

slower, resulting in a thick, viscid, membranous deposit on the surface, upon which the same yellowish-red color and cobweb-like thread are developed. On eggs, either raw or cooked, Wolff and Israel have cultivated especially well-developed branching forms.

Vitality.—The cultures are quite resistant to outside influences, old cultures retaining their vitality for months. Dried they may be kept for a year or more. They are killed by a temperature of 75° C. in five minutes.

Pathogenesis.—The actinomyces have never been found outside the animal body, but they probably occur in the husks and straw of grains and grasses, as the usual mode of acquiring the disease is apparently through the introduction of these materials, which have been met with in the centres of actinomycotic infection. They have never been found in healthy animals. The chief modes of infection in man are through the mouth and mucous membranes of the throat, through the air passages, through the intestinal canal, and through the skin. From the primary centres of infection the fungus is conveyed by wandering cells and emboli to all parts of the body, giving rise to soft granulation tissue which has a tendency to break down, and contains, in addition to small round cells, epithelial elements and giant cells, not unlike those found in tubercles. The formation of fistulae which undermine the skin favors the passage of the organism through muscular tissues and furthers the spread of the disease. More rarely, circumscribed tumors, as seen in cattle, also occur in man. The fungi are found in the pus of the affected parts, there being scarcely an organ or tissue of the body free from actinomyces.

Among animals cattle are especially subject to the disease; more rarely, pigs, dogs, and horses. The most common seat of infection is in the interior of the bone of the jaw, with the formation of granulation tissue and of new bone from the periosteum. In other cases the soft parts of the face are primarily attacked and the bone affected from the outside. The walls of the throat and stomach are sometimes first infected. The affection of the jaw gives to the disease its name of "big jaw"; it was formerly mistaken for osteosarcoma and other similar affections.

The experimental production of actinomycosis in animals has not been satisfactory. When artificially introduced into the tissues the organism becomes absorbed or encapsulated. If injected in large quantities multiple nodules are formed in some cases, and these suggest the production of a general infection, but no growth of the organisms really takes place. Pontick, John, Rotter, and others claim to have obtained positive results in animals, but Boström does not consider these conclusive. The animals used for experimentation have been calves, pigs, dogs, rabbits, and guinea-pigs; the points of inoculation, the anterior chamber of the eye, the subcutaneous tissue, the peritoneal cavity, and the blood-vessels; and the material injected, pus from the affected parts, very rarely cultures.

A number of other streptothrices have been described in connection with various pathogenic processes, but most of them are not well defined. They have been found in abscess of the brain, cerebro-spinal meningitis, inflamed pneumonic areas, and other pathological conditions. Eppinger injected cultures of a streptothrix found by him in brain abscess into rabbits and guinea-pigs, and from this a pseudo-tuberculosis developed. Consolidation of portions of both lungs, thickening of the peritoneum, and scattered nodules closely resembling tubercles were also noted by Flexner in a case of human infection from a variety of streptothrix, the pathological conditions so nearly resembling tuberculosis that the two diseases could be distinguished only by the morphological and other characteristics of the causative micro-organisms in each case.

THE HYPHOMYCETES OR MOULD FUNGI.

Most of the mould fungi are not pathogenic and are of interest to us only as organisms which are apt to contaminate our bacteriological media. Some of them, however,

are true parasites, among which the best known are the *achorion Schönleinii*, *trichophyton*, *oidium albicans*, and *microsporon furfur*. These can be only briefly touched upon in this article, as they are not bacteria, and yet some reference to them would seem to be called for here.

ACHORION SCHÖNLEINII (Favus Fungus).—This fungus, which is the cause of favus in man and animals (horses, cattle, dogs, cats, rabbits, mice), was discovered by Schönlein in 1839. The disease is communicated to man by contact with animals. Want of cleanliness is a contributing factor. The fungus seems to find a more favorable soil for its development on the skin of persons in a debilitated condition, especially from phthisis, than in healthy individuals.

Pathologically the disease represents the reaction of the tissues to the irritation caused by the growth of the fungus, the spores finding their way into the hair follicles, where they develop around the hair seat. The achorion grows in the epidermis, the density of the growth causing pressure on the parts below, thus crushing out the vitality of the hair and giving rise to atrophic scarring. This disease shows a marked preference for the scalp possessing hair but it is also found on skin devoid of hair, and even the mucous membranes or the nails may be attacked. Kaposi describes a case of favus universalis. On the scalp it first appears as a tiny sulphur-yellow disc or *scutum*, depressed in the centre like a cup and pierced by a hair. This is the characteristic lesion. The cup shape is attributed by Unna to growth at the sides proceeding more vigorously than at the centre.

According to Unna, Quincke, and others there are several varieties of favus fungi, but later investigations would seem to indicate that the achorion Schönleinii is the only species of fungus producing favus.

As seen under the microscope the mycelium consists of branched radiating hyphae. Some of the hyphae swell at their free ends, becoming club-shaped, while others give off lateral buds containing Kral's so-called "yellow bodies," which rupture, allowing their contents to escape as free bodies. When this takes place, moss-like offshoots develop in the form of dense, twisted threads. Later, the individual threads break up into cell-like, oval structures.

The favus fungus is readily cultivated at both room and body temperatures on the ordinary nutrient media. The growth develops slowly and shows a preference to grow beneath the surface of the medium. The characteristic form of growth is that of moss-like projections from a central body, the color being at first grayish white and then becoming yellow. To obtain the fungus in pure cultures the "favus crusts" are mixed with sterile silicic acid, reduced in a sterile mortar, and plate cultures on gelatin or agar are made from this mixture. Blood serum is the only medium on which the spores are developed, the most favorable temperature being 30° C. Artificial infection can be produced only with material containing spores.

TRICHOPHYTON (Ringworm Fungus).—Ringworm of the body or hairless parts (*tinea circinata*), and ringworm of the hairy parts (*tinea tonsurans* and *tinea barbae* or *sycois*) are due to the fungus *trichophyton*, discovered by Gruby in the human hair, and between the epidermal cells by Hebra.

According Sabouraud (whose conclusions are based on an exhaustive series of microscopical examinations of cases of *tinea* in man and animals, of cultivation of artificial media, and of inoculation experiments), there are two distinct types of the fungus *trichophyton*, causing ringworm in man; they are distinguished by the size of their spores—one with small spores 2 to 3 μ in diameter, which he calls *Trichophyton microsporon*, and another with large spores, 7 to 8 μ in diameter, which he calls *Trichophyton megalosporon*. These differ both in their mode of growth on artificial media and in their pathological effects on the human skin and its appendages.

Trichophyton microsporon is the common fungus of *tinea tonsurans* in children, more particularly the severe affection known as the "Maladie de Gruby," which is re-

bellious under treatment, and its special seat of growth is the substance of the hair. *Trichophyton megalosporon* is essentially the fungus of ringworm of the beard and of the smooth parts of the skin in adults.

Under the microscope the single mycelial threads are distinctly separate and from them conidia are given off. The spores of *T. microsporon* are contained in a mycelium; but this is not visible, the spores appearing irregularly piled up like zoöglæa masses; and growing outside, they form a dense sheath around the hair. The spores of *T. megalosporon* are always contained in distinct mycelium filaments, which may be either resistant when the hair is broken up, or fragile and easily separating into spores.

The *trichophyton* grows at room temperature, but best at 30° C. on the usual media. It liquefies gelatin, agar, and blood serum. The two types when grown on artificial cultures also show a downy surface and white color; those of *T. megalosporon* a powdery surface, with arborescent peripheral rays, and often a yellowish color.

Although the morphological appearances, mode of growth, and pathological effects of each type of *trichophyton* show certain characters in common, yet there are some constant minor differences which point to the fact that there are several varieties or species of fungi included under each type. The species included under *T. microsporon* are few in number, and with one exception (that which causes the contagious herpes of the horse) almost entirely human. The species of *T. megalosporon* are numerous, and many animals as well as man are subject to affections caused by the various species.

In contradistinction to other fungi, the cultures of *trichophyton* retain their vitality for a long time. The disease has been produced artificially in animals by inoculation with material containing spores.

OIDIUM ALBICANS (Thrush Fungus).—This fungus, which was discovered by Bery and fully described by Gruby, is the cause of thrush, and occurs in all mucous membranes with squamous epithelium, especially in the mouths of infants, where it is manifested by white points or patches on the inflamed surface. The usual seat of thrush is the buccal membrane of children, but occasionally it occurs in the faucial and oesophageal surfaces; rarely in the middle ear, trachea, and subdiaphragmatic portion of the digestive tract.

Under the microscope this parasite is seen to consist of mycelial threads; numerous spherical or ovoid spaces or conidia are also present surrounding the mycelium and covering the epithelial cells.

The *oidium albicans* is strongly aerobic, growing on all the usual culture media in the presence of oxygen, best at 37° C. It does not liquefy gelatin, upon this medium forming white colonies. On agar a yellowish-white growth is developed.

It is pathogenic for rabbits when inoculated intravenously, the fungus becoming localized in the internal organs.

Haller considers that this organism is identical with, or very closely allied to, the *oidium lactis*, which occurs in milk undergoing acid fermentation.

MICROSPORON FURFUR (Pityriasis Fungus).—This fungus is the cause of *tinea* or *pityriasis versicolor*, and is found in the scales cast off by the skin in this affection. When these scales are treated with a five-per-cent. solution of caustic potash and examined microscopically, short, slightly branched mycelial threads are seen with very large conidia lying together in clusters. The fungus has not been cultivated artificially, but *tinea versicolor* has been produced by experimental inoculation, both in men and animals.

THE BLASTOMYCETES OR YEAST FUNGI.

The yeast fungi are divided into two groups: (1) *Saccharomyces* or true yeasts, in which true spore formation occurs; (2) *torula*, in which no spore formation has been observed.

The blastomycetes reproduce themselves by germi-

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nation or budding, which distinguishes them from the schizomycetes or bacteria which reproduce themselves by fission or division. From the hyphomycetes or mould fungi they are distinguished by being unicellular and by a sexual reproduction. They are round or oval cells, usually many times larger than bacteria.

These organisms are of the greatest practical importance in various commercial industries, such as brewing, baking, etc., but as yet very little is known of their pathogenic properties in man. Certain varieties, when injected into animals, have proved to be pathogenic and capable of producing tumors, and recently they have apparently been demonstrated (by Sanfelice, Plimmer, and others) in the epithelial cells in cases of cancer in the human subject; but what relation they bear, if any, to this affection is yet to be determined. They are not infrequently present in the air and in cultures made from the healthy throat.

Memmo has also stated that in some cases of hydrophobia he found a blastomycete possessing pathogenic properties which he considers to be the cause of the infection. The fungus was found in the cerebro-spinal fluid, the substance of the brain, aqueous humor, stroma of the parotid gland, and in the saliva, but never in the heart's blood or in other organs. Dogs injected with cultures of this micro-organism began, in from thirty to sixty days, to emaciate, became rabid, vomited, and finally died. Paralysis of the extremities immediately preceded death. The fungus was also found in sections of the spinal cord of a dog dead of rabies.

Judging from these experiments, which, however, require confirmation, the yeast fungi may eventually prove to be of considerable pathogenic importance.

THE PROTOZOA OR ANIMAL PARASITES.

The protozoa are the lowest forms of animal life, embracing organisms consisting of a single cell or groups of cells not separable into different tissues. They reproduce usually by fission, germination, or spore formation. The protozoa are divided into: (1) *Gymnomyxa* (including proteromorpha, mycetozoa, lobosa, labarinthulidea, heliozoa, radiolaria, and foraminifera); (2) *corticata* (including infusoria and sporozoa).

To this family of animal parasites belong the amoeba coli, the plasmodium malariae, and the pyrosoma bigemium,—the specific cause, respectively, of tropic dysentery, malarial fever, and Texas cattle fever. These organisms will be described elsewhere, so that we only refer to them here in order to complete the list of interesting pathogenic micro-organisms.

Arthur R. Guerard.

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BACTERIAL TECHNIQUE. See *Micro-Organisms: Technology*.

BAEL FRUIT.—The fruit of *Aegle Marmelos* Corroea (fam. *Rutaceae*). The bael is a sacred tree among the Hindus, and its use in medicine pertains largely to religion and mythology. It is a near relative of the orange, to which it bears a general resemblance in tree, flower, and fruit. The fruit, of the size, shape, and structure of an orange and with a somewhat similar pulp, differs in having a hard smooth shell, the pulp mucilaginous, and the seeds enclosed in a woolly covering. For medicinal purposes it is collected and dried in slices, usually in quarters, with the shell retained. In the dried condition the pulp is dry, hard, and gummy, and of a mucilaginous, slightly acid, and somewhat bitter taste. Although it contains no tannin, or any other constituent which might be expected to be medicinal, it has been recommended in diarrhoea and dysentery. Possibly the large amount of mucilage which it yields may act as a demulcent. There is no fixed dose. H. H. Rusby.

BAELZ'S DISEASE OF THE LIP is a local infection of the mucous membrane of the lips characterized by an indolent swelling and infiltration of the tissues about the mucous glands and a slow ulceration from above downward. It is a chronic disease, and ceases only with the destruction of the affected gland. It is frequently accompanied by a superficial catarrhal inflammation of the mucous membrane of the lips. It has no relation to syphilis, tuberculosis, or cancer. It is a rare affection.

TREATMENT.—Apply tincture of iodine at first every other day, later daily. By this means a cure is readily effected. *G. T. J.*

BAHAMAS.—For an account of the climate, climatology, etc., of the Bahama Islands, see the article on *Nassau*.

BAILEY SPRINGS.—Lauderdale County, Alabama. **POST-OFFICE.**—Bailey Springs. Hotel.

ACCESS.—Via the Louisville and Nashville, and the Birmingham and Sheffield railroads; also by all steamboats on the Tennessee River. Tickets should be taken to Florence, Ala., nine miles distant by carriage or stage. This is one of the old-time Southern health resorts, the springs having been in use for upward of fifty years. They are located in a picturesque valley surrounded by a semicircular range of hills, among which will be found many leafy arcades and rocky nooks. A moss-banked stream a short distance from the springs, known as Shoal Creek, supplies visitors with facilities for boating and fishing. The hotel buildings are comfortable, old-fashioned structures situated on the summit of the hill, about three hundred feet above the level of Shoal Creek. They were overhauled and brought up to modern requirements a few years ago. The springs here are seven in number, known as the "Rock," "Brick," "Sulphur," "Freestone," "Soda," "Alum," and "Sour Iron" springs. The following qualitative analysis of the first three springs is taken from the author's recent work on "The Mineral Waters of the United States." It was supplied by Dr. W. A. Moody, of Florence, Ala., and is said to have been made under the direction of the *Boston Journal of Chemistry*.

| Rock Spring. | Brick Spring. | Sulphur Spring. |
|--------------------|---------------------------|-------------------|
| Magnesium. | Carbonic acid. | Magnesium. |
| Calcium. | Sulphureted hydrogen gas. | Calcium. |
| Sodium. | Sodium carbonate. | Sulphur peroxide. |
| Chlorine. | Magnesium carbonate. | Chlorine. |
| Chlorine peroxide. | Potassium carbonate. | Iron. |
| Silica. | Sodium chloride. | Silica. |
| Potassium. | Iron oxide. | Sodium. |
| Carbonic acid. | | Carbonic acid. |
| Ammonia, a trace. | | Ammonia. |

We cannot with certainty classify the waters from this analysis, although the "Rock" spring would appear to be an alkaline and the "Brick" and "Sulphur" springs alkaline chalybeates.

The waters are recommended for renal disease attended by dropsy, for dyspepsia, and for anæmia and general debility. They are believed to possess sedative effects upon the nervous system, and in virtue of this action are prescribed in cases of restlessness and insomnia due to alcoholism, overwork, anxiety, etc.

The "Alum" spring has acquired considerable reputation in the local treatment of skin affections, ulcerations, and inflammatory affections of the eye.

James K. Crook.

BALANITES ROXBURGHII (Planch).—(Fam. *Simarubaceæ*.) The bark and fruit of this small tree are ancient drugs of India, where they are used as purgatives and anthelmintics, both for human beings and for cattle. The active principle, or the chief one, appears to be saponin. Oil of Balanites is obtained from the kernels, and is said to be similar to peanut oil.

H. H. Rusby.

BALANITIS AND BALANO-POSTHITIS.—(*βάλανος*, an acorn; *πόσθη*, the foreskin.) An inflammation of the mucous membrane covering the glans penis (balanitis) and of that lining the prepuce (posthitis). This is a purely local affection which occurs very commonly as a complication of the various venereal diseases and, much more rarely, with diabetes mellitus. It has, however, no necessary relation with either, and results more often from other and simpler forms of irritation.

ETIOLOGY.—The anatomy of the part is the predisposing cause for this inflammation, the apposing surfaces of the mucous membrane favoring the retention of urine, smegma, or various pathological discharges until they may decompose and serve as irritants for the delicate mucous surfaces. If a prepuce is redundant and phimotic the opportunities for such retention of irritating substances are so much the greater.

Diabetes, rheumatism, and gout also predispose to this disease.

The immediate cause of the inflammation may be the mechanical irritation of friction (chafing of clothing, etc.) or the irritating discharges of syphilitic and chancroidal lesions, and urethral discharges, gonorrhœal or non-gonorrhœal. Vaginal and uterine discharges introduced under the prepuce during coitus may also serve as the exciting cause of the inflammation. By far the commonest cause, however, is uncleanness and the consequent decomposition of urine and smegma with resulting irritation, and Fournier says that two-thirds of all cases are caused in this way by simple lack of cleanliness, while the other third is caused by the irritation of venereal discharges.

SYMPTOMS.—In the common and mild type of this inflammation a sensation of heat and itching is usually the first suggestion of trouble. Examination reveals a reddened and swollen membrane and the beginnings of an offensive discharge of a thick creamy character. The intensity of the process is usually greatest in the sulcus back of the corona glandis, as it is there that the discharge has the best opportunity to accumulate. If the disease progresses a stage further, the next result is a series of small excoriations which, together with a more profuse discharge and a much greater swelling of the prepuce (which in its turn results in a more or less complete inflammatory phimosis), completes the picture of the severe type of the disease which often occurs as a complication of syphilis, chancroid, and gonorrhœa. Even in these cases the complication is not the result of the activity of the specific germs of these diseases, but is a consequence of the irritating character of their discharges, or of an infection with pus-producing germs contained in them.

The erosions sometimes extend and involve most of the mucous membrane of both glans and prepuce, in which case they are apt to develop a circinate margin which is quite characteristic.

COMPLICATIONS.—Occasionally the process becomes so severe that *gangrene* results unless interference be prompt and effectual. The sloughing process may result in a more or less complete destruction of the prepuce and the formation of considerable cicatricial tissue. Occasionally the glans penis is found protruding through an opening which has sloughed through the prepuce. Such extreme destruction of tissue takes place naturally only in phimotic cases in which operative interference is impossible or is neglected.

An *hypertrophy* of the tissues of both prepuce and glans penis, similar to that seen at times as a result of the long-continued irritation of a rubber urinal, may result in persons who are subject to repeated attacks of balanitis. This hypertrophy is said to occur more commonly in the balanitis which accompanies diabetes mellitus, and the thick, rigid prepuce is often a great mechanical annoyance. It may, finally, assume an epitheliomatous character.

Condylomata frequently develop, most frequently in the post-coronal sulcus, in cases of recurrent balanitis.

Lymphadenitis occurs, but rarely results in suppurating bubo.

Paraphimosis of the thickened and inflamed prepuce is not an uncommon complication.

DIAGNOSIS.—The diagnosis is usually easy except in cases in which inflammatory phimosis exists and a purulent discharge with non-retractile prepuce is present. In such cases a distinct, localized area of induration felt through the swollen prepuce suggests the initial lesion of syphilis, and continued search generally reveals other indications of that disease. Gonococci in the pus establish the gonorrhœal origin of the process, while the extent of the inflammation together with its rapid progress and the frequent presence of chancroidal ulcers on the preputial margin will usually serve to indicate the chancroidal origin of the disease. If the prepuce is retractile and the lesions can be seen and examined, the diagnosis is usually simple. The history of the case and the appearance of other lesions usually make the syphilitic origin of the inflammation plain, while the markedly circumscribed character of the erosions (which quickly become typical chancroidal ulcers), together with the greater inflammatory hardness and thickening of the tissues of the glans and prepuce, usually leave no doubt as to the chancroidal character of the process. Erosions due to herpes cannot always be distinguished from those of balanitis, although in most cases some few small, discrete, herpetic vesicles will prove characteristic enough to make the diagnosis clear.

PROGNOSIS.—The prognosis is good, but one should not forget the possibility of the gangrene, which occurs rarely in old and debilitated persons or in those cases in which proper treatment is neglected or is impossible.

TREATMENT.—The prophylaxis of this inflammation consists in cleanliness. Retraction of the prepuce and daily washing of the subpreputial cavity usually suffice to prevent a recurrence of the trouble.

Treatment of the ordinary type of the inflammation should be carried out about as follows: (1) retraction of the prepuce; (2) a mild antiseptic wash, e.g., dilute lead wash or 1 to 5,000 corrosive sublimate; (3) careful drying of the exposed surfaces in such a manner as not to chafe and irritate them; (4) dusting on an unirritating powder such as bismuth, bismuth and calomel in equal parts, aristol (in the chancroidal cases), oxalate of cerium; (5) separating the powdered surfaces of membrane by a very thin layer of absorbent cotton.

If the discharge is profuse and the erosions are extensive it is often of advantage to omit the powder and to substitute a thin layer of absorbent cotton wrapped about the glans penis and then moistened with lead wash or some equally unirritating lotion. Erosions or ulcerations which do not heal readily should be gently touched with a bit of cotton on a cotton carrier slightly moistened with a solution of nitrate of silver—five to twenty per cent, as needed in individual cases.

Phimotic cases are often very troublesome, as their proper cleansing is wellnigh impossible of attainment. They should be irrigated very often, in severe cases every hour or two, with warm water followed by mild antiseptic solutions, a large urethral syringe with a blunt nozzle being as convenient an instrument as any for the purpose. Corrosive sublimate solution, 1 to 5,000, carbolic acid solution, 1 to 100, lysol, and creolin are all good irrigating fluids, but the writer does not approve of the use of peroxide of hydrogen in these cases, as it is very irritating and often causes much preputial swelling if used in strength sufficient to make it of much value.

If the disease proves stubborn and there is a probability that the ulcerative process is extending under the tight and swollen foreskin, every effort should be made to reduce the acuteness of the inflammation with hot soaks, etc., and then an operation under the strictest aseptic and antiseptic precautions should be performed, the patient being told that he is not to expect a primary healing. In such cases the dorsal incision of the prepuce may prove adequate to the needs of the case, but more frequently a complete circumcision is necessary. Even

in the chancroidal cases the writer has never met with any untoward result from such operative procedures, although primary healing is by no means the rule.

In all cases, however mild, care should be taken in urinating to retract the foreskin sufficiently to lay bare the region of the meatus if possible, so that the urine may pass clear of the prepuce and not contaminate the subpreputial cotton, and so render its very frequent renewal more than ever imperative.

Cleanliness, then, with mild but constantly repeated antiseptic washes, and the dorsal incision or circumcision when needed in severe cases, form the basis of all treatment. *Paul Thorndike.*

BALATA.—*Balata Gum.* A caoutchouc-like substance, intermediate in properties between india rubber and gutta-percha, which is the concrete milky juice of at least two species of *Mimusops*, *M. Balata* Gaertn. and *M. Schomburgkii* (Pierre) (*M. Balata Schomburgkii* Pierre). This substance is not to be mistaken for *gum chicle*, of which chewing-gum is made, the product of *Achras Sapota* and other trees. The balatas are very large trees of Guiana and adjacent Venezuela, where they are popularly known as "bullet tree" or "bully tree." They frequently become four to six feet in diameter, and the wood is strong and valuable. The fruit is globular, mostly a little less than an inch in diameter, the space between the large seeds and the crustaceous exocarp being filled with an edible, rich and sugary pulp. As the writer has seen the gum collected upon the lower Orinoco, the trees are felled and girdled with grooves about ten inches apart. These grooves are cut through the bark to, or a little into, the wood, and conduct the exuding juice to the lower side of the trunk, where it is caught by small cups. Various methods are resorted to for its coagulation. The favorite one is to mix it with alcohol, or strong native rum, the coagulum then being pressed into cakes. Operations are now being conducted for extracting it from the bark, twigs, and leaves by the use of solvents. Up to the present, no distinct uses in medicine have been found for this substance, but it has many uses in the arts. *H. H. Rusby.*

BALLARDVILLE LITHIA SPRING.—Middlesex County, Massachusetts. The location of this spring has not, we believe, been improved as a resort. It is situated on the side of a high hill, in a barren, rocky tract of country, with no dwelling within a mile. Land to the extent of fifty acres belonging to the Ballardville Lithia Company surrounds the spring. The water is beautifully clear and very pleasing to the palate, especially when charged with gas. It is said that the rocky deposits in the neighborhood contain a large proportion of such lithia-bearing minerals as spodumene and lepidolite. It is to this fact, we are informed, that the water owes its remarkable richness in this salt, as shown by the following analysis made by Dr. Bennett F. Davenport:

| ONE UNITED STATES GALLON CONTAINS: | |
|------------------------------------|---------|
| Solids. | Grains. |
| Lithium carbonate..... | 22.01 |
| Calcium carbonate..... | 0.82 |
| Iron oxide..... | 0.70 |
| Calcium chloride..... | 0.52 |
| Silica..... | 0.46 |
| Total..... | 24.51 |

The water is said to be valuable in the various conditions produced by the retention of uric acid in the system, notably gout, concretions in the joints, kidneys, and bladder, and in certain forms of rheumatism. It is also useful in gouty affections of the skin, bronchial tubes, and kidneys. It is bottled and used commercially. *James K. Crook.*

BALLSTON SPA.—Saratoga County, New York. **POST-OFFICE.**—Ballston. Hotels. **ACCESS.**—From Albany via Delaware and Hudson Railroad, thirty miles north. The location is seven miles southeast of Saratoga Springs.

The fame of Ballston Springs is almost coeval with that of Saratoga, and at one time it was a formidable rival of that celebrated resort. Ballston is a very attractive town, where those who wish to avoid the whirl of Saratoga may live quietly and drink excellent mineral waters at the same time. Some of the springs are very heavily mineralized. Following are analyses of four of the most important:—

ONE UNITED STATES GALLON CONTAINS:

| Solids. | Sans Soud Spring, J. H. Steele, Grains. | Artesian Lithia Spring, C. F. Chandler, Grains. | Franklin Artesian Well, C. F. Chandler, Grains. | United States, L. C. Beck, Grains. |
|--|--|--|--|--|
| | | | | |
| Sodium carbonate | 12.66 | 11.93 | 94.90 | 16.88 |
| Sodium bicarbonate | ..... | ..... | ..... | ..... |
| Calcium carbonate (with iron oxide) | 43.41 | 238.16 | 202.33 | 29.20 |
| Calcium bicarbonate | ..... | ..... | ..... | ..... |
| Magnesium carbonate | 39.10 | 180.60 | 177.87 | 5.76 |
| Magnesium bicarbonate | ..... | 0.87 | Trace. | ..... |
| Strontium carbonate | ..... | 7.75 | 6.78 | ..... |
| Lithium bicarbonate | 5.95 | ..... | ..... | ..... |
| Iron carbonate | ..... | 1.58 | 1.61 | ..... |
| Iron bicarbonate | ..... | 3.88 | 1.23 | ..... |
| Barium bicarbonate | ..... | ..... | ..... | 1.76 |
| Potassium sulphate | ..... | 0.52 | 0.76 | ..... |
| Sodium phosphate | ..... | 0.05 | 0.01 | ..... |
| Sodium borate | ..... | Trace. | Trace. | ..... |
| Sodium chloride | ..... | 750.05 | 659.34 | 424.96 |
| Potassium chloride | ..... | 33.23 | 33.93 | ..... |
| Sodium bromide | 143.73 | 3.64 | 4.67 | ..... |
| Calcium fluoride | ..... | Trace. | Trace. | ..... |
| Sodium iodide | 1.30 | 0.12 | 0.24 | ..... |
| Alumina | ..... | 0.08 | 0.26 | ..... |
| Silica | 1.00 | 0.76 | 0.74 | 8.00 |
| Organic matter | ..... | Trace. | Trace. | ..... |
| Total | 247.15 | 1,233.25 | 1,184.37 | 486.56 |
| Gas. | Cubic Inches. | Cubic Inches. | Cubic Inches. | Cubic Inches. |
| Carbonic acid | ..... | 4,261.14 | 460.06 | 244.00 |

It will thus be observed that these waters are quite similar to those of Saratoga. Some of them are indeed much richer in mineral ingredients than any of the Saratoga waters. They are all saline, but some of them, as will be seen, are quite heavily impregnated with calcium, iron, and magnesium. The waters are certainly of great value for medicinal purposes. There are several other well-known springs at Ballston, among them being the Washington Lithia Well and the Iron Spring.

James K. Crook.

BALM.—This name, as well as various compounds of it, has been applied to so many different plants that its use is altogether indefinite. Only four of these drugs are of any degree of importance, and their descriptions should be sought as follows: For Lemon Balm, to which the term balm is most appropriately applied, see the next; for Bee Balm, see *Monarda*; for Patchouli Balm, see *Patchouli*; for Mountain Balm, see *Yerba Santa*.

H. H. Rusby.

BALM, LEMON. MELISSA.—“The leaves and tops of *Melissa officinalis* L. (fam. *Labiatae*)” (U. S. P.). This is a perennial herb, from one-half to one metre in height (twenty to forty inches), with several branching, leafy stems. The branches are quadrangular, the leaves opposite, petiolate, about 5 cm. long, ovate, obtuse, rounded or subcordate at the base, crenate, somewhat hairy, glandular; flowers in about four-flowered cymes, with a tubular, bell-shaped, five-toothed calyx, a whitish or purplish bilabiate corolla, and four stamens; fragrant; somewhat astringent and bitterish.

The plant is a native of Southern Europe, and is frequently cultivated in Europe for the sake of its oil. It is now and then met with in American gardens.

The botanical description, given above, will serve for that of the drug, which, it may be remarked, loses very much of its fragrance in drying. Its principal constituent is the agreeable oil of balm, *Oleum Melissa* (not to be confounded with the East Indian oil of citronella, which resembles it), of which it contains a small percentage (one-eighth to one-fourth per cent.).



FIG. 453.—Balm. Plant in flower reduced and flower enlarged. (Cré.)

Melissa has, in sufficient doses, the stimulant properties of the order, but as usually used is scarcely more than a flavor. An infusion of the herb can be given *ad libitum*, and when taken hot and in large quantity, like other mints, with the aid of hot water and plenty of coverings, is sudorific. The dose of the oil is $\mathfrak{m}\text{ss}$, ad $\mathfrak{m}\text{v}$.

W. P. Bolles.

BALM OF GILEAD.—A resinous exudation or so-called balsam, from the *Balsamodendron Gileadense* Kunth (fam. *Burseraceae*), a small tree of the Red Sea region. It has ordinary aromatic stimulant properties. It is no longer in use, but possesses considerable historical interest. The name has also been applied to our northern balsam fir and its products (see *Canada Balsam*), as well as to the buds of *Populus candicans* Aiton.

H. H. Rusby.

BALSAMUM PERUVIANUM.—*Balsam of Peru*. “A balsam obtained from *Toluijera Pereira* (Royle) Baillon (fam. *Leguminosae*)” (U. S. P.). This is a good-sized tree, with a dark, smooth trunk, branching near the ground. It attains often a height of sixteen or eighteen metres (fifty feet), and resembles, in its botanical characters, *T. balsamum*, described in the succeeding article. It is a native of Central America, and protected, but not really cultivated, as a source of the balsam, in the Indian reservation lands of San Salvador, along the Balsam Coast. It has been introduced into Ceylon, where it flourishes vigorously.

Balsam of Peru was one of the earliest products carried to the Old World from Central America, and was at first extravagantly prized for its medicinal properties, as well as for its use as incense in the Catholic churches. It was at first exported indirectly, by way of more southern South American ports, and by this means it received its misleading name of balsam of Peru. None genuine is now, or ever has been, produced in the state of Peru.

The collection is made in November or December, at the end of the rainy season, when the bark is full of resin. The Indians, to whom the trees belong, then beat the trunks on four sides with the heads of their axes, or with hammers, so as to bruise four strips of bark, and leave as many similar ones untouched. After a few days, they scorch or ignite the contused surfaces with torches, which serves to increase the flow of resin, and then, waiting another week, tear off the loosened strips of bruised bark and swathe the stems in rags, to absorb it. When the cloths are saturated, they are boiled in a vessel of water, and the balsam melted out of them collects in the bottom, and is easily separated. The trees are not killed by the process. The following year the remaining portions are similarly treated; and in the second year those operated upon first; so, by judicious treatment, a continuous annual yield is obtained.

Balsam of Peru is a dark, thickish liquid, looking at a little distance like dark molasses; it does not draw out

into a thread and is not sticky; when shaken up upon the sides of a containing glass, the thin layer so obtained is yellowish or reddish brown and transparent. Its specific gravity is 1.135 to 1.50 at 15° C. A specific gravity of 1.137 or higher will exclude the more important adulterants. It has a rather smoky but not unpleasant balsamic, and a slightly vanilla-like odor, and a taste which, at first mild, becomes later, in the fauces, warm and acrid. It is insoluble in water, yielding to it only a little free cinnamic acid, but mixes freely with chloroform and absolute alcohol. It does not dry or undergo much change upon exposure to the atmosphere, and should contain no fat. Thirty per cent. of it should dissolve in benzin.

The composition of the balsam is not very simple, but the principal constituents are: (1) not more than thirty-two per cent. of a resin insoluble in carbon disulphide, and which may be separated by means of that agent; (2) nearly sixty per cent. of cinnaméin, a brownish, aromatic liquid (benzyl cinnamate, which this is supposed essentially to be when pure, is a crystalline solid); (3) traces of cinnamic and benzoic acids and more or less styrol and styracin. Additional amounts of benzoic and cinnamic acids, with styrol and toluol, are obtained on dry distillation. Benzoate of benzyl also occurs in varying amounts. At least sixty-five per cent. of it should consist of aromatic substances. Balsam of Peru has no specific physiological action. It is a mild carminative and diffusive stimulant, and acts as an antiseptic, especially in excretion through the urinary passages. Locally, it is mildly parasiticidal, and it acts as a disinfectant and stimulating application to wounds and ulcers which lack a disposition to heal. For the latter purpose, a ten-per cent. solution in castor oil or vaseline is used. The dose is 0.6 to 2.0 c.c. (℥ x. to xxx.). There is no official preparation. The volatile oil, distilled off, is an article of commerce used in perfumery.

Henry H. Rusby.

BALSAMUM TOLUTANUM.—*Balsam of Tolu*. “A balsam obtained from *Toluijera Balsamum* L. (fam. *Leguminosae*)” (U. S. P.).

This is a fine, large evergreen tree, with a tall, straight stem, often rising from thirteen to nineteen metres (forty to sixty feet) without a branch, then bearing a fine round crown. It has alternate, glandular, odd-pinnate leaves of from seven to eleven divisions, and small flowers, in axillary racemes, not very irregular. It differs from the last chiefly in the more tubular calyx and in the fruit, which is not narrowed, but winged at the base. The leaves contain abundance of fragrant oil, the branches and stem are filled with oil and resin. It is a native of Venezuela and New Granada. The balsam has been exported from the latter state since the middle of the sixteenth century. It is collected by the Indians, and was already an object of value among them when the country was discovered. Deep V-shaped incisions are made in the trunk, and at or below the point where they meet a vessel is fastened to receive the exudation. These receptacles are usually calabashes or gourds, and many such may be arranged at the same time around the stem of a large tree. As they become filled, they are emptied into leather bags, in which they are carried to the market or town, and there again they are at present usually emptied into tin cans for exportation.

It is a soft brown, resinous substance, when fresh sometimes thin enough to pour; usually soft enough to be dipped out with a spoon or spatula, but upon exposure becomes harder and finally brittle, although easily softened by warmth. It has a brown color, but in thin layers is yellowish, and either transparent or cloudy, by the deposition of crystals of cinnamic acid. The odor is delicate and very pleasant, recalling that of Siam benzoin, and improves with age. The balsam is almost insoluble in water, but freely soluble in alcohol and chloroform. Its most important constituent is benzyl benzoate, a volatile oil, but solid at a temperature below 20° C. There are also some benzyl cinnamate, traces of cinnamic and benzoic acids, and a variable amount of resin, usually nearly

ninety per cent. About one per cent. of a volatile oil (toluene) is obtained upon distilling with water. The resin can be separated into two resins by treatment with alcohol.

The medicinal qualities of tolu are even less marked than those of Peru balsam, as the acrid quality of the latter is almost wanting in the former; still it is very much the more in use, on account of its pleasant odor and taste. It is usually called expectorant, etc., and is a common ingredient in cough and similar mixtures, but in a form which is medically wholly inert, further than for a passing local effect upon the fauces. If given with any expectation of modifying the bronchial surfaces, it must be in doses of not less than 1 or 2 gm (1 to 2 gm. = gr. xv. ad xxx.), or, probably, better by vapor. Of the preparations, the syrup has a strength of one per cent., and that of the oil and crystallizable acids only, not of the resin. It is simply a vehicle. The tincture, *Tinctura Tolutanum*, U. S. P., strength ten per cent., represents the entire balsam, but contains a large dose of alcohol in addition to the medicine in question. In the compound tincture of benzoin (*Tinctura Benzoini Composita*, U. S. P.) it is a subordinate adjunct. The best ways to give the balsam internally and alone are by pill or an emulsion extemporaneously made. Both this and the preceding balsam are used in toilet soaps and for similar purposes, as perfumes, etc.

W. P. Bolles.

BALTIMORE, MD.—The chief city of Maryland, with a population of 590,000. It is picturesquely situated on the north branch of the Patapsco River, 14 miles from its entrance into Chesapeake Bay, and about 200 miles from the ocean. It is a large manufacturing and commercial centre, and has a spacious and safe harbor. It is the seat of the great Johns Hopkins University and Hospital, is well built, and has a large park of 680 acres (Druid Hill Park). It is about 40 miles from Washington and 100 miles from Philadelphia. It is said to be a very healthy city, and has a mild climate, as the following table indicates:

CLIMATE OF BALTIMORE, MD., LATITUDE 39° 18', LONGITUDE 76° 37'. PERIOD OF OBSERVATION, 13 YEARS; ELEVATION OF PLACE OF OBSERVATION ABOVE SEA LEVEL, 14 FEET.

| Data. | January. | July. | Year. |
|---------------------------------------|----------|----------|----------|
| Temperature—Average mean or normal | 34.6° F. | 78.5° F. | 55.5° F. |
| Average daily range | 13.5° F. | 16.8° F. | ..... |
| Mean of warmest | 40.5° F. | 86.8° F. | ..... |
| Mean of coldest | 27° F. | 70° F. | ..... |
| Highest or maximum | 71° F. | 98° F. | ..... |
| Lowest or minimum | 6° F. | 59° F. | ..... |
| Humidity—Average mean relative | 70.8% | 64.2% | 66.4% |
| Precipitation—Average in inches | 3.05 | 4.06 | 41.98 |
| Wind—Prevailing direction | N.W. | S.W. | N.W. |
| Average hourly velocity in miles | 5.5 | 5.6 | 5.8 |
| Weather—Average number of clear days | 7 | 9.2 | 108 |
| Average number of fair days | 13.2 | 14.5 | 151.7 |
| Average number of fair and clear days | 20.2 | 23.7 | 259.7 |

Explanation of Temperature.—The average mean or normal temperature is deduced from the mean temperature of individual months, obtained from three daily observations, viz., at 7 A.M., 3 P.M., and 11 P.M. For example, the mean temperature for all the Januaries of the twelve years was 31.5° F. at 7 A.M.; 38.2° F. at 3 P.M.; and 34.2° F. at 11 P.M. Adding these together and dividing by three we have 34.6° F. as the average mean January temperature for the period.

The mean of the highest temperature for any given month is the average daily maximum temperature of all the days of that month throughout the entire period of observation. Thus, for example, in the period of thirteen years there are, for the month of January, $13 \times 31 = 403$ days, and 40.5° F. represents the maximum height which the thermometer may be expected to reach on each of these days. This temperature, therefore, represents the maximum temperature of a normal January, day. In the same way the mean of the coldest is obtained; if we subtract one from the other we have the average daily varia-