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A REFERENCE HANDBOOK

OF

THE MEDICAL SCIENCES.

Ergot.  
Ergot.

ERGOT (*Ergota*, U. S. P., Br. P.; *Secale cornutum*, Ph. G.; *Ergot de Seigle*, Codex Med.), *Fungus Secalis*; *Muterkorn*; Spurred Rye, etc., consists of the sclerotium of *Claviceps purpurea* (Fries) Tulasne, Order *Ascomycetes*, replacing the grains of rye, *Secale cereale* Linn.



Fig. 1940.—Ear of Rye with two Ergots. Natural size. (From Luerssen.)  
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Our Pharmacopœia prescribes that ergot should be only moderately dried, preserved in a closed vessel, chloroformed occasionally to prevent the development of insects, and rejected as unfit for use when more than a year old. This remarkable parasite is developed in the flowers of several cultivated grains and of a considerable number of wild grasses, germinating upon the ovaries, which it aborts and finally destroys, and growing in the place of these organs like some monstrosity of the flowers themselves. It attains to a sort of maturity as the grain ripens in the fall, and in this condition remains quiescent until the following season, when, if in a suitable situation, as upon the surface of damp ground, it produces spores in time to attack the blossoming grasses and grains of the succeeding year. It is this resting-stage which constitutes the "sclerotium."

The first noticeable evidence of the presence of this fungus in a spikelet, say of rye or wheat, is a sticky, unpleasant-smelling, very sweet, liquid exudation from the interior of one of the flowers, which accumulates in considerable quantity, and may even drop off or run down the stem. It consists mostly of some sort of sugar, and is probably a decomposition product of the affected pistil, etc. Like similar results of the irritation of vegetable tissues by other fungi, as well as by aphides, etc., it is known as "honey dew," and designated the "honey dew of rye." It is a certain sign that ergot will follow. Ants and beetles are fond of it, flock to the ears where it is to be found, and

as it contains cells capable of developing into ergot in other flowers, they assist in spreading the blight. Bees are said to avoid it. A soft, spongy or cottony, mould-like tissue, consisting of long, fine, weak filiform cells, felted together at this time, envelops and permeates the ovary; as it grows the latter becomes disorganized and disappears, and the mycelium of the ergot, as this structure is called, takes its place. In a short time after, a very redundant and much wrinkled layer of perpendicular cells covers the surface of the mycelium, and produces an innumerable number of minute oblong false spores (*conidia*), which are dis-

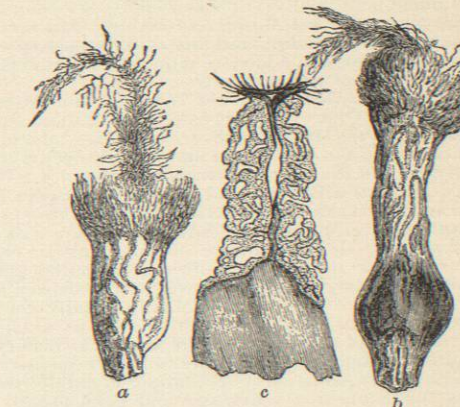


Fig. 1941.—a, Ovary of Rye with Commencing Growth of Claviceps in the Sphaecelia Stage; b, the same with the parasite further developed; the hairy styles and the remains of the ovary are borne at the top of the mycelium, the commencing sclerotium or ergot is shown at the base; c, section of specimen a little older than b, and rather more magnified; the two styles and aborted ovary are seen at the top, the ruminated sphaecelia in the middle portion, and the compact smooth ergot below. (Luerssen.)

charged into the adhesive "honey dew" just mentioned. These are capable of reproducing the plant, and are the first method of propagation. In this stage it was at one time considered to be an adult and perfect plant, and named *Sphaecelia segetum* (Léveillé, 1827) (see Fig. 1941). A further development next takes place in the formation and growth of the *sclerotium*. This begins as a condensation of tissue at the base of the "sphaecelium" just described, the cells of which become shorter and thicker-walled, as well as more closely packed together. The mass becomes firm and brittle as it develops, the outer surface assumes a purple-black color, and it finally grows to a long spur-like, curved, irregularly cylindrical body protruding half its length or more beyond the plumes and paleæ of the rye. The "sphaecelium" atrophies as the sclerotium grows, and is carried up on the apex, as

are also any remains of the unfortunate pistil (see Fig. 1941). When the ergot is fully grown and gathered, scarcely any traces of either of these are to be found. At this stage ergot was also considered a distinct plant

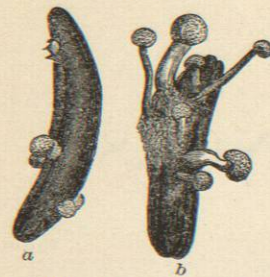


FIG. 1942.—Ergot in its Final Fruiting Stage. (Luerssen.)

from the above, and it received separate names (*Sclerotium clavus* De Candolle, 1816, etc.). The growth of the first season terminates with the *sclerotium*, but in the early summer of the next year several minute globular heads raised upon stalks, half an inch or more in length, and looking like miniature "toadstools," grow from the sides of this organ and bear, in numerous cavities (*perithecia*), a multitude of groups of long and slender spores (see Figs. 1942 and 1943). These spores, applied to the flowers of suitable grasses, are capable of reproducing the whole series of forms described above, and complete the life history of the fungus. It is interesting to note that this stage of claviceps was also known long before its connection with the others was made out, and it was described and named by several authors (e.g., *Spharia*, *Cordiceps*, etc.).

The first botanist to follow the course of this plant through all its changes was M. Tulasne, who gave it its present name, and finally published his report upon it in the *Annales des Sciences Naturelles* for 1853. His investigations were so thorough, and his illustrations so fine, that but little has been added to either, so far at least as the botany of ergot is concerned.

**HABITAT.**—*Claviceps purpurea* is found in most temperate countries where the grains and grasses upon which it flourishes grow. It is, however, much less abundant in this country than in Europe, and there it occurs most generally in the warmer and moister countries. It is gathered in Central Europe, and especially in Spain and Central and Southern Russia. It is an incidental product of agriculture, and is sorted out from the grain at the harvest with the double purpose of collecting the ergot and of removing its baneful influence from the grain. Ergot of wheat is occasionally saved; it is shorter and thicker than that of rye, and medicinally equally good.

**HISTORY.**—Ergot has long been known as a blight upon grain and as a poison, but its medicinal history is comparatively modern. It appears to have been used by the peasantry, in some parts of Europe, in childbirth as much as three hundred years ago, and is mentioned by several authors of the sixteenth and seventeenth centuries in this connection; but its formal introduction into modern medicine is due to the efforts of Dr. Stearns, of New York, in the early part of the last century.

**DESCRIPTION.**—The above-described "*sclerotiums*," which constitute ergot, are from 1.5 to 3 cm. ( $\frac{1}{4}$  to a little more than 1 in.) long and 3 mm. ( $\frac{1}{8}$  in.) thick, oblong, tapering toward, but obtuse at both ends, triangular-cylindrical, the sides unequally grooved; externally purple-black, nearly smooth; internally whitish, with purplish tinge or striae, the fracture short, not sharp nor snapping; odor peculiar, disagreeable, especially upon trituration with potassium or sodium hydrate T. S.; taste oily and disagreeable. It moulds and spoils rather easily, and should be kept fresh and dry. It should not be broken or ground until needed for use. Microscopically it consists of closely entwined, elongated, thick-walled cells containing an abundance of oil drops. Of the commercial varieties, Russian and Spanish ergots are commonly preferred. Small or medium-sized grains are believed to be superior to very large ones.

**COMPOSITION.**—Ergot has been repeatedly examined within the past half-century, with the result of exhibiting a more and more complex composition with each suc-

cessive investigation; but its active principle, if indeed there be any one substance entitled to the name, is still in doubt. One of its most abundant constituents is a *fat*, of which it contains from one-fourth to nearly one-third of its weight. This is a thick, bland, non-drying, light yellow oil consisting chiefly of olein with some palmitin and traces of glycerides of several common volatile, fatty acids. It has no therapeutic value, but is reported to be not without disagreeable action. It is recommended by Hager (as it is obtained in considerable quantity as a by-product of ergot preparations) for soaps and as a lubricant. A little *cholesterin* and *resin*, some *mycose* (sugar), several common *acids*, a fragrant *camphoraceous substance*, etc., are ingredients of no medicinal importance. In regard to the more active substances, scarcely any two chemists are agreed. *Ergotin* is a name given to various products, none of which is chemically pure. First, Bonjean's "ergotin" is prepared by treating a watery extract of ergot with alcohol, and evaporating the alcoholic solution to the consistence of a soft extract. It is a deep brown, strong-smelling, bitter substance, soluble in water and alcohol, of considerable activity and of frequent employment, but not an active principle properly so called. Wigger's ergotin was obtained by exhausting the ergot of wax, fat, etc., by means of ether, and then extracting with alcohol, evaporating the tincture, and washing with water. It is a sharp, bitter, reddish-brown powder, insoluble in water. Wenzell's *ergotine* (1864) was obtained by a more complicated process, and comes nearer the rank of a chemical compound. It is a brown, amorphous, bitter, alkaline substance, soluble in alcohol and water, but not in ether, and uniting with acids to form amorphous salts. Wenzell also separated another alkaloid, which he named *eboline*, resembling his ergotine in most respects; on the other hand, other chemists assert that both of Wenzell's two alkaloids are practically the same, and that neither is pure. Tanret has isolated a crystalline alkaloid, which he has named *ergotinine*, soluble in ether, alcohol, and chloroform, but not in water. Its solutions rapidly decompose, and its value is not yet proved. A still more recent and very thorough analysis of ergot was made a few years ago in the laboratory of Dragendorff, with the result of separating the following, more or less well-defined, amorphous substances: 1. *Sclerotic acid*, a (yellowish-brown) hygroscopic, faintly acid, tasteless powder, obtained to the extent of from two to four per cent. 2. *Scleromucin*, a nearly related substance, two or three per cent. 3. *Sclererythrin*. 4. *Sclerogodin*, a coloring matter. 5. *Scleroanthin*. 6. *Sclerocrystalline*, etc. Sclerotic acid is an article of commerce, but not much called for. The others, excepting Bonjean's ergotin, are scarcely known excepting to the chemists who have isolated them.

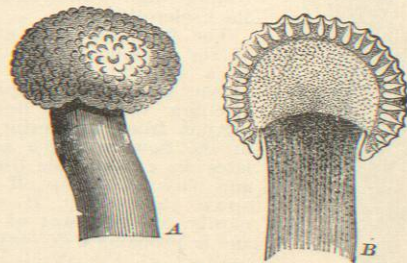


FIG. 1943.—Details of Fig. 1942. (Luerssen.)

Ergotic acid is a doubtful substance. *Ergotinic acid*, *sphaclotinic acid*, and *cornutine*, described by Kobert, although none of them pure chemical compounds, are thought by Cushny most perfectly to represent the three distinct actions of the drug. Sphaclotoxin is regarded by Jacoby as the active constituent of sphaclotinic acid, though this again appears resolvable into constituents, of which the most important one is called chrysotoxin.

From the foregoing it will be readily seen that ergot is not amenable to chemical assay for the determination of its quality, although, because of the highly varying action of different commercial samples, to some extent in kind as well as in degree, there are few drugs more in need of it. Under these circumstances, Houghton's method of physiological assay becomes of great interest. This consists in feeding the drug to fowls, then noting the extent and promptness of the discoloration of the comb, and finally rejecting any ergot which does not produce an effect reaching to a fixed standard. To this method various *a priori* objections have been urged by those who have not resorted to the very simple expedient of ascertaining the practical results of the method, which appear to have been the putting of an end to complaints of irregular or uncertain action.

**ACTION.**—The action of ergot and of its constituents is extremely complicated and can as yet by no means be said to be understood, though great progress has recently been made. We have now a fair knowledge of its practical effects as a drug. Our lack of knowledge relates mainly to the different effects produced by the different constituents, with the resulting disadvantage that we are unable intelligently to administer different preparations to meet special cases. The two most important effects of the drug are the prolonged contraction of the arteries, and the physiological strengthening of the natural rhythmic contractions of the uterus. Both of these effects are of complex origin, but primarily and principally due to the chrysotoxin or sphaclotoxin. In the production of the former effect, the chrysotoxin acts chiefly by stimulating the vaso-motor centre, to a lesser extent by acting directly upon the artery. At the same time, the vaso-motor centre is stimulated by the cornutine, but this stimulation is spasmodic and irritable, and is succeeded by depression, which, when the entire drug is used, may be supposed to act against the chrysotoxin, as there is often an early fall of blood pressure. This antagonism is still farther induced by the ergotinic acid, which is a direct depressor of the vaso-motor centre and of the heart, if introduced directly into the circulation. To get the full arterial effect, therefore, preparations of ergot should be given by the mouth, although the other method is preferable if we desire to secure a prompt action. In spite, however, of these antagonisms, the net effect is a powerful, prolonged contraction of all the smaller arteries, with a consequent marked increase of blood pressure, going on, *pari passu* with the administration of the drug, to dry gangrene and loss of the extremities, and to extravasation of blood into the viscera.

The effect upon the uterus is primarily due to spinal stimulation by the chrysotoxin, but there is evidently also a direct action upon its walls.

Upon the intestine, the effect of ergot is to increase peristalsis, but at the same time to diminish secretion, as is true of the secretions generally, due to diminished arterial supply.

**USES.**—Ergot is chiefly employed as an ebolic, being given in the later stages of parturition, especially to secure the complete emptying of the uterus, and to check hemorrhage. Formerly it was given at one stage earlier, to favor the expulsion of the placenta, but this practice is now generally discouraged. Against these views are still those of some excellent practitioners who recommend the early moderate use of ergot to promote labor.

Next to this use of ergot, that for checking internal hemorrhages, especially of dysentery, may be considered the most extensive. Its use has been found favorably to affect aneurisms. It is also very largely employed in the relief of headache resulting from prolonged mental activity and excitement, and whenever congestion exists. It also gives marked relief to conjunctivitis of a similar character.

Finally, it will frequently be found to do good service as an aphrodisiac, although in many cases it will fail.

**PREPARATIONS AND DOSES.**—The unofficial preparations of ergot are exceedingly numerous, and the practitioner should treat them with great conservatism, owing

to the possible serious change in property resulting from slight differences in the mode of extraction. Since the cornutine and sphaclotoxin are alcohol-soluble, the ergotinic acid water-soluble, both solvents should be used in the extraction. The official fluid extract, especially if having been found to meet a satisfactory physiological test, made with diluted alcohol, and with the addition of two per cent. of acetic acid, answers every requirement. It may be given in doses of from 2 to 4 c.c. (fl. 3 ss.-i.); the wine of fifteen-per-cent. strength may be given in doses four or five times as large; the extract ("ergotin") is considerably used in doses of 0.3 to 1 gm. (gr. v.-xv.).  
Henry H. Rusby.

**ERIODICTYON.** See *Yerba Santa*.

**ERYNGIUM.** See *Umbellifera*.

**ERYSIPELAS.**—(Fr. *Erysipèle*; Ger. *Rothlauf*).\*  
**DEFINITION AND ETIOLOGY.** By the term "erysipelas" is understood a disorder of the general system, of febrile nature, cyclic character, and varying severity, which is caused by the introduction, into the body, of a specific pathogenic germ of bacterial form. This is of the streptococcus variety, and was first described by Fehleisen, and for that reason is called by his name.†

The disease is seated upon an epithelial surface, either of the skin or of a mucous membrane. When situated upon the skin, it is characterized by a sharply defined area of redness, which gradually advances to occupy a larger surface, is accompanied by a relatively intense febrile action, and generally terminates in complete recovery, with exfoliation of the epidermis upon the surface which was the seat of the disease. One attack of the disease affords no immunity against recurrence, in the same or another locality, and it may involve the mucous membranes as well as the outer covering of the body. The accounts of some of the earlier of the known epidemics represent a much severer type of disease than the erysipelas of our day.

From a careful study of cases, as well as from experimental inoculations, the period of incubation of erysipelas has been estimated as being not less than fifteen nor more than sixty hours. A specific germ, the streptococcus of erysipelas, is found in all cases of the pure disease and is capable of transmitting the malady to healthy individuals in series. This germ is found in the lymphatic vessels of the skin and in the lymph spaces, and when the culture is pure, it is believed never to produce suppuration.‡

Infection with the streptococcus of Fehleisen produces at the point of inoculation a special inflammation of the integument, external or internal, of which the characteristic tendency is its extension peripherally, until the virulence of the micro-organism is exhausted, or the individual attacked has become immune to the disease.

At present, no difference in character or nature is recognized between erysipelas of the face (so-called "spontaneous" or "medical" erysipelas) and erysipelas following wounds ("traumatic" or "surgical" erysipelas). Contagion is the simple, inevitable, and indispensable cause of the disease.

It is always necessary that there should be a door of entrance for the microbe, and if careful search fails to discover a solution of continuity of the surface of the skin, we must still admit that such an abrasion of either the skin or the adjacent mucous membrane really exists. In certain cases it would seem that the simple absence of epidermis or epithelium is in itself sufficient to allow the entrance of the poison of erysipelas into the system. In this direction the occurrence of erysipelas in young and imperfect cicatrices from recent injuries is interesting. Warren says that it is probable that healthy skin offers

\* For the bacteriology of erysipelas consult the article on *Bacteria*, in Vol. I.

† "Die Aetiologie des Erysipels," Berlin, 1883.

‡ Petruschky (quoted by Warren) showed conclusively that a streptococcus cultivated from pus may cause erysipelas in the human subject.

a sure protection against infection from erysipelas (*op. cit.*).

The progress of erysipelas seems to depend upon the extension of the local infection by contiguous growth of the specific coccus, and not by transmission of the infection to distant parts by the circulation. The spread of the disease is usually from a distinct centre by peripheral growth. The appearance of erysipelas in regions distant from the point of original infection has been thought to indicate that the virus may be transmitted by means of the blood current, but this method of spread is not universally accepted. The constitutional disturbance—fever, etc.—accompanying the disease is probably due to the presence in the blood of the toxic products of the specific germ of the disease.

That erysipelas is a communicable disease has been proved by repeated transmission. Warren cites the former frequent conveyance of this disease in vaccination, and quotes the statements of Moreland in the Records of the "Boston Society for Medical Improvement." There is, however, a strong probability that in the former state of surgery, the poison of erysipelas was conveyed by means of hands or instruments not surgically clean, or by the contamination of dressings or other material with the virus of the disease.

The origin of erysipelas upon surfaces covered with mucous membrane is not so easily determined. In the eyes, mouth, and nose it may often be impossible to discover the wound through which entrance to the system was effected, as these mucous surfaces are extensively reflected, or are concealed to a great extent from view.

Erysipelas is comparatively rare before the age of puberty, and still more rare in old age. The associated causes of the disease may include conditions of inanition, poverty, exhaustion, overwork, previous illness, chronic poisoning, cachexia, etc. All these render the entrance of the microbe more easy by diminishing the resistance of the tissues and organs.

Certain individuals present an unusual susceptibility to erysipelas, suffering an attack whenever they are subjected to a fresh exposure. One of the physicians attached to a Paris hospital took the disease each time he had a patient with erysipelas in his service, although he employed all possible precautions against infection.

**PATHOLOGICAL ANATOMY.**—Fehleisen distinguishes three zones in the erysipelatous plaque: a central field, in which the process may be receding, a circle in which the disease is still spreading, and an outer area in which the tissues are in a state of commencing congestion preceding the actual extension of the malady. On section of the tissues there is observed an abundant infiltration of the area with leucocytes, which entirely fill the field, particularly in the vicinity of the vascular channels, around the hair follicles, and in the neighborhood of the sudoriferous glands. The distinguishing characteristic of erysipelas in comparison with inflammatory oedema, is the proliferation of the fixed cells of the connective tissue, due to the specific action of the particular organism of this disease.

**SYMPTOMS AND COURSE OF THE DISEASE.**—The most common seat of erysipelas is the face, and its symptoms will be considered as observed in that location.

The invasion of the disease is accompanied by the general symptoms of septic infection, viz., malaise, headache, anorexia, dryness and a bad taste in the mouth, and occasionally vomiting. The chief symptom, however, and one which is never absent, is the initial chill, sometimes slight, but often very severe. This is sometimes repeated, but usually it consists of one prolonged rigor. The severity of the disease seems to bear some relation to the severity of the premonitory chill as regards duration and intensity. The chill is soon followed by fever of an intense character, with elevation of the temperature, often to 104° F. or even above that figure. The patient is frequently delirious. In erysipelas of the face, there are tumefaction and tenderness of the submaxillary lymphatic glands before other local symptoms of the disease are apparent. In some cases this precedes the exanthem

by from one to several days. The adenopathy would seem, however, to be necessarily secondary to the local infection and its primary local processes, though the glands are possibly invaded by the micrococcus before the disease has made itself evident at the seat of invasion. The glands are sometimes painful even before there is any apparent increase in their size.

The first onset of the visible disease is in the form of an acute dermatitis, situated at the angle of the eye, at the naso-labial fold, at the nasal orifice, about the ear, or in some other location about the face or head. In a few hours a plaque of erysipelas is formed which rapidly enlarges and acquires double its first dimensions within twenty-four hours. The part affected presents a color which varies from bright scarlet to dull rose. In anæmic patients the tint is only a rosy blush. Pressure by the finger dulls it, but the color at once returns. The skin becomes tense and glistening. The temperature of the affected part is higher by from one to four degrees than that of the opposite side. There is a sensation of burning heat, and sometimes there is also considerable local pruritus. The entire plaque is elevated on account of the swelling of the skin, and its borders are sharply defined. The maximum intensity of the disease will always be found at the border of the patch, as at this point the malady is extending, while at the centre of the plaque it may be subsiding or already healed. The pain accompanying the advance of the disease is in inverse ratio to the tumefaction of the tissues; the loose structures in the vicinity of the eye allowing much swelling without great pressure, while the tense tissues upon the scalp cannot yield to pressure, and the suffering here is consequently more intense. The erysipelatous inflammation extends slowly from the periphery of the plaque, in all directions, and its advance has been compared to the spreading of a drop of oil on paper. In this way the disease may invade the greater part of the face and forehead, but it rarely extends over the surface of the chin. In a recent case seen by the writer, however, the inflammation passed from the lips to the chin on both sides of the neck, and induced great difficulty in swallowing. At the same time the face showed very marked deformity. In some instances the disease may render the patient quite unrecognizable, and breathing may be embarrassed from the swelling in the nares. The eyes may be quite closed, and the sufferings of the patient may become intense. The scalp is frequently invaded, but the disease seldom passes the line between the head and neck. The invasion of the hairy scalp is usually accompanied by severe headache and delirium, which may alternate with dulness or coma. These symptoms are thought to be of reflex character and due to irritation of the branches of the fifth pair of nerves. Nervous phenomena are much more frequently observed in alcoholic subjects.

The general character of erysipelas remains the same, though different terms have been applied to express particular features of its progress, such as "fixed," "serpiginous," "vague," "migrans," "ambulant," "phlegmonous," etc., as observed in erysipelas of the trunk, limbs, face, etc.

The variety of erysipelas which is called "phlegmonous" is characterized by the spread downward of the disease into the deeper subcutaneous tissues. The infection is much more extensive than in ordinary erysipelas, and the quality of the virus may be more virulent; the local symptoms are consequently more distinct. The fever continues high, and is often typhoidal in character. It is not long before suppuration takes place. Free incisions give vent to abundant discharge, in which may be found shreds of necrotic tissue. Large sloughs are eventually discharged. The pus burrows rapidly, to considerable distances, under the skin, which is thus dissected off from the subjacent structures. In rare cases suppuration may extend more deeply still and penetrate the intermuscular spaces. Even the periosteum and bones may become infected, and cases are recorded in which the joints have been involved and have become disorganized. In the extreme forms of this last type, large

masses of tissue may become gangrenous, and at times there is emphysema of the parts from the formation of gas in the tissues, owing to the decomposition of the necrotic and sloughing tissues. The simplest case of facial erysipelas may without apparent cause assume the phlegmonous form, and be followed by the most disastrous consequences. The disease may extend to the eyelids, and orbital suppuration may occur with infection of the eye itself. Blindness is not an infrequent result of this complication. Septic meningitis may also follow erysipelas in this location.

As already stated, erysipelas occasionally involves the mucous membranes. In the faucial form of the disease, there may be extension to the pharynx, and thence through the Eustachian tube to the cavity of the middle ear, whence it may pass through the drum membrane to the external auditory meatus and to the scalp. It may be traced internally as far as the lungs. Should the glottis become oedematous, as it occasionally does, the result is usually rapidly fatal. The other natural openings of the body are also occasionally the seat of this disease.

Strauss has recognized a pulmonary erysipelas. This generally occurs subsequently to an erysipelas of the face or throat, and is marked by insidious development, without chill, and by a rapid extension.

Erysipelas may also extend from the face or other point of primary attack to the digestive tube. Rendu has reported a case in which the disease was thought to have extended through the alimentary canal, and appeared at the anus, where it caused a perineal abscess. In 1887 Heidenreich published a case of erysipelas of the right thigh which had extended to the intestine by way of the anus. Ivanowski made an autopsy of a case of intestinal erysipelas which had been propagated from the perineum through the entire large intestine. To our knowledge these are all the reported observations of this complication.

Pericarditis and endocarditis have also been reported as complications of erysipelas, and the specific germ has been recovered from the blood and from the fluid in the pericardium. In this complication the path of the infection is no more clear than in rheumatic invasion of the heart or its coverings. The results depend on the amount of damage to the valves or on the other changes effected. Lesions of the kidneys are among the most frequent complications; albuminuria is generally present at some stage of the disease, but is usually transitory in character, and disappears with the recovery of the patient. Its presence or amount bears no relation to the elevation of temperature or the pulse rate. The urine often contains blood elements and epithelial and hyaline casts. Bacilli are often present in the urine; they may be due, as indicated by Professor Bouchard,\* to the infectious nephritis.

Peripheral neuritis, pleurisy, and peritonitis have also been noted as complications of erysipelas.

Erysipelas in open granulating wounds often causes comparatively little disturbance. The disease sometimes appears to exert a stimulating effect upon the healing process, the part closing more rapidly than before.

There is no regularity in the temperature curve of erysipelas. Oscillations of slight extent coincide with grave forms of the disease, though there seems to be no direct relation between the degree of elevation of temperature and the extent of area comprised in the erysipelatous process. A constant elevation without irregularity usually precedes a fatal termination. The temperature may even rise after death. Usually when the progress of the disease is arrested, there is a rapid fall of temperature. This critical fall may appear at any time between the fifth and the tenth day. In severe cases the fall is usually by lysis.

**DIAGNOSIS.**—The diagnosis of erysipelas may be difficult in the absence of indications of efflorescence, as in cases in which the seat of the primary infection is in the

\* See also a valuable reference by Salinger in Medical News, July 3d, 1891.

nasal fossa or in the interior of the mouth; but the high fever and the swelling and tenderness of the submaxillary glands are valuable indications of the character of the disease, and the absence of other causative agencies should lead to a suspicion of the infection even before the efflorescence is evident.

When the disease is situated upon the external surface of the body it is hardly possible to mistake it for any other malady. Erysipelas may be confounded with simple lymphangitis. The former is, however, always accompanied by inflammation of the lymphatic channels and glands. In simple lymphangitis there is swelling in the course of the lymph channels, but there is no typical inflammation of the skin with peripheral extension and central recrudescence; there are also less tumefaction of the skin and less elevation of the temperature, and the surface is not dry and glazed as in erysipelas. In lymphadenoma, and in malignant diseases, there is often induration of the glands in the vicinity, but there is absence of fever, and the course of these diseases is chronic; other signs of systemic disease, such as cachexia, emaciation, etc., are also usually unmistakable. The various forms of erythema may present some degree of resemblance to erysipelas, but this lesion is seldom confined to a single point, is not accompanied by glandular induration, and is usually disseminated over the surface of the body and limbs. Herpes zoster may simulate erysipelas to some degree, but the course of the disease will soon determine the difference. Certain drug eruptions may present appearances similar to those of erysipelas, but it is usually possible to trace their origin to the irritating substances which have produced them. Glanders presents many appearances similar to those which characterize erysipelas, when developing, but this disease is accompanied by a hard oedema, is not distinctly defined, and the skin is not so raised at its borders. At the end of a few days, the development of pustules upon the surface affected will distinguish it from erysipelas.

**PROGNOSIS.**—The prognosis of erysipelas is on the whole favorable. After a few days of inflammation there is a marked tendency to resolution; and this simple fact should be borne in mind in estimating the value of any remedy. The disease varies greatly in severity, but it may be said that the danger from the disease itself is less than that which attends its complications.

If the disease attacks the mucous membrane as in the throat, it will probably be severe; if the vagina is the point of origin, as in puerperal cases, there may be great reason to fear pyæmia or septicæmia. The late Dr. Oliver Wendell Holmes was among the first to recognize the frightful conditions arising from puerperal infection, and openly laid the tremendous mortality of that disease to the introduction of erysipelas into the system of the parturient woman. "The work for which Holmes will always have a place among those who have advanced the art of healing and thus deserved well of humanity, is his demonstration of the infectiousness of puerperal fever, read before the 'Boston Society for Medical Improvement' in 1842. He was not the first to preach this doctrine, but to him belongs the credit of having forced men to listen to the truth" (*The Practitioner*, vol. lxvi., 1901, page 77). The further discussion of the relations of erysipelas to puerperal fever will doubtless be found under the latter heading, in a later volume of the present series.

The deeper-seated types of the disease, such as the phlegmonous or gangrenous, have undoubtedly a higher mortality than the cutaneous forms. In individuals enfeebled by long-standing suppuration, and in alcoholic subjects the disease may prove a formidable complication. The same may be said of a number of organic diseases, such as diabetes and Bright's disease, particularly in advanced life. For similar reasons, youth and old age are periods of life when the patient is less resistant to its influence than when in the prime of life. Erysipelas is distinguished among acute diseases for its tendency to relapse, but the relapses are usually not so serious as the initial attack. This may be due to a diminished virulence of the contagion or to the fact that the system is protected

to a certain extent by the secretions of the streptococci (antitoxin?), which may increase the resistance of the body or tissues to the poison of the infection.

The ordinary duration of erysipelas varies from a few days to two or three weeks, according to the extent to which it spreads over the surface of the body. The tendency is notably toward recovery, but occasionally patients succumb from exhaustion, from the systemic poisoning caused by the toxins of the disease, or from meningitis, when the infection extends to the membranes of the brain, from the ear, the lining of the nose, or the frontal sinus.

Erysipelas of the new-born is generally acquired by infection from the navel, and usually leads to a fatal result.

The curative influence of erysipelas when it occurs in the course of other diseases has been already noticed. Chronic inflammations of the skin, particularly those of a tuberculous or syphilitic character, have been reported as benefited by an intercurrent attack of erysipelas, after resisting all other modes of treatment. Sarcoma and carcinoma have also been relieved or cured by the same influence.\* Old and refractory neuralgias have often been cured or greatly relieved through the same means. In the insane, likewise, a temporary improvement has occasionally been observed.

This effect is supposed to be due to a change in the nutrition of the cells of the morbid tissues, or to a direct destructive influence upon the elements of the foreign growth by the micrococci of erysipelas. This ingenious theory needs the support of more extensive observation for its entire confirmation. At the present time one would naturally hesitate to employ so serious a measure as the voluntary infection of the system of a human being with the virus of erysipelas for a doubtful therapeutic purpose.

In like manner, the effusion of fluid within the thorax, following an acute attack of pleurisy, has been observed rapidly to diminish, and at times to undergo complete absorption, as a sequence of an invasion of the skin of the chest and trunk by erysipelas.

**TREATMENT.**—The treatment of erysipelas is chiefly to be directed to the complete isolation of the patient from all other sick persons, and the employment of all possible means for the establishment of good sanitary conditions about the patient. This includes scrupulous cleanliness, pure air, pure water, sunshine, and the rigid antiseptic treatment of existing wounds or other lesions. The local symptoms may be treated according to the varying requirements of the case.

The most rigid prophylaxis should be carried out; the patient should be isolated, and all possible means be employed to restrict the spread of the disease by soiled dressings, infected linen, or other articles. All these things should be burned at once.

The general treatment is the same as that commonly employed in other infectious maladies. The large number of remedies which have been recommended for erysipelas may be of service in ameliorating certain symptoms, but they are in no sense specifics for this disease. Aconitine (crystallized), in doses of 0.25 mgm. every six hours, or 0.1 mgm. every two hours, has been thought to reduce the duration of the disease and to alleviate the pain.

As regards the local treatment there are various procedures which may be used to advantage. Compresses dipped in some lotion of a cooling nature and applied to the inflamed skin usually afford considerable relief. Painting the part with tincture of iodine, with nitrate of silver, with carbolic acid in weak solution, or with corrosive sublimate in dilution of one-tenth of one per cent., has proved helpful in certain cases. Favorable results have been obtained by spraying the affected surface with a solution of corrosive sublimate in ether, in similar dilution. Under treatment of this kind the disease has apparently ceased to advance, and the inflammation has

\* See the various contributions to this subject by Dr. Coley and other investigators.

subsided in from twenty-four to forty-eight hours. Painting the borders of the affected area and the sound skin adjacent to it with contractile collodion has been a most prompt and satisfactory method of treatment in the hands of the writer, the disease seldom crossing the line of collodion; or if it has not been entirely subdued by the first application, it has generally yielded to a renewed and more extended "fencing in" by the same means.

Subcutaneous injections of carbolic acid have been highly recommended as an almost specific treatment for erysipelas, and often its use in this way has been followed by the most favorable results. The frequent application of carbolized oil relieves the sensation of burning and stiffness, and is generally very soothing in its action. White paint has been used in the same way. Frequent or sudden changes of temperature in the sick-room should be avoided, and if a "cold" is contracted it is liable to aggravate the inflammation.

When sloughing or gangrene occurs, the case must be treated according to general surgical principles—*i. e.*, by free incisions, drainage, etc.

Cool baths may be employed for the purpose of diminishing the general temperature of the body, and the internal administration of the salicylates has sometimes been of service in accomplishing the same result.

Treatment by large doses of tincture of the chloride of iron (twenty to sixty drops in water at intervals of three to six hours) was at one time highly esteemed as almost a specific in erysipelas; but its use has been almost discarded since the increased knowledge of later years as to the nature of the malady, and the introduction of antiseptic methods in its management. Many other forms of drug treatment have been abandoned for the same reason, and to the great advantage of the patient.

In the phlegmonous form of erysipelas it is important to recognize suppuration as early as possible. It is in these cases that prompt surgical interference may be productive of the best results. The tendency of the infection to spread along the spaces separating the bands of loose connective tissue must be corrected promptly, no matter how long or how numerous the incisions may have to be. Very hot and large antiseptic poultices are now indicated, and they should be often changed. The graver forms of gangrenous erysipelas with malignant oedema should be dealt with promptly and heroically by long and deep incisions. Many a life has been saved by the timely action of the surgeon.

In phlegmonous erysipelas of the face, pus often forms in the tissues of the orbital cavity, necessitating incision between the eye and the orbital margin. In scrotal erysipelas of a phlegmonous or gangrenous character, a free incision should be made through the raphe, completely dividing all the tissues involved. This incision usually results in the prompt arrest of the inflammatory process, and the wound generally heals rapidly.

During the period of convalescence the treatment should be tonic and supporting; and care should be taken to avoid chilling of the surface of the body and fatigue. So long as desquamation lasts isolation should be continued, and in private practice the patient should not be allowed to mingle with other members of the household, particularly during periods of epidemic disease, until it is tolerably certain that the micro-organisms of the disease have been completely eliminated from the system.

Cases of this disease should be visited by the surgeon after he has seen all other patients, and the hands and instruments should be thoroughly cleansed and disinfected afterward. The patient should not be considered safe from a recurrence of the disease, nor should the precautions against infection of other persons be relaxed, until the disease has entirely disappeared from every portion of the body which was at any time invaded; and the danger of a relapse or of communicating the disease to others is not entirely absent until the process of desquamation of the epidermis in the regions affected by the erysipelatous inflammation has been completed. When the skin has fully returned to its normal condition, it is advisable that the entire surface of the body should

be carefully bathed in warm water, made alkaline by means of sodium bicarbonate and perceptibly impregnated with carbolic acid. A complete attire of fresh and uninfected clothing should replace the clothes previously worn. The patient may then be allowed to go at large.

One of the remoter dangers associated with erysipelas,—a danger, however, which is not of frequent occurrence—is an interference with the function of the kidneys. This complication may assume a variety of forms, and its presence as a complication of the erysipelatous process is of sufficiently grave importance to make the daily examination of the urine advisable. The renal condition often seems due not so much to the specific character of the erysipelatous infection, but rather to the action of the toxic products of the bacilli which accompany the graver forms of the disease. Should this or any other unusual complication arise in the course of erysipelas, the same rules should be observed and the same measures adopted as in other cases of similar disturbance of these important organs. The strength of the patient should be carefully husbanded, and tonic measures should be cautiously employed to support the system until the natural vigor shall have been re-established. For this purpose the diet should be carefully selected, and should consist of nutritious but unstimulating food, with the addition of some of the artificial digestive ferments if the functional ability of the alimentary organs has been seriously impaired. A very excellent addition to the ordinary diet of a weak and debilitated patient is the extract of malt in some of its more acceptable forms. Perhaps the best preparation at present for this purpose is that known as "Amé," or the Japanese extract of rice. It is of pleasant taste and possesses great nutritive power.

To overcome the debility often remaining after a prolonged attack of erysipelas, a change of scene and climate is often of great service. Excessive fatigue or prolonged bodily exertion should be prohibited, and the patient should be directed to pass a portion of each afternoon in a reclining posture, and if possible to obtain an hour's sleep in the middle of the day. In cases in which the attack of erysipelas is followed by the formation of abscesses, a sojourn at some of the watering-places, particularly at one of those whose waters are of an alterative and chalybeate character, is often of much benefit.

Albert N. Blodgett.

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**ERYTHEMA.**—The term erythema is a general one for certain diseases of the skin in which there are evidences of hyperæmia and passive inflammation.

Erythema simply means redness, and is therefore nothing more than a symptom, and, used without a qualifying adjective, has but little definitive value.

The definition of erythema, as given by some authors, is "a localized congestion, accompanied by redness, which disappears under pressure."

Two divisions of the subject are usually made, *viz.*, Erythema hyperæmicum and Erythema exudativum; these are again subdivided according to symptoms.

The first general division, **ERYTHEMA HYPERÆMICUM** or *Simple Hyperæmic Erythema*, is that form of the disease which is characterized by various-sized and various-shaped points and patches of redness, exhibiting no evidences of inflammatory exudation.

The patches readily disappear upon pressure.

The causes of the affection are numerous: heat, cold, the presence of irritating substances, as well as certain general systemic disorders.

It occurs both idiopathically and symptomatically.

The *Idiopathic Hyperæmic Erythemas* are those which are produced by cold or by heat, by traumatism, or by the application of some irritant to the surface of the body.

If the skin be exposed to any of these agents for a great length of time the condition passes from the simple hyperæmic into the exudative stage. Slight sunburn is perhaps the mildest type of hyperæmic erythema. Artificial heat may produce the same condition (*Erythema ab igne*).

Cold will also produce a certain amount of congestion (*Erythema pernio, chilblain*).

Wounds and contusions, pressure of clothing or bandages, also cause a localized erythema.

Exposing the skin to irritating substances, as mercury, iodoform, certain dye stuffs, or poison ivy can cause an erythema.

The *Treatment* for simple erythema is upon general lines. If it is caused by pressure of clothing or from the chafing of two opposing skin surfaces (*Erythema intertrigo*), remove the pressure and apply some soothing dusting powder.

If it has become almost eczematous in character, and the diseased area is covered with a sticky exudation, as is often the case in infantile intertrigo, Lasar's paste, calamine lotion, made with the stearate of zinc instead of the oxide, or any of the other external applications for eczema, are indicated.

If the erythema is from the external application of drugs, the treatment is obvious; remove the cause.

The *Symptomatic Erythemas* are important, because they so often simulate more serious affections. They generally occur as the result of some derangement of the digestive tract, and are more frequently seen in children or young people. They may also accompany certain systemic diseases, such as diphtheria, scarlet fever, cholera, uremia, Bright's disease, etc.

The eruption may be found on any portion of the body, although the face seems to be the part most frequently affected. The lesions appear in various shapes; patches, spots, rings, etc., small reddish pea-sized spots called *roscola*, are often seen in the beginning of a syphilitic rash, smallpox, or as an accompaniment of vaccination, and in some cases of jaundice.

The persistent or fugitive flush seen in rheumatism, asthma, goitre, hemiplegia, is an erythema produced by some impairment of the central or peripheral nervous functions.

The symptomatic erythemas occur in both the hyperæmic and the exudative varieties; and, as they are more frequently observed after they have passed into the inflammatory stage, to save space they can be more conveniently discussed here, before considering the distinct group of erythema multiforme.

*Erythema Diphtheriticum.*—During an attack of diphtheria, especially if severe, there often occurs upon the thorax and abdomen a diffuse eruption, sometimes extending over the extremities; it may be mottled, punctate, or scarlatiniform in character. The rash usually appears on the second or third day of the disease and should be distinguished from the toxic maculo-papular erythema multiforme which appears late in the course of diphtheria.

Since the introduction of antitoxin as a therapeutic measure a form of erythema has been noted; it occurs chiefly on the trunk, making its appearance from six to twenty-four hours after the injection. This epiphenomenon is regarded by bacteriologists to be due to some idiosyncrasy of the horse from which the antitoxin is taken and not to any defect of the preparation itself. This erythema is not of any grave importance, but is a disagreeable accompaniment of the most effective therapeutic measure in the treatment of diphtheria.

*Erythema Cholericum.*—This is a polymorphous, maculo-papular erythema seen in some cases of cholera. The eruption first appears on the hands and feet, extending to the forearms, legs, and trunk, and finally to the face. It usually begins early or late in the disease, lasts several days, and disappears by desquamation.

The erythema of *Uremia* is of the maculo-papular variety. The first lesions are bright red macules which rapidly change into papules, and are generally upon the extensor surfaces of the hands, forearms, and legs. The