure of the strength of ultra-violet light* is the time for which it is necessary

to expose the skin to these rays for an erythema (reddening) and its after-effects to be produced. This erythema does not begin to appear until some hours after the application, and reaches its full intensity about 12 hours after the exposure, being followed by a brownish pigmentation or 'sunburn.' A band of cardboard or thick paper can be put across the abdomen, and small windows cut in this, so that the skin is exposed to the source 2 ft. away for 5 or 10 minutes and the erythema observed in each area. The dose required is that giving a slight erythema.

Lamps of various kinds capable of producing these effects after exposures of as little as two to five minutes are now obtainable through the medical stores, and can be fitted up in doctors' houses and in hospitals. Such powerful sources of light should only be used after the test of dosage by skilled people, or severe burns will result. This is obvious when it is remembered that it usually requires exposures of an hour or more to the summer mid-day sun in England to produce a sunburn on the skin of the neck or arms, so that an arc or mercury vapour lamp capable of producing this effect in five minutes must emit much more potent rays.

Lamps suitable for Domestic Use.

The Mercury Vapour Lamp.

In this well-known source of ultra-violet light the radiations are produced from an arc or stream of electrons carried by a column of mercury vapour, the whole enclosed in a quartz tube. The spectrum shows many characteristic lines of great intensity in both the near and far ultra-violet region, with much visible blue light and very little yellow and red.

A very small lamp of this kind would be suitable for the domestic use we are considering, and such a lamp would not take more than an ampere and a half after it had been alight for a few minutes.

The mercury vapour lamp is efficient and cheap in current consumption, whilst the cost of the quartz burner is lower than it was formerly, so that in price the mercury vapour lamp compares well with its rivals, and a very small lamp of this kind will be all that is desirable for domestic use. Elaborate stands and reflectors do not add to the efficiency of a lamp as they add to its cost. The quartz mercury vapour burner only requires a safe and simple support and a resistance and starting switch. The lamp is fairly cool, perfectly silent and easy to handle, though the burner is easily broken by shock or impact. The more powerful mercury vapour lamp commonly used for treatment might well be adapted for domestic use by interposing a thin filter or screen of vita-glass, which has the power of cutting off all the shorter ultra-violet rays and a proportion of those of medium length, whilst transmitting freely the near or longer rays: which last do not constitute a very powerful component of the mercury vapour lamp's output. The disadvantage of using such filters is that it is difficult to produce numbers of them with a consistent absorption, and that it would be more economical to use a much smaller and cheaper lamp to give much the same effect.

The running expenses of the mercury vapour lamp are due to current consumption, which is very small, and to deterioration of the burner, which usually has to be replaced or reconditioned after from 600 to 1000 hours' use. The atmospheric type of lamp lasts longer than the vacuum type.

Mercury vapour lamps can be made to work with direct or alternating current, lamps for the latter being rather more costly; or rectifiers can be obtained to make use of alternating current to work the direct current type of lamp.

The Arc Lamp.

This lamp has gained an unfair reputation for low output as a result of the perpetuation of obsolete designs by some manufacturers. As a result of recent improvements in lamp design and in the composition of the electrodes or carbons, therapeutic arc lamps are now obtainable that can give their effects as quickly, or more quickly, than the mercury vapour lamps commonly used.

Arc lamps using a current of three amperes, and therefore capable of being used on an ordinary lighting circuit, are now made, and these should be suitable for domestic use.

The quality and intensity of ultra-violet radiations from an arc can be varied over a wide range by the use of different electrodes—carbons cored with different metals and salts—so that the strength of the dose can be varied at will. The arc lamps used by Reyn of Copenhagen maintain a short arc between two plain carbons, the top one of which is the positive electrode. The distribution of light and ultra-violet light from such a lamp is greatest at an angle of 45° below the horizontal, and the relative strength of the biologically active rays is small compared with that of the visible light and the heat rays. Such lamps use very high currents, and the patients require exposures to them of an hour and more.

It was shown by Eidinow that the arc can be made a much more efficient source of ultra-violet light for treatment by lengthening the distance between the carbons, and by Angus by making the bottom carbon the positive instead of the top: the putting of the positive pole below ensures the diffusion up of the ionised gases and an effective flame from which most of the ultra-violet rays come. The distribution of light intensities from such an arc is nearly spherical, so that patients are best placed on the same level as the lamp. If a carbon cored with iron particles or a mixture of iron and cerium is used at the bottom, a much more powerful erythema-producing radiation is produced with which dosage time may be reduced to 2 to 5 minutes; it is then found that a plain and consequently cheaper carbon can be used in the top (negative) holder with practically no diminution of intensity of ultra-violet light from a direct current arc and a 20 per cent. diminution in an alternating current arc; this makes for a considerable saving in running

costs, because the top carbon is always the more quickly consumed.

The advantages of the arc as a source of ultra-violet light may be given as :

1. Quality and intensity of output can be varied at will by changing the electrodes.
2. No deterioration or loss of power with age.
3. A large output of warm visible light as well as ultra-violet, making the treatment pleasant.
4. Not easily broken or put out of order.

The disadvantages :

1. Uses more current than an equivalent mercury vapour lamp.
2. Carbons have to be renewed when they burn away.
3. Lamp gets hotter than mercury vapour lamp.

Precautions.

Overdosing should not be possible with lamps used for domestic self-treatment : lamps strong enough to produce overdoses should only be used under the control of a doctor.

Fire.—Lamps should be thoroughly stable and not so easily overturned that fires might be caused. All wiring and connexions should be of the best possible quality.

Electric Shocks.—Unlike the ordinary glass lamp in common use, ultra-violet lamps have one or two points where bare wires or points are exposed and may be touched when, by oversight, the current is switched on and the lamp is therefore 'alive,' although it may not be burning, and an unpleasant and even dangerous shock may thus be obtained. This may happen with the mercury vapour lamp when cleaning the burner with alcohol, as the makers recommend, and with the carbon arc when changing or renewing the electrodes ; although, of course, both these operations should be carried out before the lamps are switched on at all. This being always a potential risk, it may be well to install lamps for home treatment in the *bedroom* rather than in the *bathroom* ; this because the latter place is one in which possible shocks are far more likely to be serious on account of the large number of earthed metals and the state of moisture of floors, objects, and particularly of the body. Also, it may be well if buying an arc lamp to specify one where proper provision is made for changing electrodes without risk of shock should the switch be inadvertently left 'on.'

Care of the Eyes.—The cornea and conjunctiva are very sensitive to ultra-violet light and should always be protected by dark goggles during light treatment ; these should have close-fitting side pieces.

The relative 'cost of lamps' is as follows :

	amperes.	volts.	
Short flame Finsen arc .	.	$70 \times 110 = 7700$	watts.
Long flame arc . .	.	$25 \times 110 = 2750$	,,
Tungsten arc . .	.	$5 \times 110 = 550$	,,
Mercury vapour lamp .	.	$4 \times 110 = 440$	,,

The carbon arcs require purchase of carbons. The tungsten arcs require expensive tungsten electrodes. The mercury vapour lamp usually wants renewing after about 600-1000 hours' run, but is the cheapest.

A self-regulating long flame arc costs about £20-£25. A mercury vapour lamp without stand or reflectors costs about £10. A hand-fed tungsten arc can be made for £1 or £2. Then there are the expenses of resistance coils, wiring keys, etc.

The price of lamps is put up by provision of plated reflectors and stands. A mercury vapour lamp with an iron retort stand and a tin or cardboard screen suffices. Domestic mercury vapour lamps are now sold complete for about £10 direct, or £18 alternating current. Hand-fed arc lamps with iron and cerium cored carbons can be had for about £5. These can be run off the house circuit.

Selection of Ultra-Violet Lamps for Home Use.

By B. D. H. Watters.

THE idea of employing ultra-violet radiation at home is a new one, and there is as yet no wide selection of lamps made for this purpose. Those at present on the market must be regarded as largely experimental attempts to meet the new demand. The majority of them are of the type used for general irradiation in hospital practice, but reduced in size, and it is not generally realised that an exposed and live electrode which is safe enough in the laboratory or clinic in the hands of trained workers, may be quite definitely dangerous in the home.

The first of these lamps which were put on the market were all carbon or carbon-cored arcs, but recently the quartz mercury lamp has been produced commercially in a small size. The carbon lamps burn either plain carbon electrodes or carbon cored, with some metallic mixture which volatilises and adds the characteristic spectrum of that metal to that of the carbon arc. The metals or mixtures of metals selected are such as to enrich the arc with radiation of the shorter wave-lengths. From a therapeutic point of view, there seems little to choose between the different corings.

Carbon Arcs.

Ajax, Ltd.—The lamp is known as the 'Uviray,' and is a magnetically controlled tungsten-cored arc. It is remarkably steady in running owing to the automatic control. The arc is housed in a deep hood supported on a stand which contains the series resistance. A small knife switch is fitted to break the circuit, which serves the purpose admirably, but the fact that the contacts are so much exposed is a weak point in an otherwise good design. The current consumed is 4-5 amp. Price £5 10*s.*

Apex Sun Ray, Ltd.—The No. 1 model made by this firm is a small arc made between two thin pencils of carbon which are mounted almost