By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

This manual contains copyrighted material.

Field Manual
No. 8-40

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 31 October 1977

MANAGEMENT OF SKIN DISEASES IN THE TROPICS AT UNIT LEVEL

Page

CHAPTER 1. INTRODUCTION 2
2. DESCRIPTION OF THE SKIN 5
3. DEFINITIONS 14
4. PREVENTING SKIN DISEASE 28
5. GENERAL PROCEDURES: INSPECTION AND TREATMENT 3
6. FUNGAL INFECTIONS 41
7. BACTERIAL INFECTIONS 65
8. WARM WATER IMMERSION SKIN DISEASES 85
9. MINOR SKIN INJURIES 96

APPENDIX A FORMULARY 103

***This publication supersedes Department of the Army FM 8-40, Management of Skin Diseases by Company Aidmen in the Tropics, 22 August 1969.**

CHAPTER 1 INTRODUCTION

In wars, far more soldiers are incapacitated by disease than by wounds. In tropical operations, bacterial and fungal skin conditions are often disabling. Tropical heat, high humidity, and prolonged exposure to water and mud often damage the skin, the body's protective layer. Rubbing of gear and clothing against the soggy skin produces raw and inflamed areas. Bacteria and fungi have an ideal climate in which to multiply. Lesions spread quickly over the body's surface, consequently the skin becomes uncomfortable and sometimes tender. The patient may experience fever and chills and movement, such as walking, may grow painfully difficult.

This manual will enable you, as an enlisted medical specialist, to prevent and treat tropical skin diseases. It proposes proper skin care techniques, and suggests appropriate wearing apparel to keep soldiers from becoming casualties of skin diseases. In addition, the manual outlines practical, effective, and safe treatments and medications to use when the skin is damaged. They are mentioned in the text by number and are described in the Appendix.

This manual is in accordance with the following International Standardization Agreements which are identified by type of agreement and number at the beginning of each appropriate chapter:

TITLE	NATO STANAG	CENTO STANAG	SEATO STANAG
Medical Training in First Aid Basic Hygiene and Emergency Care	**2122**	**2122**	**2122**

Metric measurements used throughout this publication are approximate equivalents of the customary units of measurement and are provided for the convenience of the reader.

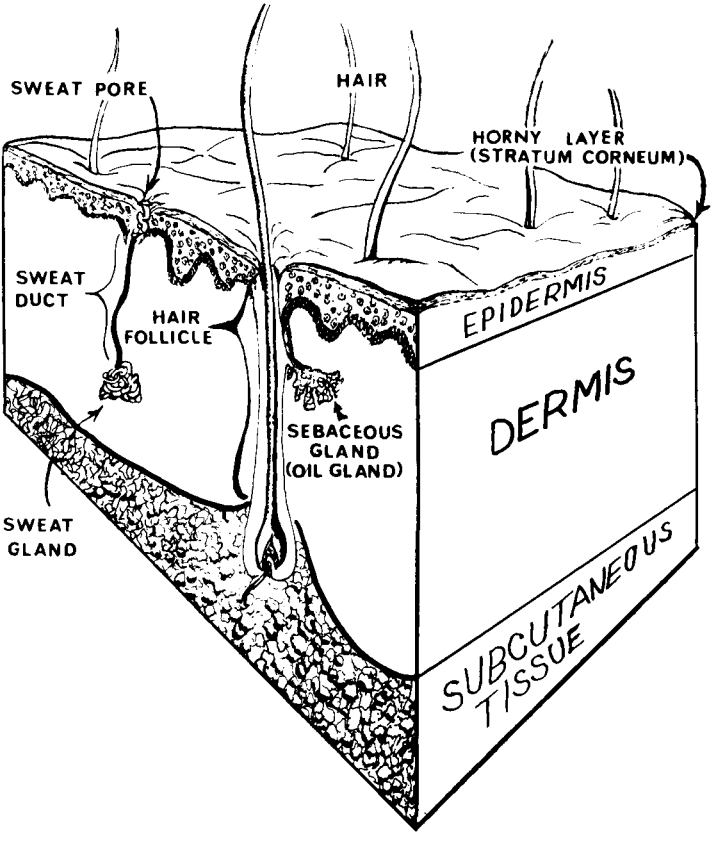
Users of this publication are encouraged to submit recommended changes and comments to improve the publication. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to the Superintendent, Academy of Health Sciences, US Army, Attn: HSA-TDL, Fort Sam Houston, Texas 78234.

CHAPTER 2 DESCRIPTION OF THE SKIN

The skin is the largest organ of the body. It has the main duty of protecting people from damage by their environment.

The Epidermis (ep-i-der'-mis)

The epidermis is composed of two layers: the stratum corneum, also known as the horny layer, and an inner living layer. Injury to the epidermis does not cause bleeding (no blood vessels are located in this layer) or scarring. The sensation of itching occurs in this layer, but if the epidermis is scratched off, the itching ceases and pain ensues. Damage to the epidermis by ultraviolet light causes changes in the skin's color, such as light or dark spots, or the darkening familiar with suntan.



Principal Structures of the Skin.

THE STRATUM CORNEUM
(stra'-tum cor'-nee-um)

Just as our hair, fingernails, and toenails are constantly growing outward and being shed, so too is the superficial layer of the skin over the entire body being rubbed off and shed. This layer is the stratum corneum. It is composed of dead, tightly packed, horny cells which act as a barrier to protect the body against bacteria, fungi, and other harmful substances found in the environment. The stratum corneum varies in thickness, being very thin in the groin and many times thicker on the palms and soles. Even though this layer is constantly shedding, excessive rubbing and friction impair its protective function. In addition, prolonged contact with environmental factors, such as water, heat, sunlight, and chemicals, weaken the stratum corneum.

THE INNER LIVING LAYER

The inner living layer of the epidermis is about as thick as a sheet of paper. As its name implies, it is composed of living cells: those which constantly renew the stratum corneum and others, called pigment cells, which contribute to the skin's color.

The Dermis (der'-mis) or Cutis (cue'-tis)

The dermis is the supporting layer of the skin, giving it strength and flexibility. (Leather is made from this layer of animal skin.) It is composed mainly of a tough protein called *collagen (coll'-a-gen).* The dermis averages about one-eighth inch (3 millimeters) in thickness, and its total weight in the average person is about 10 pounds (4.5 kilograms). Throughout this layer are blood vessels, lymph vessels, and the nerves for touch, pressure, pain, and temperature.

Because of the presence of blood vessels, injury to the dermis can cause oozing and bleeding. The redness around an infected scratch results when the blood vessels dilate, and pale skin, following fright, ensues when the blood vessels contract.

The Hair Follicle (fol'-i-kl)

The hair follicle is actually a group of structures consisting of the hair shaft, the hair root, and a surrounding tubelike wall. The hair shaft is composed of tightly packed, dead cells which contain a hard protein. The only living part of a hair is the hair root, which is about one-third as thick as a sheet of paper. The opening of the hair follicle often is a weak spot in the skin defenses; it is a place through which bacteria may enter and cause infection.

The Sebaceous Gland (se-bay '-sush)

The sebaceous gland consists of a sac filled with living cells containing oil. It secretes an oil y substance, called *sebum (see'- bum)* into the follicle. Sebum reaches the skin surface through the follicle opening. What makes the skin soft, however, is the amount of water in the stratum corneum, not the amount of oil in the sebaceous gland.

The Sweat Pore, Sweat Duct, and Sweat Gland

The sweat gland is located near the bottom of the dermis. The sweat duct passes through the dermis and epidermis carrying the sweat through to the sweat pore located on the skin's surface.

Sweating is one of the ways the human body maintains its temperature. The body sweats and air evaporates the sweat from the skin's surface; consequently the skin is cooled.

In hot, humid areas, sweat (which is composed of water, common salt, and tiny amounts of other chemicals) pours off the skin without evaporating. Effective cooling of the body does not take place and large amounts of salt and water are lost. Heat cramps or heat exhaustion results, if lost water and salt are not replaced. Heat exhaustion can also occur, if for any reason, normal sweating cannot take place over large areas of the body surface.

The Subcutaneous Tissue (sub-cue-tay'nee-us)

Underlying the dermis is the subcutaneous layer consisting of fat cells. In addition, those large veins seen under the skin's surface are located in this layer. Subcutaneous tissue helps conserve the body heat. It varies in thickness over the body and, obviously, from person to person. Much of the swelling seen in infections occurs in this layer.

CHAPTER 3 DEFINITIONS

This chapter covers the terms which are used to describe changes in the skin.

Inflammation

Inflammation is a visible reaction resulting from injury to the cells. The injury can be caused by infection, allergy, poison, heat, or cold. The four signs of inflammation are:

Redness–due to dilated blood vessels,

Warmth–due to increased blood flow,

Pain—due to irritation of the nerves, and

Swelling—due to accumulation of fluid.

Inflammation of the skin is commonly called *"dermatitis" (der-ma-ti'-tis).* When the full thickness of the skin is inflamed, it is called *"cellulitis" (cel-u-li'-tis).*

Pruritus (pru-ri'-tus)

Pruritus is an intense itching that sometimes is a symptom of skin disease.

"Jock Itch"

"Jock Itch" is a slang term used to describe an itching dermatitis of the groin. It is often, but not always, caused by fungi.

"Athlete's Foot"

"Athlete's Foot" is a slang term used to describe a dermatitis of the skin of the feet. It is often, but not always, caused by fungi.

"Jungle Rot" or the "Crud"

These terms are useless slang terms. They are used to describe many unrelated skin diseases.

Abrasion (a-bray '-shun)

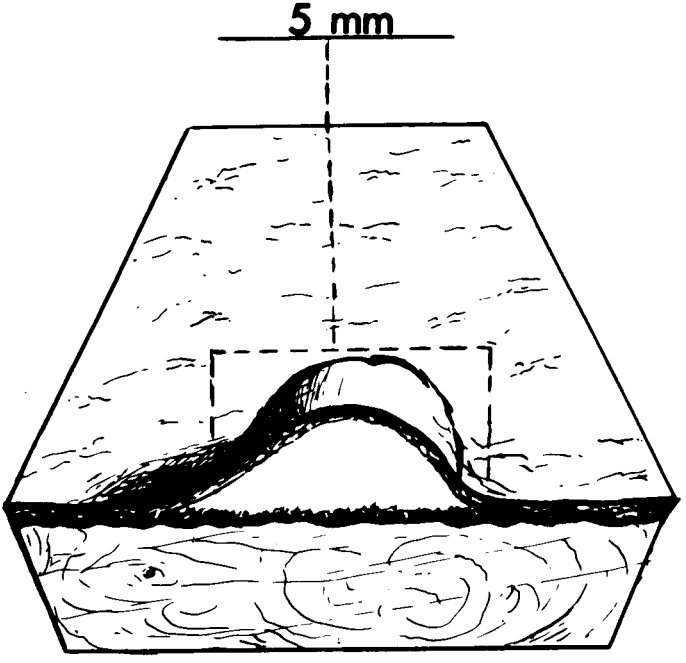
An abrasion is an injury that results in a loss of skin that extends into the dermis. The skin loss can occur if you scratch your skin too hard or if you scrape your knee or knuckle. Bleeding generally results when you first injure yourself. An abrasion can be very tender to the touch.

Lesions

Lesions are local, abnormal changes in the skin which can be detected by sight or touch. They are categorized into primary and secondary lesions.

Vesicle (ves'-i-kul)

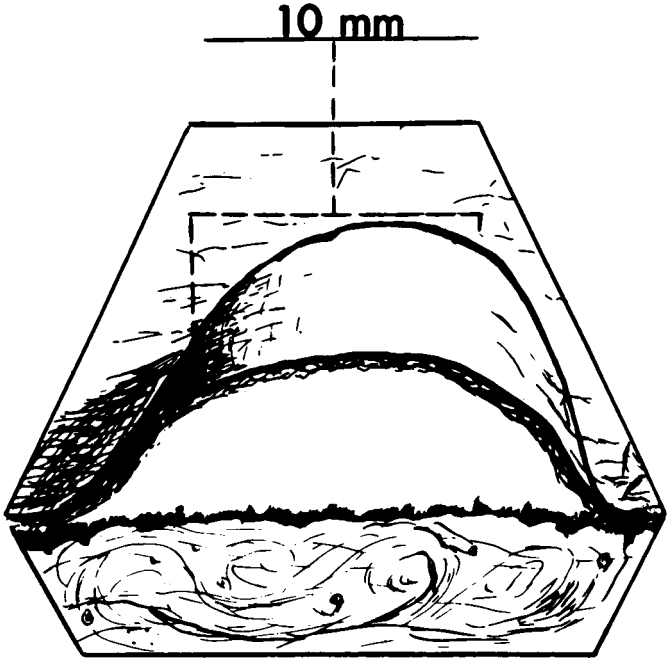
A vesicle is a small blister; a small, raised area of skin filled with a clear fluid, one-fifth inch (5 millimeters) in size or less. Fever blisters are examples of vesicles.



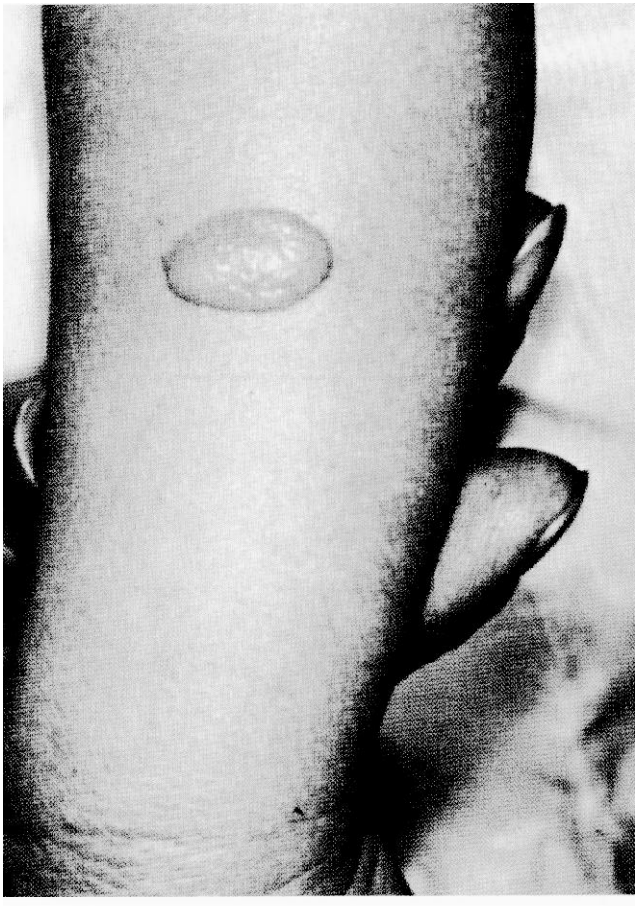
Vesicle.

Bulla (bul'-ha)

A bulls is a large blister over one-fourth inch (6 millimeters) in size. Burn blisters are examples of bullas.



Bulla.

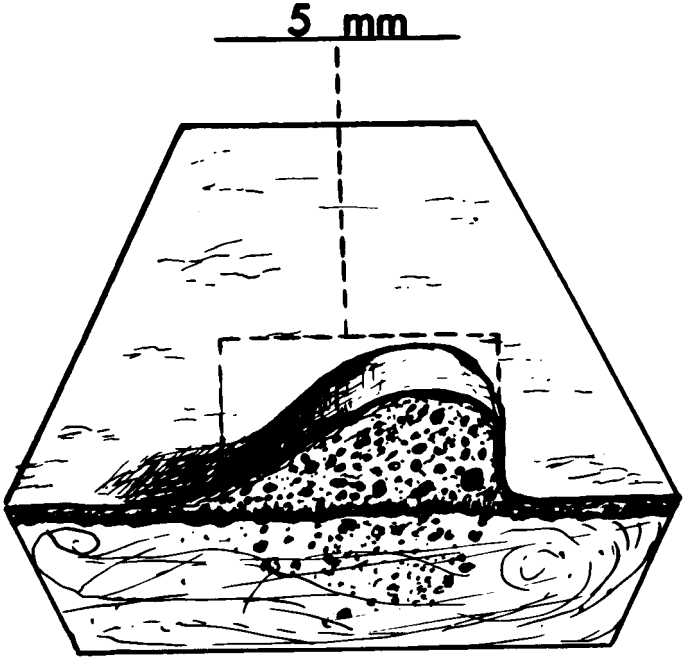


Flea Bite.

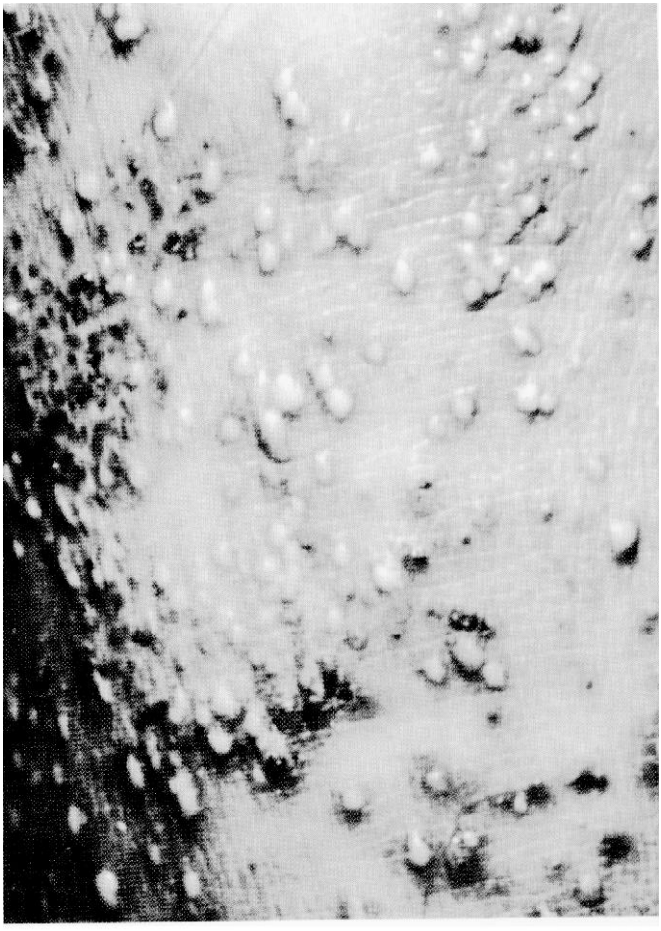
This photograph illustrates a bulla that has formed after a flea bite.

Pustule (pus'-tyule)

Pustules are small raised areas of skin filled with pus instead of clear fluid.



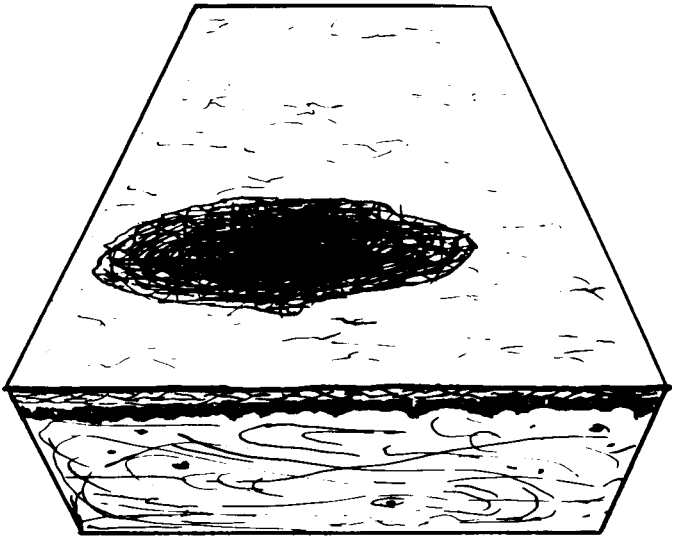
Pustule.



Pustules.

Macule (mack'-yule)

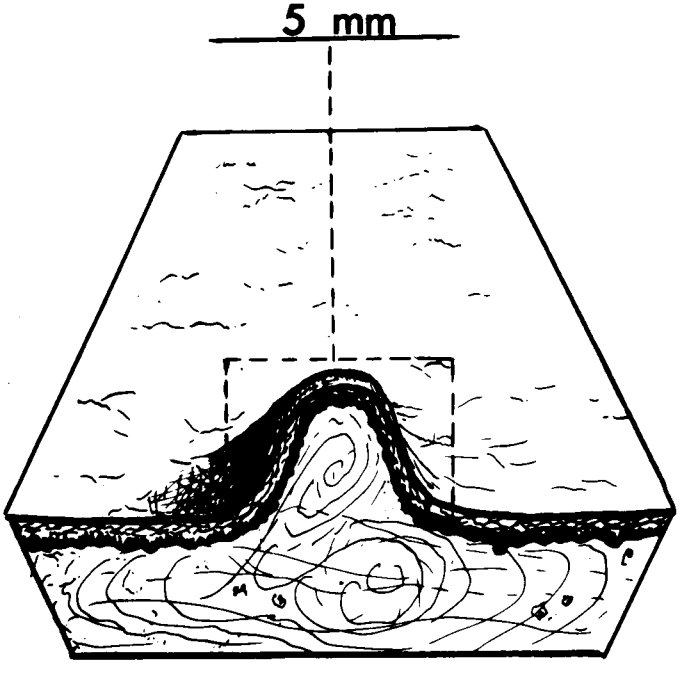
A macule is a flat spot, not above or below the skin surface; it cannot be felt (palpated). However, a change in skin color to red, blue brown, black, or white can be seen. Freckles are examples of macules.



Macule.

Papule (pap'-yule)

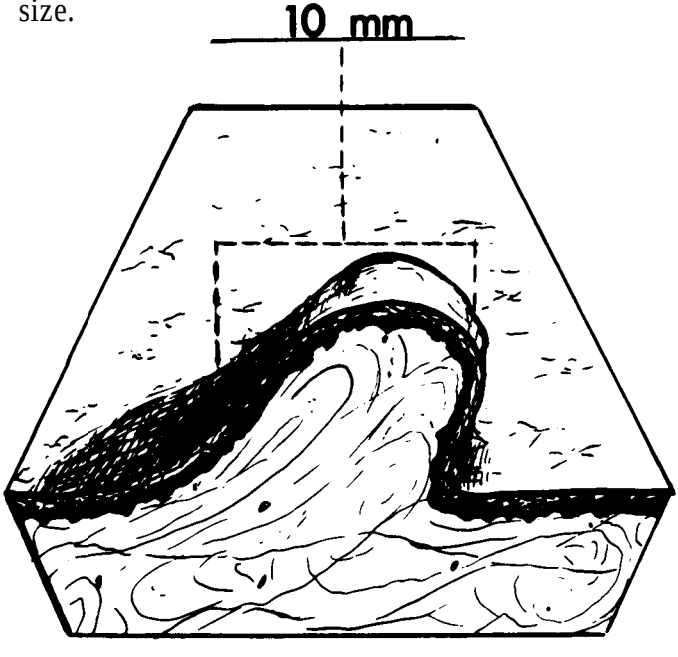
A papule is a solid elevation or lump in the skin one-fifth inch (5 millimeters) in size or less. "Bumps" or "hickeys" of acne are examples of papules.



Papule.

Nodule (nod'-yule)

A nodule is a solid elevation or lump in the skin over one-fourth inch (6 millimeters) in size.



Nodule.

SECONDARY LESIONS

A skin lesion which results from or complicates a primary skin lesion is a secondary lesion.

Erosion (e-row'-shun)

An erosion is a superficial loss of skin, (it involves only the epidermis) that occurs

without bleeding. Often, a vesicle breaks and its base becomes an erosion.

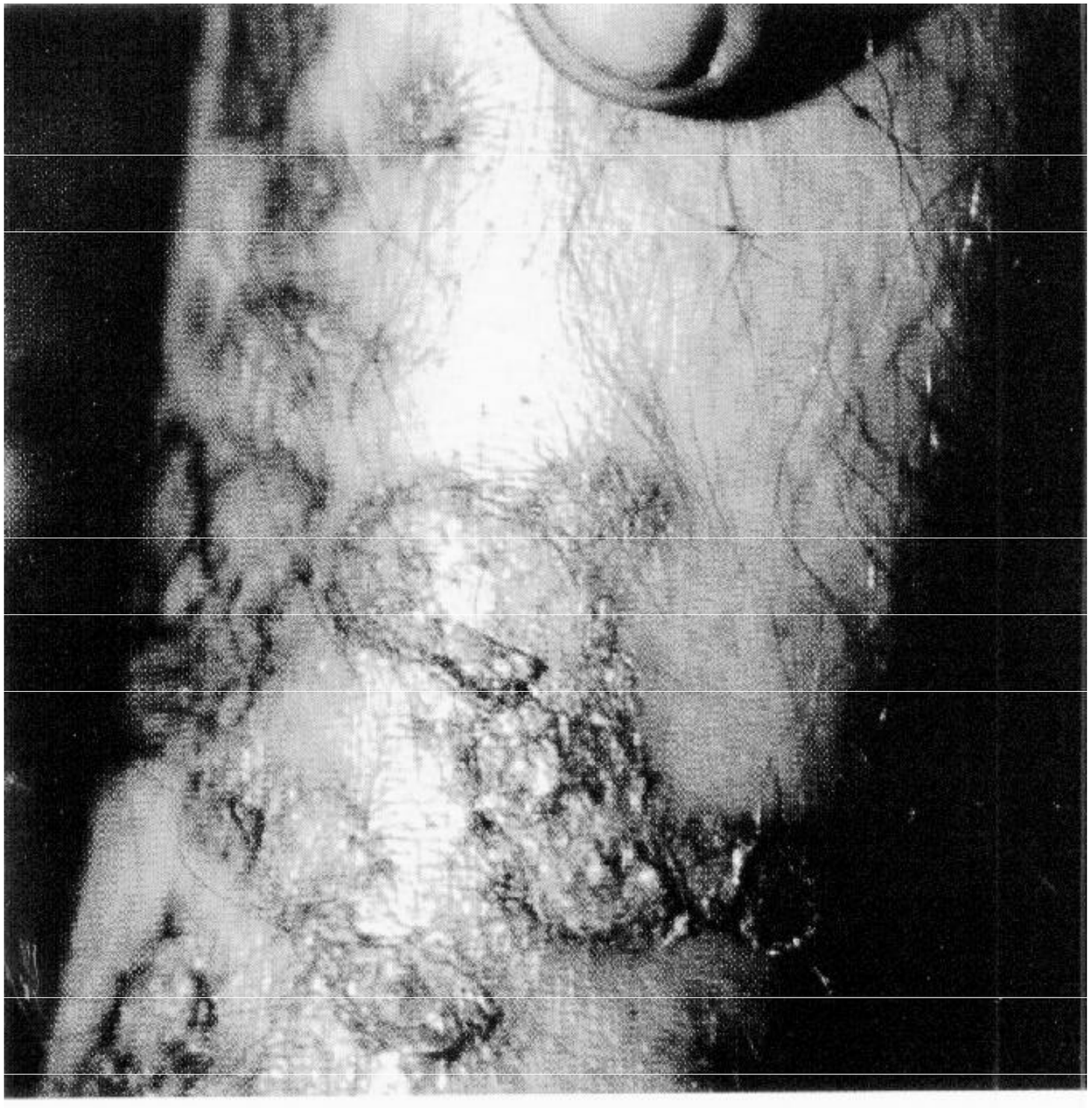
Crust

A crust is a scab and a collection of materials, including pus, blood, serum, dead cells, dirt, and bacteria all packed together in a mass. A crust forms after a blister or bulls breaks, or after a cut, scrape, or scratch becomes infected.

Click here for

Crusts on healing fungal infection.

Crusts on healing fungal infection.



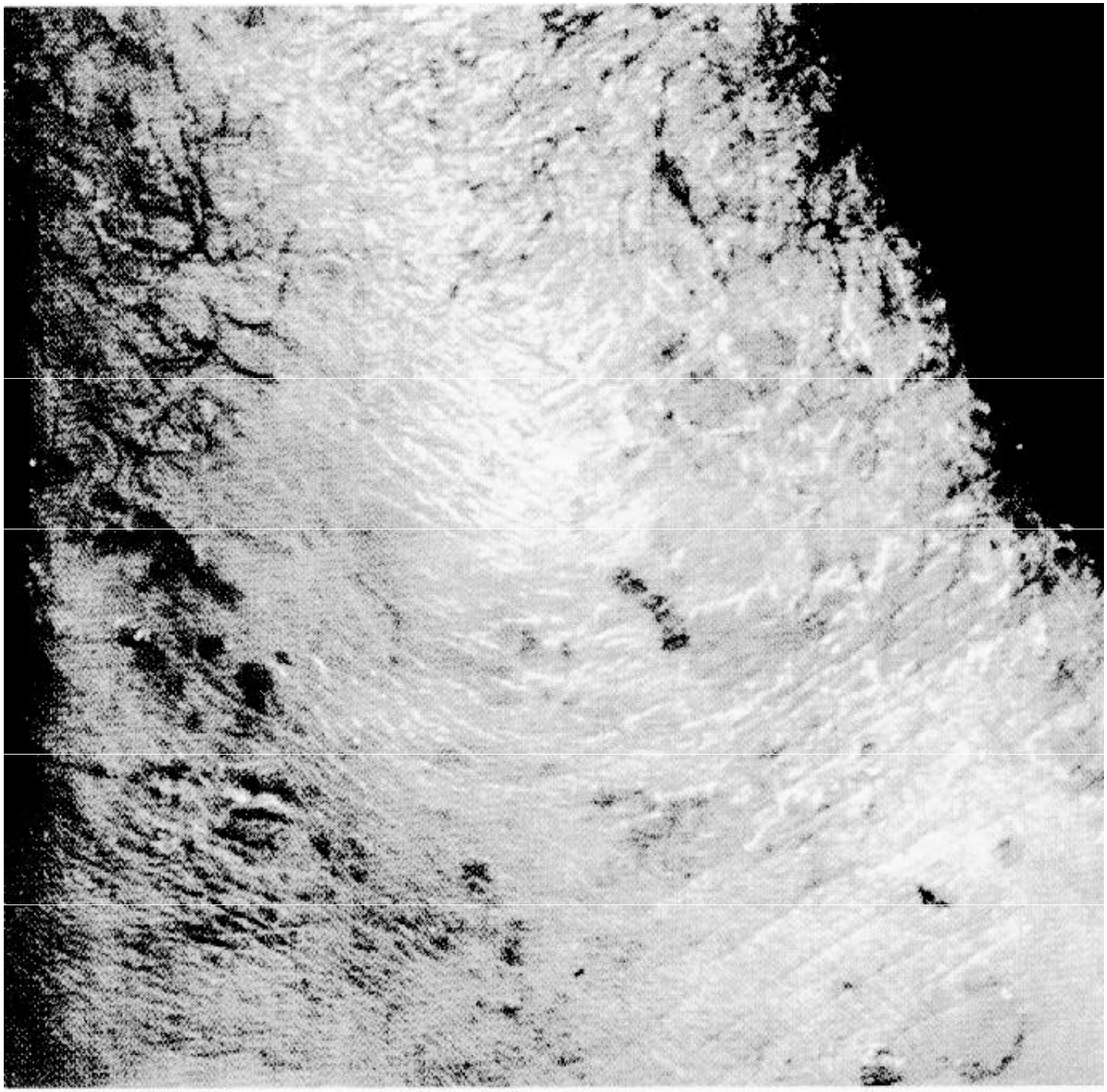
Crusts on healing fungal infection.

Scales are pieces of stratum corneum and other dry skin surface materials. Some scales are loose and flake off easily, such as is seen following a mild sunburn or in dandruff. Other scales are tightly attached and are seen in certain fungal infections and in other inflammations, particularly as the skin is healing.

Click here for

Scales on fungal infections.

Scales on fungal infections.



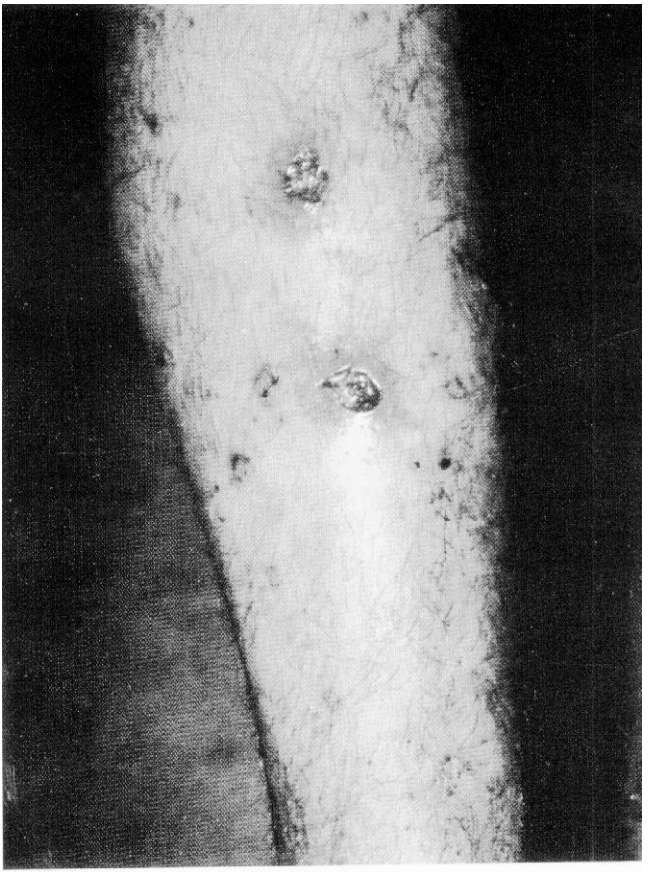
Scales on fungal infections.

Ulcer

An ulcer is a deep sore extending through the stratum corneum and epidermis into the dermis. An ulcer usually heals slowly, leaving a scar.

Click here for

Two small ulcers.



Two small ulcers.

CHAPTER 4 PREVENTING SKIN DISEASE

(NATO STANAG 2122, CENTO STANAG 2122, SEATO STANAG 2122)

The mission of the United States Army Medical Department is to conserve the Army's fighting strength. You can work toward that goal by helping the troops prevent skin diseases. Detailed instructions follow which will aid you in your efforts.

Instruct the troops to:

KEEP THE SKIN CLEAN

Explain to them

Cleanliness helps preserve the skin's health. Bathing removes dirt, decreases the number of microorganisms, and lessens body odor. For all these reasons, keeping clean is preferable to remaining dirty. In addition, showers are great for relaxation, morale, and personal comfort.

Point out to them

If bathing facilities are not handy, they can keep quite clean by washing with cold water from their helmets. Potable water is preferable for showers but if not available, nonpotable water is adequate.

Caution them

Soap and water must be used judiciously and properly. Whatever soap is used must be rinsed off completely. As to the type of soap to use, scientific evidence does not support the notion that germ killing or deodorant soaps or detergents reduce the incidence of bacterial or fungal infections.

Soldiers must not shower excessively, such as three showers a day with lots of lather. Too much soap and water removes the skin's moisteners and protective oils, causes the skin to become dry and irritated, and thereby reduces the skin's capacity to protect the body.

End by saying

Even though cleanliness helps preserve the skin's health, bathing cannot perform miracles in preventing skin disease. This is true regardless of the brand of soap used or the number of showers taken.

KEEP THE SKIN DRY

Explain that

Tropical skin diseases would be greatly reduced if another rule of skin hygiene, keeping the skin dry, could be adhered to.

Point out to them

The realities of combat and military operations often make this difficult, but there are a few rules to follow:

Remove wet socks and boots as frequently as possible.

If dry socks are not available, wring out wet ones.

Rinse mud off boots. Mud on boots prevents drying.

Pay special attention to the skin fold areas—the armpits, groin, buttocks, and areas between the toes—where several common skin diseases can erupt. Dry these areas frequently. In addition, get in the habit of using talcum powder. These two practices will promote drying, reduce friction, and prevent infections.

Do not starch jungle fatigue uniforms. Starch clogs the openings in the cloth, blocks sweat from escaping, and therefore prevents the sweat from evaporating and cooling the skin.

Air the skin as much as conditions permit.

If underwear is aggravating an existing skin condition, do not wear it.

Offer assistance to them

In base camp, encourage the wearing of as little clothing as the commander will allow. Under some conditions, commanders may permit clothing, such as shortened fatigue pants, tennis shoes, or shower clogs, at base camp and particularly in the company area. It is the commander's responsibility to prescribe the uniform, however. The medic can only recommend a uniform that is consistent with command policy.

Caution them

Keep in mind malaria discipline. It does little good to dry the skin to prevent fungal infections, and then have soldiers become casualties from malaria. Fortunately, most malaria-infected mosquitoes bite from dusk to dawn, the time period when personnel can cover their skin.

Suntan alone has no proven value in preventing skin disease, although the drying action of the sun and air can be beneficial. A blonde or redheaded person, whose skin burns easily, should not try to get a suntan for hygienic purposes. Newcomers should start with a sun exposure of 20 to 30 minutes a day and should gradually extend the time. Remember the clouds do not block the burning rays of the sun.

CHAPTER 5 GENERAL PROCEDURES: INSPECTION AND TREATMENT

(NATO STANAG 2122, CENTO STANAG 2122, SEATO STANAG 2122)

You must prevent skin disease if you can. But, if you fail to prevent it, then you must aim to limit the damage. In tropical areas, this means that you must inspect the skin frequently and as soon as you spot damage to the skin, you must treat the lesion *immediately,* thoroughly, and gently. This chapter offers you some guidelines on inspection and treatment. More specific information and procedures are found in Chapters 6, 7, 8, and 9, and in the Appendix.

Inspection

Visually inspect the skin of each member of your company after each mission. To do your inspection properly, you must be able to see the skin well. Have personnel step outside, or into a well-lighted area. In addition, have them wear only their underwear or a towel and a pair of shower shoes.

Treatment

Emphasis is placed on immediate treatment of lesions because, in the tropics, minor skin lesions can become serious and incapacitating injuries very quickly. For example, if not treated early, a small abrasion can become an ulcer and a small patch of ringworm can spread to cover half the body.

SOOTHING TREATMENTS

Unless you are reasonably sure the patient has a fungal or a bacterial infection, it is better to soothe the skin than to kill the "germs." More damage can be done by "overtreatment" than by "undertreatment." As a rule, highly inflamed, blistered, or oozing areas require gentle and calmative treatment. Application of wet soaks, removal of restrictive clothing, and administration of anti-itch tablets (Rx No. 5) soothe the affected area, prevent rubbing of clothing, and encourage the patient to stop scratching by eliminating the itching. In addition, immobilization of the affected part provides the necessary rest.

Soaks

Cool and warm wet soaks are not practical in combat situations, but are frequently used in aid stations. Cool, wet soaks are applied to

acutely inflamed, oozing, or infected skin. They relieve pain or itching, reduce inflammation, soften crusts, remove accumulated secretions, and promote drainage of pus. Warm, wet soaks, on the other hand, are used to apply heat to an abscess or to a boil. They aid in bringing the boil to a head.

The general soaking procedure is as follows:

To lessen the chance of infection, use potable water.

To relieve severe itching, put a couple of ice chunks in the water.

If infection is present, warm the water to a comfortable temperature, but not so hot that you will scald the patient.

When removing dried secretions and crusts, such as in treating infected dermatitis, add just enough surgical detergent (Rx No. 4) to make the water cloudy.

Use a compress to soak a limited area on a leg, arm, or thigh.

Employ a helmet, pan, plastic bag, or bucket to soak hands, toes, or feet.

Use a cup to soak a finger.

Under usual circumstances, continue the soaking procedure for a period of 10 to 20 minutes and repeat, two to four times a day.

When softening hard crusts, extend the initial soaking period to 45 or 60 minutes.

Specific instructions for soaking with a compress are:

Use a towel, a washcloth, or a 4-x4-inch or 4-x8-inch (l0-xl0-centimeter or 10-x20-centimeter) gauze pad as the compress.

Thoroughly wet the cloth.

Apply to the affected area.

Change every 3 to 10 minutes, or whenever the compress approaches skin temperature.

In changing, take the compress off completely, immerse it in the water or solution, wring it out, and reapply.

Be sure to completely rinse the compress each time.

Misapplication of wet soaks can result in complications. Prolonged wet soaks can damage the skin by either making it too soggy or too dry.

Check patients requiring soaks daily.

Make adjustments in the number of soaks to be done and in the time of application.

Skin damage can also occur if the soaks are covered with plastic or rubber sheeting. Such covering prevents evaporation, encourages the skin to become soggy, and reduces the effectiveness of the soak.

Do not cover soaks with plastic or rubber materials.

CREAM TREATMENTS

Using antifungal and antibacterial creams

Both antifungal and antibacterial creams (Rx Nos. 1 and 3) are applied in the same way.

Rub the cream gently and thoroughly into the infected areas until it disappears.

Rub it in *immediately* after obstructing crusts are removed.

Rub it into the areas that were infected for *2 weeks* after the skin is healed.

Explain to the patient

In treating the areas that were infected for 2 weeks after they are healed, you are preventing the return of the infection.

Use caution

If the cream is still visible, too much cream is being used. Be especially careful in the groin area and between the toes to rub the cream in until it disappears. Use the proper medicine; i.e., use the antibacterial cream for a bacterial infection and the antifungal cream for a fungal infection.

Adverse reactions

A skin lesion may not improve or may become worse; i.e., become redder, itch more, and weep or ooze, with the antibacterial or antifungal cream treatment. This situation may arise if:

The medicine is applied incorrectly; i.e., too much or too little is used, the rubbing is too vigorous, or the cream is not used often or soon enough.

The wrong medicine is used; i.e., an antibacterial medicine is used against a fungal infection, an antifungal medicine is used against a bacterial infection, or an antifungal or antibacterial medicine is used to soothe an allergic reaction or skin irritation.

The patient has an adverse reaction to the medicine; i.e., the medicine is too strong or the patient is allergic to the medicine.

Remedies

Use the following remedies to counteract any adverse reactions.

The medicine is applied incorrectly. *Review and closely follow the directions for application.*

The wrong medicine is used. *Stop the treatment; review your diagnosis; and administer the correct medicine, orget the patient to the doctor.*

The patient has an adverse reaction to the medicine. *Stop the treatment. Evacuate the patient if the reaction is severe or if improvement does not occur within 48 hours.*

CHAPTER 6 FUNGAL INFECTIONS

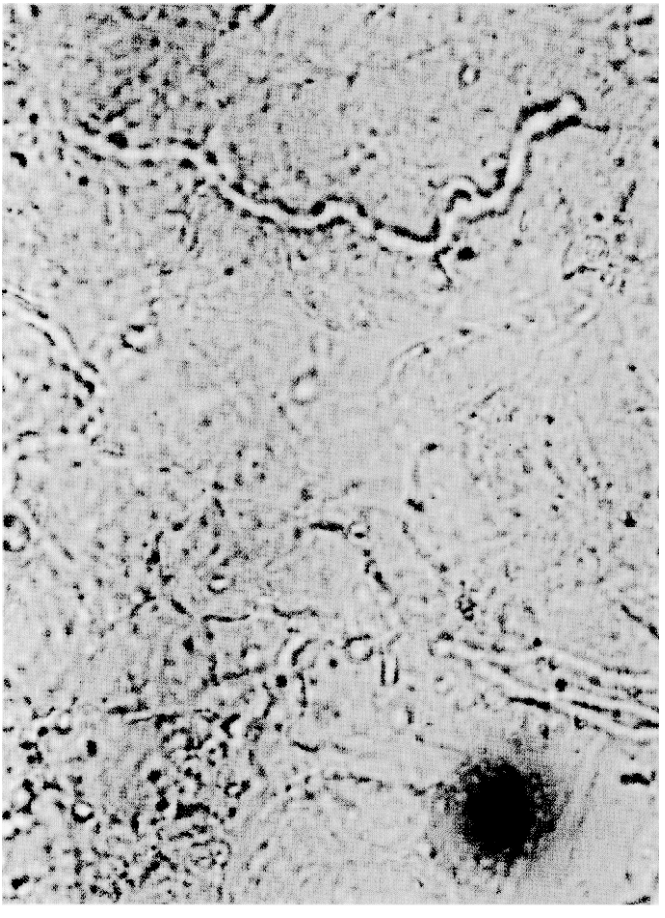
(NATO STANAG 2122, CENTO STANAG 2122, SEATO STANAG 2122)

Fungi

A fungus is a type of plant life without roots, stems, leaves, or the green pigment, chlorophyll. Mushrooms, bread molds, and leather mildews are examples of such plant life. Fungi eat dead or living organic matter. Although over 70,000 species exist in the world, only about 20 species live and produce disease on the skin.

Fungi can be seen, using a microscope, in scrapings of the dead skin taken from the edge of the infected area.

They can also be grown on a special fungal cultural media.



Fungi in skin-scraping seen under microscope (typical thread like structures).

Many terms are used in describing fungal infections:

DERMATOPHYTOSIS
(der-ma-toe-fi-toe'-sis)

Dermatophytosis means fungal infection of the skin.

TINEA PEDIS
(tin'-ee-ah pe'-diss)

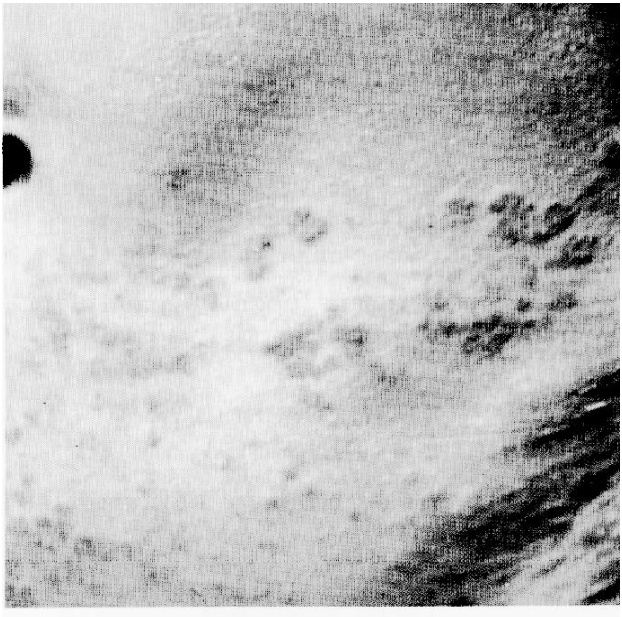
Tinea pedis means fungal infection of the skin of the feet and/or hands.

TINEA CRURIS
(tin'-ee-ah kru'-ris)

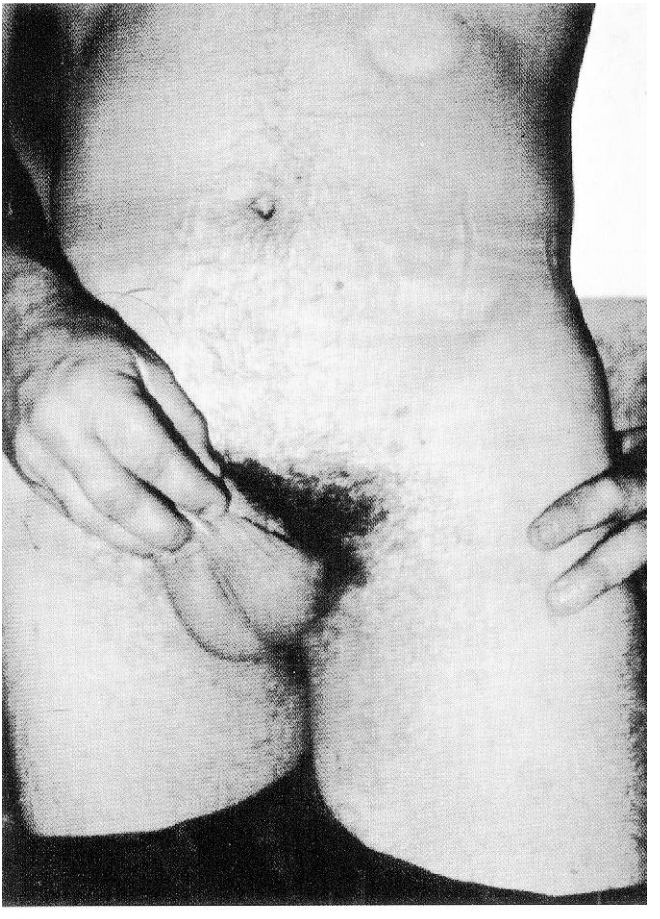
Tinea cruris means fungal infection of the skin of the groin.

TINEA CORPORIS
(tin'-ee-ah kor'-por-iss)

Tinea corporis means fungal infection of the skin of the body.



Fungal infection—Tinea Corporis (note localization in slow-drying belt area).



Extensive fungal infection—"tinea corporis" and "tinea cruris."

The fungi, that attack the human skin, eat the dead horny layer (stratum corneum). Sometimes they move outward from the center in search of more food, forming ring-shaped lesions known as “ringworm.”



Typical ringworm (many fungal infections do not take this ring-form).

Symptoms

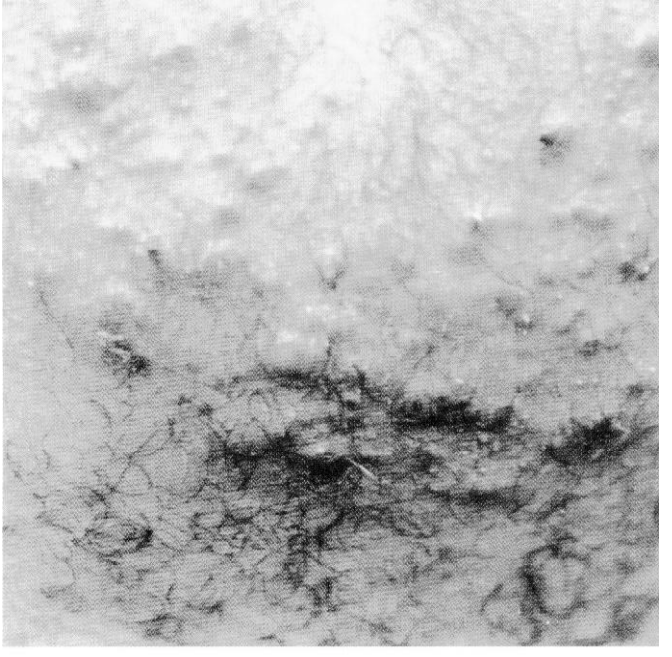
In the tropics, fungal infections on the body usually begin as small, reddish, scaling macules around the ankles, on top of the feet, on the buttocks, or in the groin. Within a few days they become papular and more scaling on the advancing edge. Tiny vesicles appear. Itching is usually mild at first but becomes worse, particularly in the groin. As the inflammation increases, the itching often awakens the patient. The center of the lesion may be less red than the edges, producing the "ringworm." The papules enlarge and often grow together producing large areas of dermatitis. The entire groin, buttocks, and legs may be involved.

With an acute and rapid onset, groups of tiny vesicles or pustules appear and the itching becomes severe.



Pustules on top of foot due to acute fungal infections.

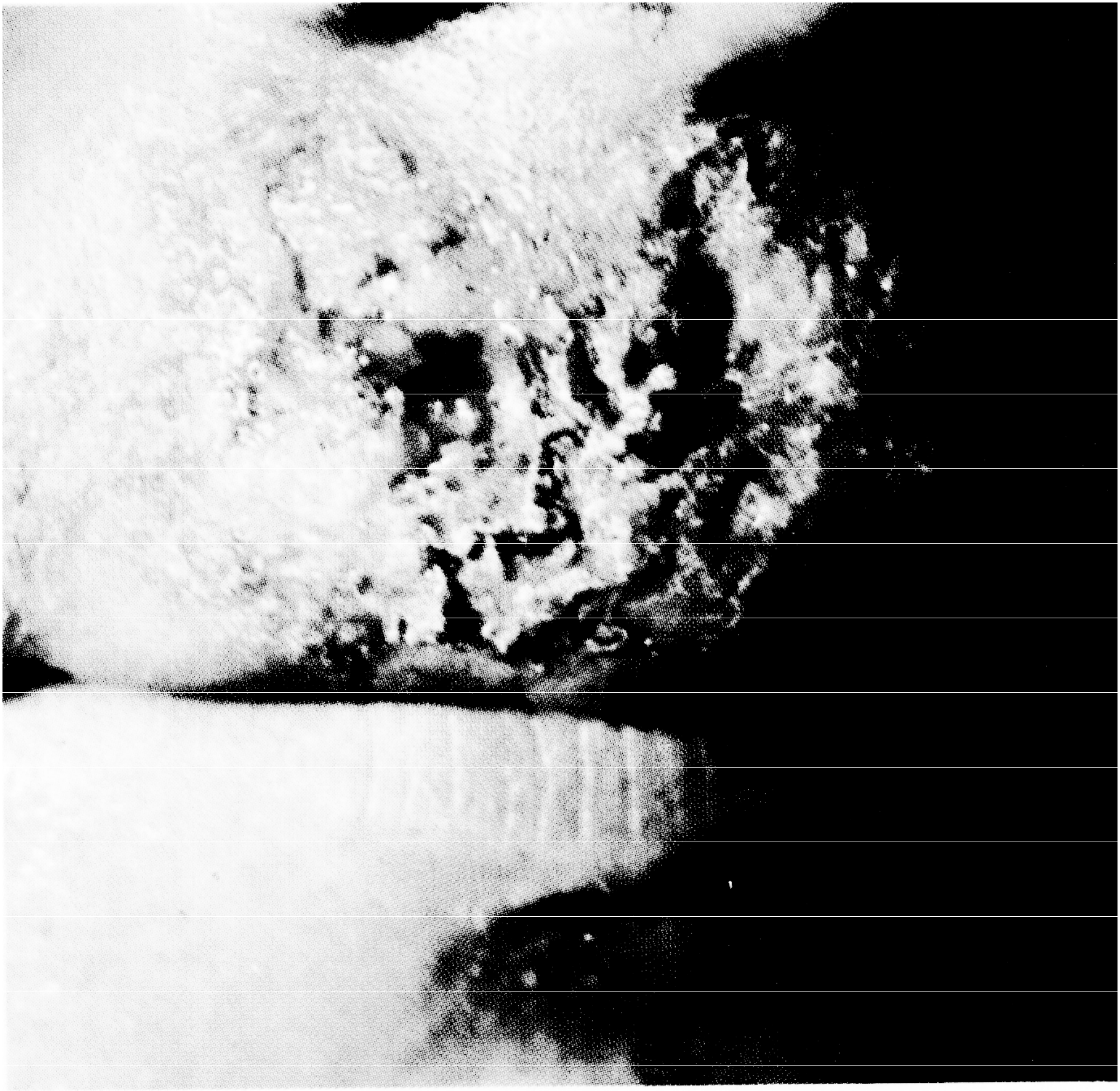
The patient scratches off the tops of the pustules; then bacteria invade and cause a secondary infection. Crusts and cellulitis may result. On hairy areas, the fungi may grow into the hair follicles creating pustules, small boils, or inflamed follicles.



Fungal infection of hair follicles
of hairy lower abdomen.

Click here for

Severe, deep fngal infection of hair follicles on upper lip

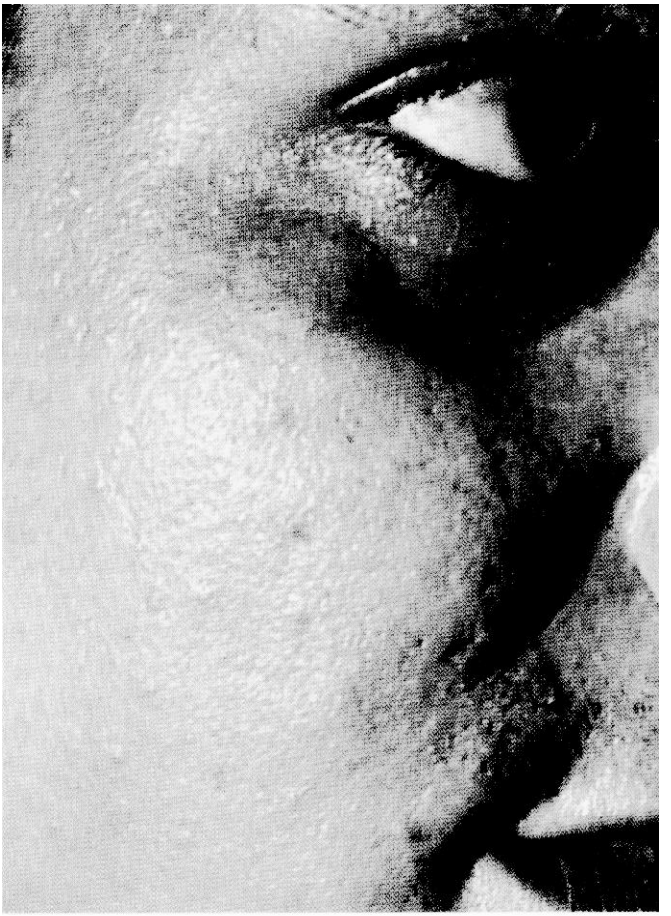


Severe, deep fungal infection of hair follicles on upper lip.

An extensive or very inflamed fungal infection may incapacitate and make the patient quite miserable for several weeks. General health will be unharmed and full recovery can be expected.

Diagnosis

In tropical areas, looking at skin lesions will not give any clue concerning which fungus is causing the infection. But, locating typical fungal lesions on the patient's buttocks, ankles, or groin is often helpful in diagnosing a puzzling patch of scales or vesicles on the face.



Two patches of fungal infection of face

Treatment of Fungal Skin Infections

TOPICAL TREATMENT

Use antifungal cream. This cream is also *antipruritic (an-te pru-rit'-ik)* and anti-inflammatory.

Explain to the patient

Rub in antifungal cream.

Rub it in two or three times a day or whenever itching occurs.

Itching will be greatly reduced in 3 days; in the groin, it may take 4 days. The redness will fade in 3 days; in the groin it may take 5 days. The infected skin will look well, except for some brownish or dark spots, in 10 to 14 days. If the infected skin is quite scaly, there may be some harmless, yellow staining of the skin.

Some Fungi That Produce Disease

Three common fungi produce skin infections.

TRICHOPHYTON MENTAGROPHYTES (tri-kof'-i-ton men-tag-grof-fi'-tees)

Trichophyton mentagrophytes usually produces a form of "athlete's foot" with patches of blisters on the toes, soles, or top of the feet. In wet tropical climates, it may cover the top of the foot, the ankle and the lower half of the leg, the groin, the buttocks, the face, the arms, and other areas.

Click here for

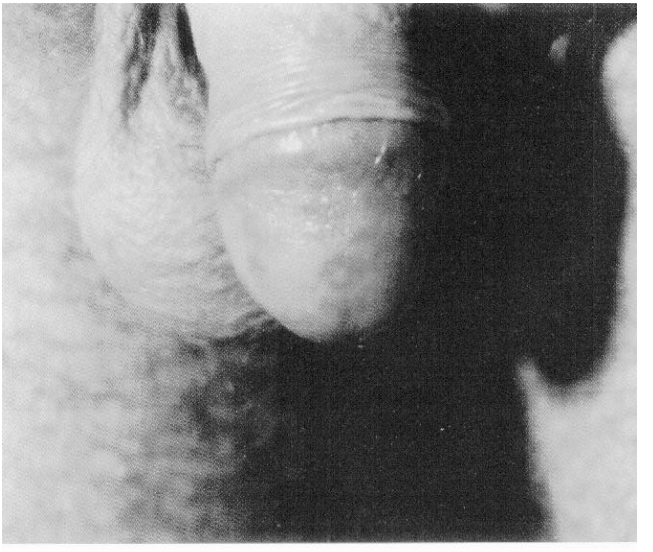
Typical fungal infection



Typical fungal infection.



Fungal infection of area covered by tops of boots (common in the tropics when wet boots must be worn for several days).



Fungal infection of head of penis by trichophyton mentagrophytes seen in the wet tropics but not in the United States. (Infections of head of penis are usually caused by candida albicans).

TRICHOPHYTON RUBRUM
(tri-kof'-i-ton ru'-brum)

Trichophyton rubrum is the most common cause of "athlete's foot" in the United States, causing dull-red scaling of the soles and occasionally, cracks between the toes.



Dull-red, scaling—typical of trichophyton rubrum infections.



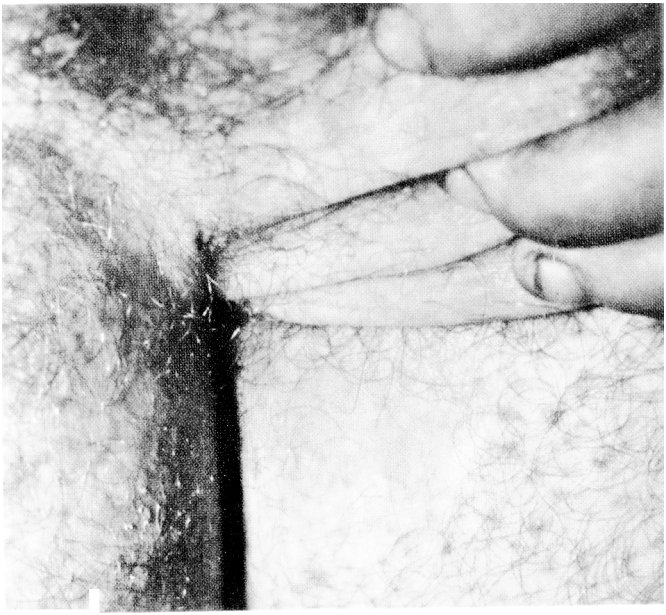
Typical extensive trichophyton rubrum infection.

CANDIDA ALBICANS
(can'-di-dah al'-bi-cans)

Candida albicans is a yeast that produces an inflamed patch with tiny pustules around the edges.

It infects any moist, warm area where skin rubs against skin such as the groin, the armpits (axillae), and the penis, under the foreskin (prepuce).

These infections by candida albicans are called *"candidiasis" (can-di-dei'-a-s* is) or *"moniliasis" (men i-lie'-a-sis).*



Typical candida albicans infection (note outlying, scattered, tiny pustules).

CHAPTER 7 BACTERIAL INFECTIONS

(NATO STANAG 2122, CENTO STANAG 2122, SEATO STANAG 2122)

Bacteria

Bacteria are microscopic, single-celled forms of plant life, containing no chlorophyll. They live on the skin, on the surface of the stratum corneum, and in the hair follicles of the skin.

Most bacteria are harmless to humans. Some are even necessary to life, such as those in the intestines that make Vitamins K and B_{12}. Others, however, cause disease and are *pathogenic (path-o-gen'-ik).*

Bacteria favor an environment of heat and moisture in which to develop and multiply. Weather and skin conditions alike affect their activity. For example, bacterial skin infections are very common in hot, humid climates to include the tropics, and parts of the United States. Likewise, bacterial growth is helped by the moisture from a cut or scratch.

It is not possible by any safe method to kill all skin bacteria. Soap and water washing removes many of them and is worthwhile, if not done so often or so roughly that it damages the skin barrier. Pure alcohol kills some bacteria, but a mixture of 70 percent alcohol and 30 percent water is most effective.

Some Bacteria That Produce Disease

Two bacteria cause the greatest number of infections.

STAPHYLOCOCCUS AUREUS
(staff-e-low-kok'-us oar'-ee-us)

Staphylococcus aureus is commonly called *"staph."*

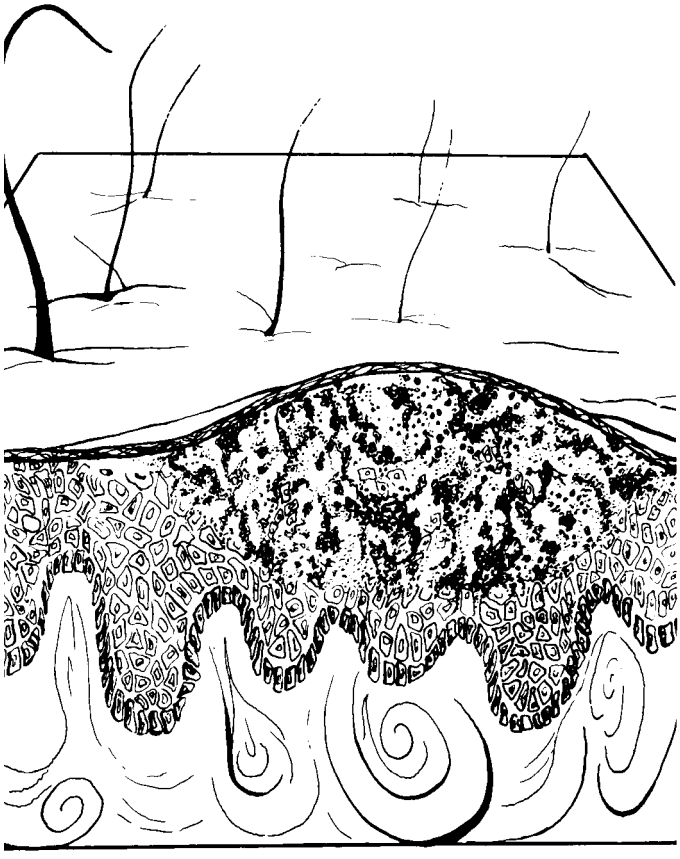
BETA HEMOLYTIC STREPTOCOCCUS
(bay'-ta he-mo-lit'-ik strep-toe-kok'-kus)

Beta hemolytic streptococcus is commonly called *"strep."*

Types of Bacterial Skin Infections

IMPETIGO (im-pe-tie'-go)

Impetigo is a bacterial infection caused by staph or strep, or by a combination of both.



Impetigo.

Impetigo is limited to the stratum corneum and epidermis. Therefore, it heals without scarring. It may leave a reddish or brownish mark which disappears in several weeks.

It begins suddenly, (within a few hours) on the face, neck, arms, or legs. There may be one or dozens of lesions which itch and burn a little, and are mildly tender to the touch. The lesions may be vesicles, pustules, bullas (up to 3 inches (8 centimeters) in size), raw glistening spots, or cracks in the skin. Initially, the skin surrounding the lesion looks normal, but within a day or so, a red ring develops. In addition, a soft, soggy, yellow or honey-colored crust forms.

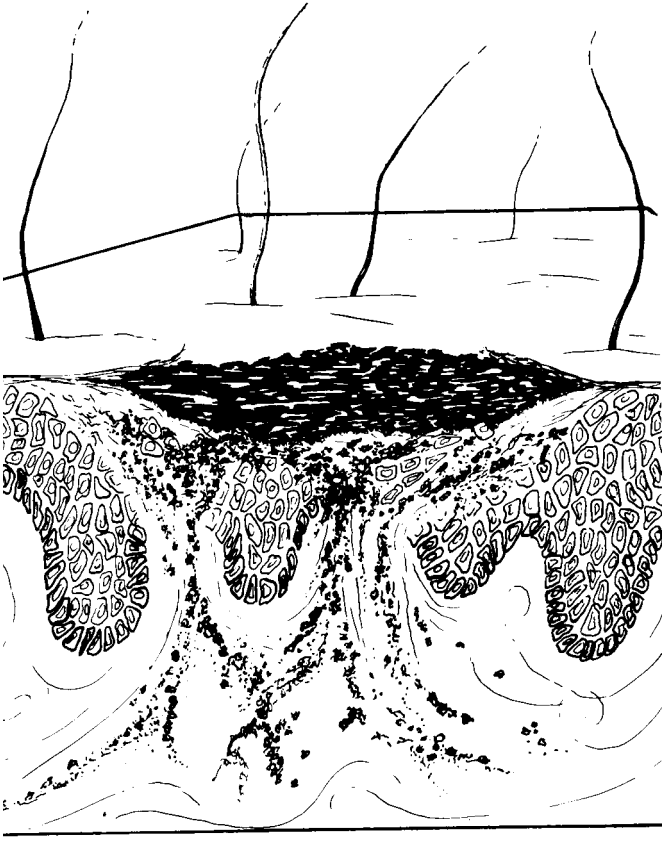
Often, impetigo begins without any preceding skin infection. Sometimes, however, there may be an infected fever blister, hangnail, insect bite, cut, or burn, present at the same site or elsewhere on the body, which serves as the source of infection.



Impetigo (lesions on finger and face).

ECTHYMA (ek-thi'-ma)

Ecthymas are infections characterized by a hard, difficult to remove, brown or black crust.



Ecthyma.



Ecthyma following insect bite and scratch.

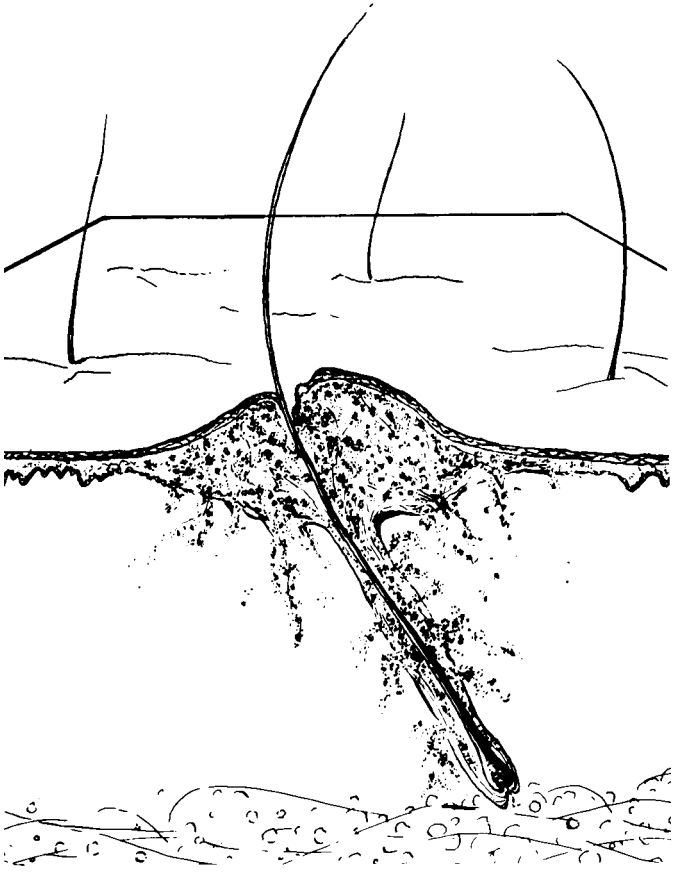
An ecthyma is painful if it is squeezed, or if pressure is applied. In addition, bleeding from the raw base and pain from the remaining ulcer may result, if the crust is removed. This type of infection invades the dermis and therefore heals with a scar.



Bloody, crusted ecthyma

FOLLICULITIS (fo-lik-u-lie'-tis)

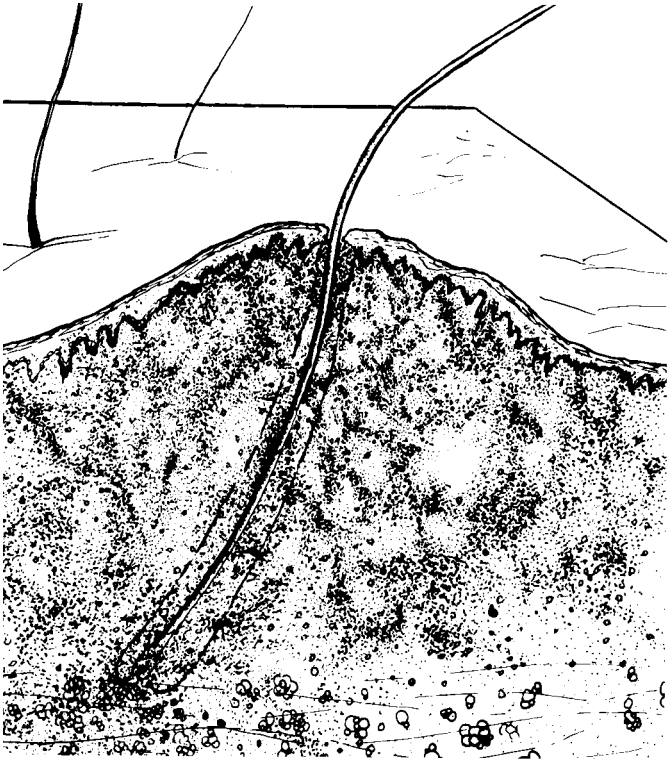
Folliculitis is limited to the hair follicle. The follicle is small and slightly tender and contains pus. Although usually due to bacteria, folliculitis can be caused by fungi and chemicals.



Folliculitis.

FURUNCLE (f'ur'-ung-kl)

A furuncle or boil is an infection of the hair follicle and tissue around it.



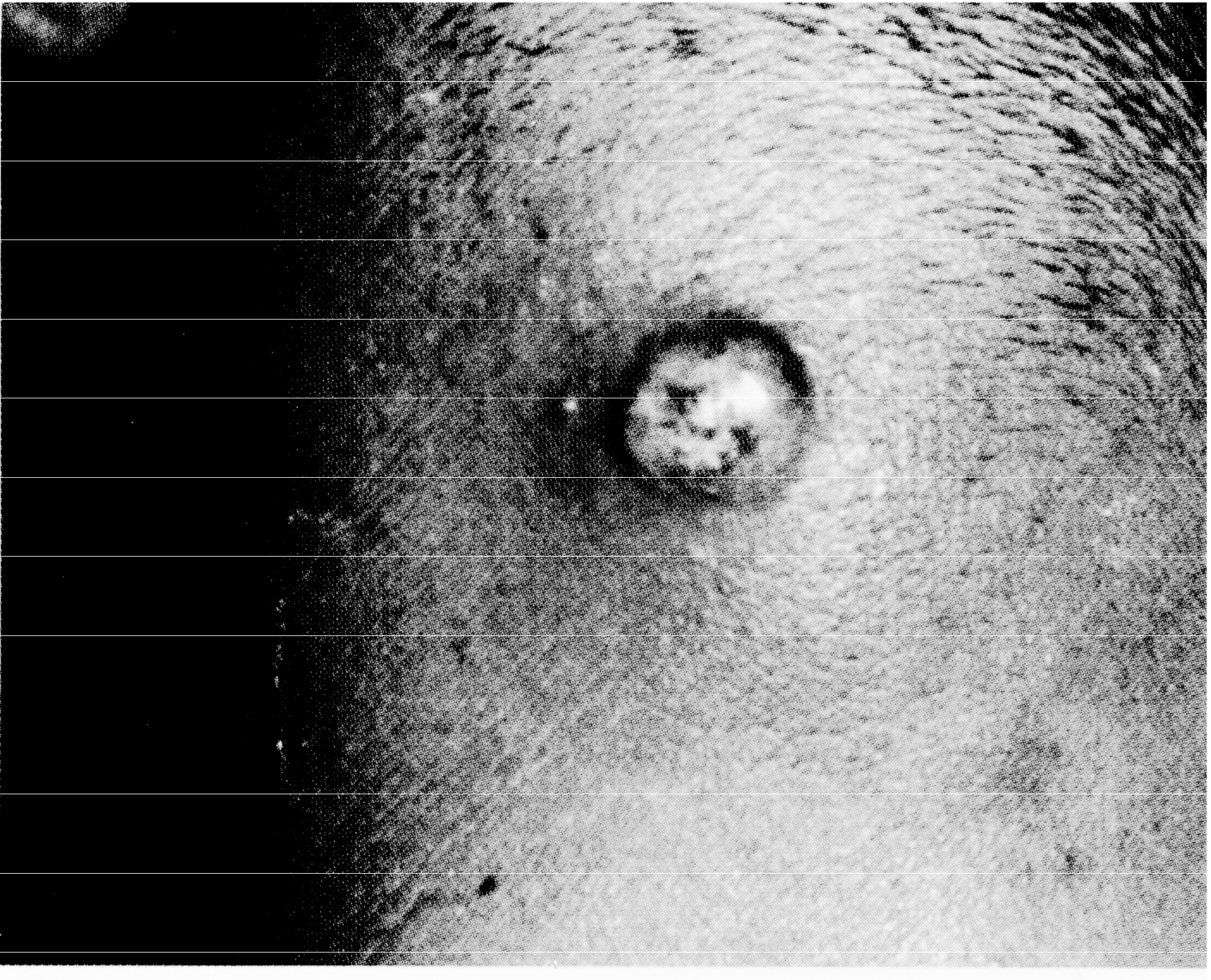
Furuncle.

It is characterized by redness and pain. At first, a red, tender lump appears, but in a few days a yellow “head” develops.

Click here for

Ripe furuncle (boil) on neck.

When a furuncle opens, pus, blood, and a plug of dead tissue (core) come out. If the furuncle is small, it heals with no visible scar.



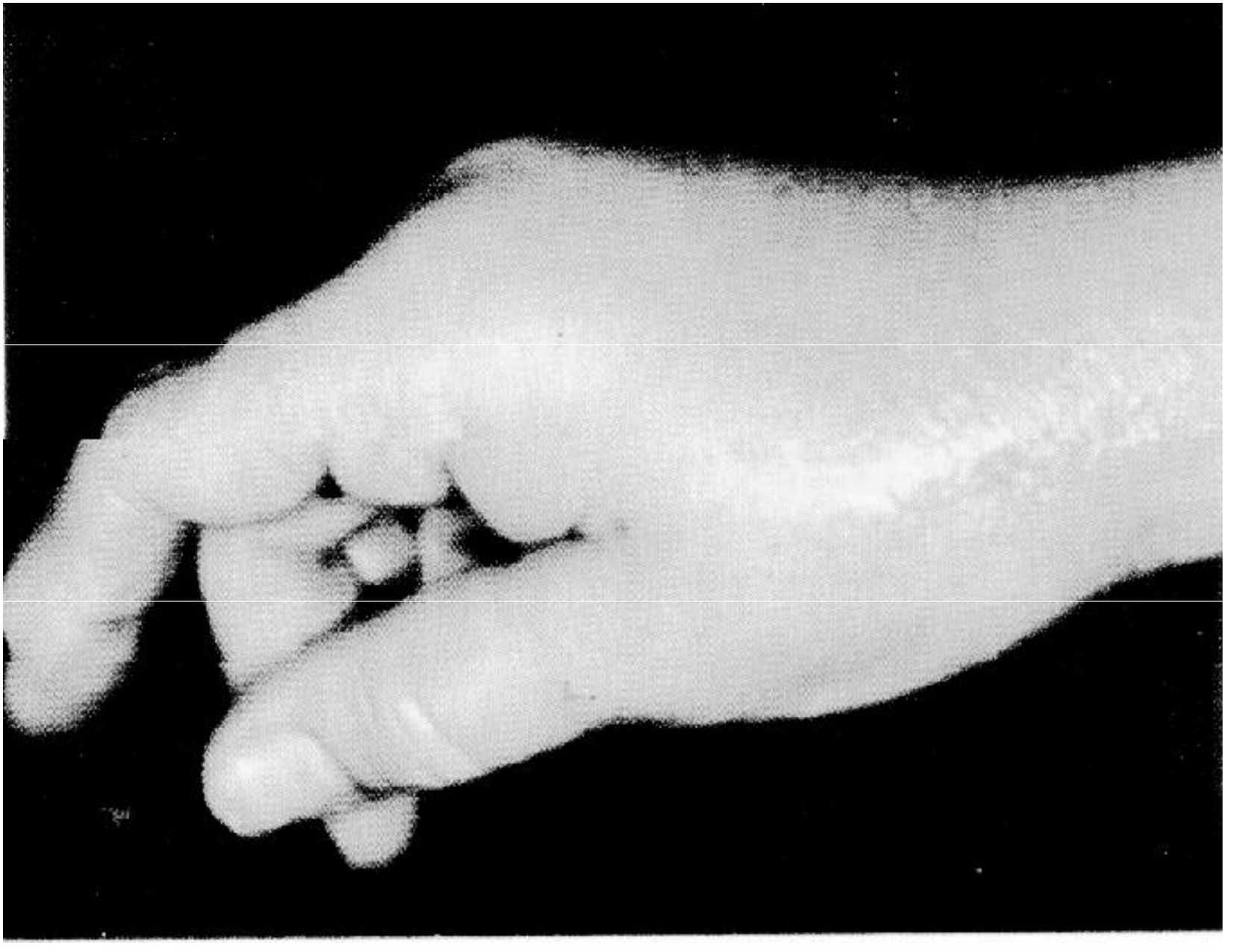
Ripe furuncle (boil) on neck.

CELLULITIS
(when used to describe a skin infection)

Cellulitis is a diffuse, inflammatory infection involving all layers of the skin. It can form around ecthymas or furuncles, be seen with fungal infections, or occur by itself.

Click here for

Cellutis following insect bite.



Cellulitis following insect bite.

Click here for

Cellulitis (note swelling of one foot and ankle)



Cellulitis (note swelling of one foot and ankle).

SECONDARY BACTERIAL INFECTIONS OF THE SKIN

A secondary bacterial infection of the skin occurs when a preceding skin lesion has become infected with bacteria. The skin lesion may be a cut, scratch, bite, burn, abrasion, wound, cold sore (fever blister), or a generalized dermatitis. Many types of bacteria cause the infection, the most common being staphylococci and streptococci. Some skin lesions readily become secondarily infected, others seldom do.

LYMPHANGITIS (lymph-an-gi'-tis)

Lymphangitis is an infection caused by streptococci. It is identified by the red streaks under the skin of a leg or arm which travel along the lymph vessel pathways from an ecthyma, a cellulitis, or another type of infected skin lesion.

Symptoms of lymphangitis include fever, chills, swelling, and tenderness of the regional lymph glands (nodes) that drain the affected extremity.



Lymphangitis (note red streaks going up foot and ankle).

TOPICAL TREATMENT

The crusts of impetigo and ecthymas prevent healing and insure the spread of the infection. They protect the bacteria which multiply underneath. Chemicals released by the bacteria kill more of the dermis thus giving the bacteria more food. Pus accumulates and the infection spreads. In addition, the crusts act like a wall to keep the edges of the wound apart. They also prevent externally applied antibacterial medicine from destroying the bacteria. Therefore, topical treatment of impetigo, ecthymas, and ulcers mandates that you *take the crust off and keep it off. Then, rub in antibacterial cream (Rx No. 3), gently but thoroughly*.

Because impetigo crusts will initially reform in 2 to 4 hours, topically treat impetigo the first day, five or six times. You can then treat it the second day, four times and the third day two or three times. It is usually healing by the fourth day. An ecthyma crust, on the other hand, usually reforms in 6 to 8 to 12 hours. Topically treat ecthymas two to three times daily. They usually heal within 8 to 14 days.

Remove the crust

When removing an impetigo crust:

Cleanse the lesion with water and soap or surgical detergent.

Do not be concerned if there is some bleeding when the crust comes off.

When removing an ecthyma crust:

Soak the area in water and soap or surgical detergent for 10 to 20 minutes.

If the crust fails to come off, use a number 15 to 20 disposable knife blade around the edge, between the crust and the skin. *Do not cut the crust off, but rather pry and scrape it off.*

Make sure the crust comes off all the way even though the patient may complain of pain and the ecthyma bleeds.

Prevent the spread of infection

Staphylococcal and streptococcal infections can be transferred from an initial lesion to other parts of the body.

Have patients wash their hands and clean under their fingernails with soap and water several times a day, especially after each treatment.

TREATMENT BY THE BATTALION SURGEON

Whenever you observe

more than three lesions of impetigo,

more than two ecthymas,

several lesions of folliculitis that are painful,

any cellulitis,

any lymphangitis,

Make Sure the patient is seen quickly by the **Battalion Surgeon.** A systemic antibiotic, such as penicillin, tetracycline, or erythromycin, may be prescribed.

CHAPTER 8 WARM WATER IMMERSION SKIN DISEASES

(NATO STANAG 2122, CENTO STANAG 2122, SEATO STANAG 2122)

The swelling, wrinkling, and whiteness of the skin of the hands when they have been immersed in water for a half-hour or so is familiar to everyone. These effects are similar to the visible damage that most people will incur if the stratum corneum stays wet for 48 to 72 hours.

Types of Warm Water Immersion Skin Diseases

This prolonged wetness of the skin causes three types of disabling skin conditions.

TYPE 1 - "WARM WATER IMMERSION FOOT"

Warm water immersion foot usually occurs when the exposure to water is intermittent as happens when soldiers have to cross numerous creeks, streams, and canals with dry ground between. It is a type of dermatitis that is confined to the soles of the feet.



Type 1 immersion foot

Symptoms

After about three days of intermittent exposure, the thick stratum corneum of the soles of the feet becomes white and wrinkled and some of the creases in the soles grow quite tender on walking. In the following 24 to 48 hours, severe pain develops with walking and the feet swell slightly. The soldier may describe a sensation of walking on pieces of rope in the boot. When the boot is removed, it may be impossible to put it back on because of the pain and swelling.

Treatment

Drying the skin and keeping it dry is the only treatment for Type 1 warm water immersion foot. This is best accomplished by bedrest, without boots or socks. Within 24 hours, after treatment is begun, the wrinkling, whiteness, and sogginess disappear. The pain leaves, but the soles remain tender. In 3 to 6 days, the tenderness diminishes, and the thick stratum corneum begins to peel.

TYPE 2- "WARM WATER IMMERSION FOOT" or "PADDY FOOT"

Type 2 "warm water immersion foot" or "paddy foot" is common when soldiers continuously stand or wade through creeks, streams, and canals. Proper drying of the skin is prevented because the exposure is almost constant. This type of dermatitis involves the tops of the feet, the ankles, and the legs to the tops of the boots and socks.

Symptoms

"Paddy foot" begins to affect soldiers in 48 to 60 hours. The skin turns red, a cellulitis appears, and a great deal of swelling develops.

Pressure over the top of the foot and the instep produces pain. There may be many tiny vesicles and bruises scattered over the skin and superficial raw spots or erosions, from one-eighth to one-half inch (3 to 13 millimeters) in diameter, may appear.

The swelling does not dent (pit) on pressure and the area is hard to the touch.

Click here for

Type 2 immersion foot (swelling does not pit).



Type 2 immersion foot (swelling does not pit).



Type 2 immersion foot (note redness and cellulitis).



Two cases of Type 2 immersion foot (note tiny vesicles, bruises, and erosions).

The vesicles, bruises, and erosions may be present singly or in combination.

Click here for

Type 2 immersion foot with tiny bruises and erosions.



Type 2 immersion foot with tiny bruises and erosions.

Rubbing of the boot against the soggy skin may cause large deep raw spots or abrasions to appear.

Click here for

Type 2 immersion foot (note large abrasions from rubbing of boot and foreign material).



Type 2 immersion foot (note large abrasions from rubbing of boot and foreign material).

Occasionally, the abrasions and erosions become infected with bacteria or fungi. The soles are usually free of disease and are not painful, but they may be white and mildly wrinkled. About half of the soldiers develop tender, swollen lymph nodes in the groin *(femoral lymphadenopathy–fem'-or-al lim-fad-e-nop'-ah-the);* others have a temperature of 100° to 102° F (37.7°to 38.8°C) norally. Some soldiers never develop this type of warm water immersion foot.

Treatment

Treatment procedure dictates drying of the skin and bedrest with head flat and feet elevated. Patients should not sit on the bed or chairs even with their feet up. They may, however, be permitted to go to the latrine and dining facilities. Within 6 hours, after treatment is started, the edema is soft and pitting (it dents upon finger pressure). The pain, edema, vesicles, lymph node swelling, and fever subside within 48 to 72 hours. The skin then begins to scale off, and does so for the next week.

Prevention

Having the skin of the feet and legs dry for 10 hours at night will prevent "paddy foot" in nine out of 10 soldiers. Limiting a combat operation in a wet, muddy area to 48 hours, followed by a drying-out period of 24 hours, also will reduce the number of "paddy foot" immersion casualties to a low level.

TYPE 3

Type 3 occurs when soldiers have to wade through water to their waists and very often to their necks. Their clothing may stay wet for hours or days.

Symptoms

The skin of the groin and the inner thighs shows damage from prolonged wetness and rubbing of the skin by the trousers. It becomes very red and painful.

Treatment

The treatment permits the skin to dry.

Prevention

Prevention entails allowing the skin to dry before the dermatitis begins.

(NATO STANAG 2122, CENTO STANAG 2122, SEATO STANAG 2122)

Blister Beetle Burns

Throughout the world, various insects (beetles, caterpillars, and moths) and plants (salt or fresh water and land plants) manufacture an irritating chemical that produces a bulls or vesicle if it comes in contact with human skin. One of these offenders is the blister beetle.

Often, several soldiers are attacked the same night. Some persons have suffered blister beetle burns while sleeping in small Navy boats which were anchored overnight to a river bank.

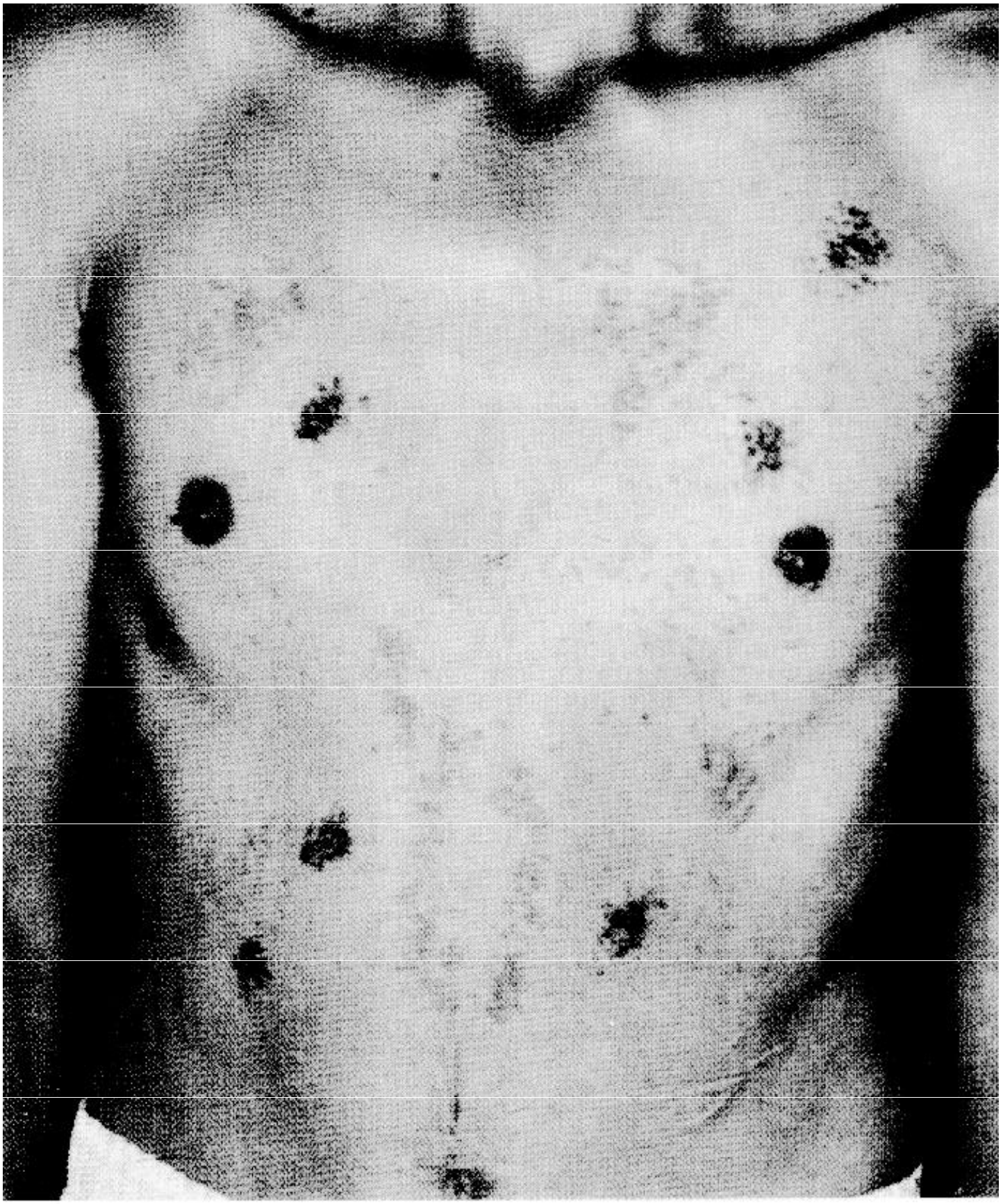
DIAGNOSIS

Part of the information needed for diagnosis is found in the patient's story of the lesion's formation. The following story is typical: "Yesterday, I rubbed mosquito repellent on my face and arms. Then, I went to sleep on the ground. When I awoke this

morning, I noticed this big, swollen, red spot on my arm, here by my elbow. By lunch time, the spot had turned into a big blister. That so-and-so repellent burned me!"

Click here for

Multiple blister beetle burns (used by courtesy of F. Kerdel-Vegas, Venezuela).

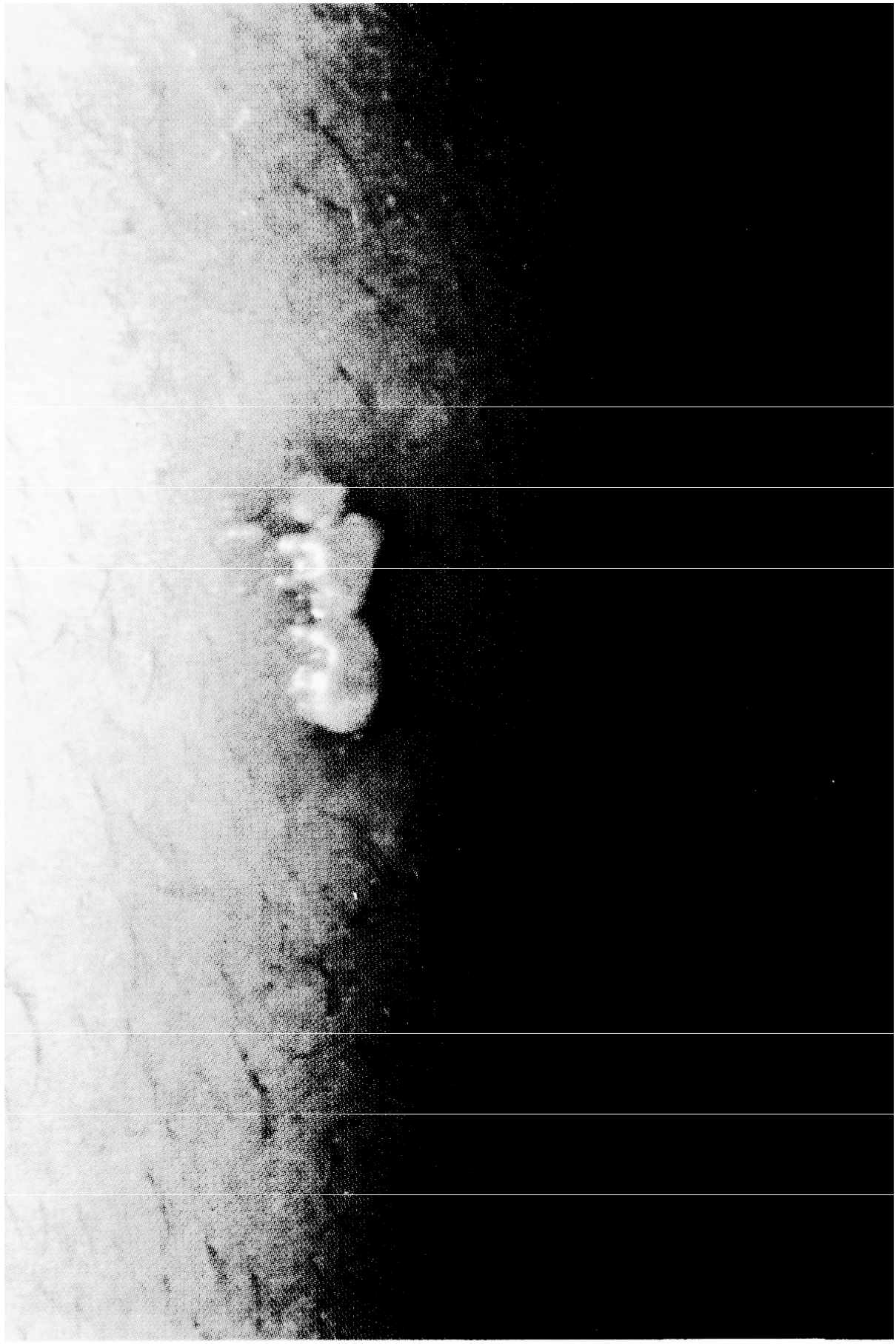


Multiple blister beetle burns (used by courtesy of F. Kerdel-Vegas, Venezuela).

The lesion resembles a large burn blister; i.e., a large bulls, filled with clear fluid. It covers the inflamed area.

Click here for

Early blister beetle burn (used by courtesy of F. Kerdel-Vegas, Venezuela).



Early blister beetle burn (used by courtesy of F. Kerdel-Vegas, Venezuela).



Early blister beetle burn—Vietnam

A streak is located on one side, presumably where the beetle's chemical irritant dripped on the skin.

Click here for

Early blister beetle burn in bend of elbow "kissing" lesions (note kissing lesions and streak) used by courtesy of F. Kerdel-Vegas, Venezuela.

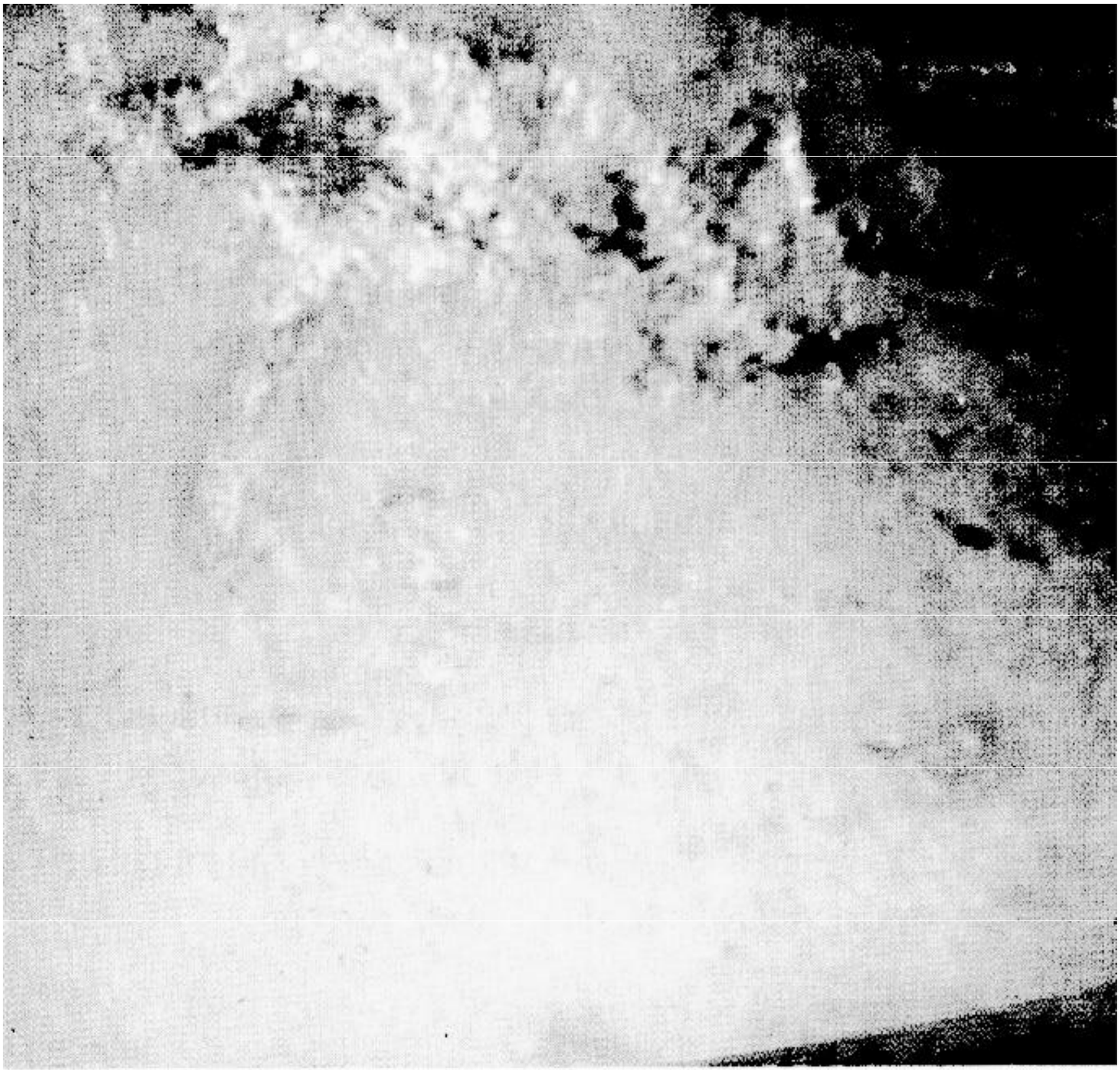


Early blister beetle burn in bend of elbow "kissing" lesions (note kissing lesions and streak) used by courtesy of F. Kerdel-Vegas, Venezuela.

Usually, the fluid blisters the skin through to the dermis; hence a third degree “burn” results. The lesion heals slowly, probably taking several weeks.

Click here for

4-day old blister beetle burn of waist--Vietnam (note the deep damage and streak).



4-day old blister beetle burn of waist--Vietnam (note the deep damage and streak).

TREATMENT

To treat the blister beetle burn:

Drain the blister, using sterile technique.

Apply the antibacterial cream (Rx No. 3).

If the bulls has broken, remove the top and have the patient apply the antibacterial cream, two to four times a day.

Minor Skin Injuries

TREATMENT

Treat minor skin injuries such as abrasions, cuts, and scratches in the following way:

Cleanse the wound with soap or surgical detergent (Rx No. 4) and water.

Remove any crusts.

Apply antibacterial cream (Rx No. 3).

Rx No. 1 Antifungal Cream

NATIONAL STOCK NO.	NAME
6506-00-680-2407	Hydrocortisone Powder 1/4-1.0%
6505-00-153-8536	Iodochlorhydroxyquin Powder 3.0%
6505-00-114-3010	Coal Tar Solution 2.0%
6505-00-131-6420	Ointment Base, Water Soluble 100.0%

This cream is mixed by the division pharmacist arid is dispensed in tubes or 1-pound (.45-kilogram) jars. It can be obtained from the Division Medical Supply Office. It is antifungal, antibacterial, antipruritic, and anti-inflammatory. If in treating fungal infections, the cream is not available or not tolerated, you may use—

6505-00-926-2241	Tolnaftate Solution (Tinactin) 1.0%, 10 milliliters (.33 ounce) bottle.

Tinactin is in a propylene glycol solution. It is clear, odorless, and stainless. It is ineffective in treating yeast (candida albicans) or bacterial infections. In extensive fungal infections, Tinactin promotes healing in 8 to 14 days. It is applied in drops, two to three times a day. One drop is enough to treat an area about the size of the hand.

Also available in the medical supply system for use in treating fungal infections is —

6505-00-926-2101	Iodochlorhydroxyquin and hydrocortisone cream (Vioform HC), 30-gram tube, (3% Iodochlorhydroxyquin and l% micronized hydrocortisone)

The 3% iodochlorhydroxyquin contained in this cream is occasionally irritating to acutely inflamed fungal eruptions, especially in areas where the skin overlaps. Moreover, clothing and scaly skin may be stained yellow by Vioform HC.

Rx No. 2 Antifungal Foot Powder

NATIONAL STOCK NO.	NAME
6505-00-515-1584	Foot Powder, fungicidal, 1 -ounce (30-gram) can

This powder is often ineffective because it is not used correctly. It is intended for the prevention of fungal infections of the feet, and *not* for the treatment of them. Furthermore, it can cause irritation if used in the groin. Sprinkle it on the dry foot skin, and rub it in.

Rx No. 3 Antibacterial Cream

NATIONAL STOCK NO.	NAME
6505-00-926-2159	Neomycin, Gramicidin, Polymyxin Cream, 15-gram tube

This cream is a combination of three antibiotics which kill common, pathogenic, skin bacteria. It is not an irritating cream and even when applied to raw areas, it produces only mild stinging. Furthermore, it does not stain. Occasionally, people will be allergic to neomycin.

Rx No. 4 Liquid Detergent

NATIONAL STOCK NO.	NAME
6505-00-116-1740	Detergent, surgical, 5-fluid ounce bottle (148 milliliters)
6505-00-116-1750	Detergent, surgical, 1 gallon (3.78 liters)

This liquid detergent contains hexachlorophene, an antibacterial agent. It is a mild soap, which produces only a little stinging when applied to raw tissue. It does not lather very well. Use it as you would use soap: Always use it with water and rinse it off completely. If instructed to soak an infected area in a solution of this detergent and water, add just enough detergent to make the water cloudy.

Rx No. 5 Anti-Itch Tablets

NATIONAL STOCK NO.	NAME
6505-00-935-9826	Trimeprazine Tartrate Tablets, 2.5 milligram tablets

This small, grey tablet is given for the relief of severe itching. It is *not* given routinely for itching. It is far less likely to make a person sleepy than other systemic medicines administered for the same purpose. It does, however, produce mild dryness of the mouth and drowsiness. It is given in dosages of one tablet, four times a day.

ACKNOWLEDGMENT

Three figures in Chapter 9 have been copyrighted and are so designated. Copyright release has been obtained from Dr. Francisco Kerdel-Vegas, Universidad De Caracas, Venezuela.

Distribution:

Active Amy and USAR: To be distributed in accordance with DA Form 12–11A requirements for Management of Skin Diseases by Company Aidmen in the Tropics.

★ GPO : 1994 0 - 381-922 : QL 3