paraffin. When there is any question of injury to the cornea it should be an invariable practice to ask an ophthalmic surgeon to see the case as soon as possible, a procedure which should never be omitted. Atropine should not be used as a routine, especially in elderly patients, unless the cornea is definitely involved.

Burns of the External Genitalia.

These burns are difficult to deal with and are very liable to become infected. Tannic acid should never be used in these burns as it tends to interfere with the circulation and increases the oedema of the parts. As these burns are always infected, the coagulum formed by the tannic acid is an additional disadvantage; a tannic acid coagulum in the presence of sepsis forms a tenacious slough, which is very difficult to remove. The most satisfactory treatment is to apply the first-aid cream recommended, or a plain sulphonilamide or sulphathiazole cream and a pressure dressing. Moist or wet dressings should not be used.

Burns of the Hands and Feet.

Here again coagulation methods should not be used, as a coagulum on the fingers or toes tends to interfere with the circulation and may lead to stiffness of the digits. A sulphonilamide cream or sulphonilamide powder and tulle gras are the most satisfactory first-aid dressings. If the hand be burned it should be placed on a splint in the optimum position and the part elevated.

Burns of the Air Passages.

Inhalation burns are frequently serious and may be caused by either flame or steam. The gravity of the condition may not be apparent until a few hours after the accident, when the air-passages may become filled with froth and mucus. Oxygen should be administered preferably by the oro-nasal type of B.L.B. mask. If laryngeal obstruction develops early tracheotomy is indicated, the operation should not be postponed. These cases should be removed to hospital without delay.

SPECIAL TYPES OF BURNS

Electrical Burns.

The hand is the part most frequently affected in electric burns owing to its liability to come in contact with a live wire. If the skin be wet the injury will be more severe, a dry skin is much more resistant to the electric current. Most of these burns are caused by low voltage currents; high-voltage currents generate great heat and

may also cause serious burn from flash, and, in addition, interfere with the respiratory centre and lead to cessation of respiration. When the injured person is unable to free his hand from the live wire, owing to contraction of the muscles, no attempt must be made to pull him free as the rescuer himself may be injured; the correct procedure being to turn off the switch. In these cases in which respiration has ceased, artificial respiration must be carried out.

Phosphorus Burns.

The injured part should be immersed immediately in water as the phosphorus continues to burn in the tissues. The burned part should be soaked in a 2 per cent solution of sodium bicarbonate, the actual percentage is not important provided that the solution is not too weak, a rough measure is two tablespoonfuls of sodium bicarbonate to a pint of water. The burn is then swabbed with 1 per cent copper sulphate, and the particles of phosphorus removed with forceps. After removal of the particles of phosphorus the part is again washed with sodium bicarbonate solution and examined in the dark for phosphorescence. When the phosphorus has been removed, the ordinary methods of burn treatment may be applied. Dressing containing oil should not be used for first-aid treatment as phosphorus is soluble in oil.

NOTES ON THE BURN CREAMS

By Professor J. P. TODD, Ph.C., Ph.D.

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The various Burn Creams evolved in the Glasgow Royal Infirmary were made possible by the introduction within recent years of new types of compounds. These substances have the property of converting oil and water stirred with them in a molten condition to a cream-like emulsion freely miscible with water. This property is due to the polar nature of the molecules of these wax-like substances on one end of which is a hydro-carbon radical and on the other a water soluble grouping such as sulphuric acid. In making creams with these substances it is only necessary to melt the waxes, to add water, and, if required, some additional oil, and to stir the ingredients together; no elaborate machinery is necessary. The cream can then be sterilised by heating at 110° C. for thirty minutes, shaking to reform the cream as it cools. The desired medicament sulphanilamide, sulphathiazole or penicillin can then be incorporated aseptically, care

being taken to prevent contamination of the cream with resistant types of organisms like pyocyanus and proteus.

The first Royal Infirmary Cream, which proved very successful, contained one of these substances, namely, Lanette Wax, S.X., mixed with cod-liver oil and water, 1 per cent sulphanilamide was added as a bacteriostatic agent, but the bland healing properties were generally considered to depend on the presence of the cod-liver oil. The war led, however, to the discontinuance of the use of cod-liver oil, and more emphasis then had to be placed on the antiseptic and bacteriostatic properties of the sulphanilamides and other medicaments. Sulphanilamide is cheap and plentiful, but later sulphathiazole was substituted, and still later penicillin proved extremely efficacious in a cream of this type for clearing up infection. These creams are not actively bactericidal, but rather bacteriostatic, and are suitable chiefly for work under good conditions such as prevail in the hospital ward.

In dealing with burns in the out-patient department a more actively antiseptic cream was found to be necessary.

A substance, similar in physical properties to Lanette Wax and possessing also marked detergent properties had become available in the substance known as C.T.A.B. or Cetavlon, which, like Lanette Wax, has a hydro-carbon radical and hydrophyllic tail, but in this case a trimethyl ammonium bromide radical in place of the sulphuric acid grouping of Lanette Wax S.X. This substance has the ability to produce an emulsion, and has also good detergent and reasonably good bactericidal properties. It had been used in watery solution for the general cleaning up of the surface of the skin, and had proved fairly successful in preventing and clearing up infection. The idea therefore occurred to convert it, because of its emulsifying and antiseptic properties, into a first-aid cream for treatment of burns in the outdoor section of the Burn Unit. This was tried, and the cream was found to maintain sterility in many, but not all, cases. Certain gram negative type organisms were unaffected by it, but it retained sufficient potency as an antiseptic to make it of general use as a first-aid application in burns, dealing as it did with the haemolytic streptococci and staphylococci. Sulphanilamide was also added and the cream was eventually adopted by various sections of the armed Forces of the Allies.

In making these creams the sterility of the finished product is important, but, as the cream forming substances are liable to suffer hydrolysis when treated in the presence of steam or water at high temperature, a certain amount of care is necessary. Too high a sterilising temperature, and this varies from sample to sample in case of

Lanette Wax S.X., may crack the emulsion and produce an unsightly preparation. Lately no difficulty has been experienced in sterilising the cream after preparation, and this should be done if possible.

This cracking of the emulsion should not be confused with the separation of the emulsion which takes place on heating, and which can be overcome by rotation while the cream is cooling. A cracked emulsion cannot be remade into a satisfactory preparation.

It is an advantage if the finished product can be sterilised immediately before the incorporation of the medicament, whether it be sulphanilamide, sulphathiazole or penicillin, but with careful preparation it is possible to sterilise all ingredients separately before making the cream, and this can be done in cases where sterilisation of the finished cream leads to cracking. Where it is desired to sterilise the ingredients separately, to prevent hydrolysis of the Lanette Wax S.X., they can be sterilised by heating for one hour at 150°C. in an electrically-heated oven, the water being sterilised in the usual way.

To make the Royal Infirmary Cream, the Lanette Wax 10 per cent and Castor Oil 25 per cent are melted at as low a temperature as possible and water added, heated to about the same temperature; stirring produces the cream. If sulphanilamide or other gritty types of substance is to be incorporated, this should be levigated with 10 per cent glycerine, 10 per cent referring to the final weight of the cream. Some trouble has been experienced when incorporating the sulphanilamide in this way owing to the grittiness, but this does not usually cause any ill-effect or discomfort, but should be avoided if possible.

In making the Glasgow No. 9 Cream, the oily ingredients, Castor Oil 25 per cent, Beeswax and Wool Fat 1.8 per cent, and Cetyl Alcohol 5 per cent should be sterilised by heating as above described, then a boiled solution containing the equivalent of 1 per cent of Cetyl Trimethyl Ammonium Bromide should be incorporated, using aseptic precautions, and stirred till cold. Glycerine 10 per cent should be used to levigate the sulphanilamide in a sterile mortar, which can then be added directly to the cream.

The formulae of Royal Infirmary Burn Cream and the No. 9 Burn Cream are given below:—

1. Royal Infirmary Burn Cream.

Castor Oil	..	..	..	25	per cent
Sulphanilamide	..	..	..	3	"
Sulphathiazole	..	..	..	3	"
Lanette Wax S.X.	..	..	..	10	"
Glycerine	..	..	..	10	"
Water to produce	..	..	..	100	"

2. *First-Aid Burn Cream* (No. 9).

Cetyl Trimethyl Ammonium Bromide (Cetavlon)	1 per cent
Sulphanilamide	3 "
Castor Oil	25 "
Beeswax	1.8 "
Wool Fat	1.8 "
Cetyl Alcohol	5.0 "
Glycerine	10 "
Water to produce	100 "

THE CARE OF THE BURNED
PATIENT

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History

Tannic acid, for long the most popular method of treating burns, was introduced by Davidson (1925), and good support was given in England by Wilson (1929) and Mitchener (1938). Because tannic acid lacks any bactericidal action, Aldrich (1933) favoured gentian violet, and later the triple dye solution (1937).*

Since the War began in 1939, there have been many articles written (Mowlem 1941, Wells 1942, Erb et al 1943) relating to liver necrosis following the use of tannic acid. Present writings appear to favour—saline treatment (McIndoe 1940), plaster of Paris (Barnes and Trueta 1941; Fleet and Ackman 1944), the Koch method of pressure dressings (Allen and Koch 1942; Silver and Reid 1942), or the envelope method (Bunyan 1941, Douglas 1944).

Objects

Whichever method is chosen, the objects should be the same:—

- (1) To obtain a skin covering as soon as possible.
- (2) To maintain full function.●
- (3) To prevent deformity.
- (4) To prevent infection and cross infection.
- (5) To eliminate pain.
- (6) To reduce to a minimum the length of time between receipt of the injury, and return to normal duty.

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Planning

There should be a definite plan of campaign in every hospital, large and small, understood and adopted by all who may be called upon to take part in the treatment of the case. By this means better results will be obtained and the value and comparative value of any method better assessed.

Ackmann (1944) and his colleagues have drawn up a plan which is a model of perfection. It is sad to note that a complacent attitude still exists in some hospitals: burns must not be regarded as minor problems and their treatment left in the hands of the enthusiastic but inexperienced junior residents.

First Aid

This will depend upon the materials to hand at the site of the accident, and will vary from applying the cleanest material available, to a sulphonamide preparation (Colebrook 1944) spread as a cream on gauze, covering this with wool and a firmly applied crêpe bandage. The general measures consist of warmth, warm sweetened drinks such as cocoa or tea, calm reassurance: the use of narcotics, depending upon the presence of a doctor and the absence of any other undiagnosed injury. Several cases of partial thickness burns in Service personnel have been treated since "D" Day, and the results of applying 5 per cent sulphanilamide cream on gauze, followed by bandaging, without any cleansing of the burned area, were very gratifying. Particularly so if the dressings had been renewed at least every 48 hours for, naturally, the cotton bandages used tended to become loose and the wound exposed, as movements of the individual, and passage of time occurred. None of the areas were free from bacterial contamination, all were clinically clean and very rapidly healed with 100 per cent function after the application of Stannard envelopes. It is agreed that they would have healed just as speedily by any of the other methods, but the advantage gained by using the envelopes was the immediate freedom of movement.

Definitive Therapy

(a) *Local—limbs*

Since reporting on the use of envelopes in the *British Journal of Surgery* (1943), the author has continued to use these whenever possible. Douglas (1944) has since issued a detailed account of this method as used in the U.S.A., and to him should go the credit for first introducing the procedure (1936 and 1939). Nothing further need be added to the detailed account already given except to