

between the processes observed and human cirrhosis, and indeed tobacco has never been noted as one of the causes of the latter. As a result of somewhat similar experiments Kohos found small, hard livers.

The effects on the blood have been studied experimentally by Vas on puppies. After eight weeks he noted marked anemia, the hemoglobin and red corpuscles decreasing over a half. The solid residue and the alkalinity decreased a little while the white corpuscles were decidedly augmented.

Of all the effects of chronic tobacco poisoning the most important, both from their frequency and from their severity, are those which have to do with the circulatory system. Though sometimes seen in boys, they generally result from long-continued abuse. They are said to be most frequently caused by Havana cigars. Many if not most of the cases, like the writer's patient previously referred to, are predisposed by other conditions, such as alcoholic excess, emotional strain, over-exercise, nervous disease, convalescence from acute diseases, bad habits, or indigestion. Epidemics of tobacco angina, like those described by Kleefeldt and Gélineau, may depend largely on such predisposing influences. In the latter instance a series of cases appeared on a French man-of-war, where the men, debilitated by scurvy and poor food, smoked to excess in a small close apartment.

Although the clinically observed effects of tobacco have not been fully explained, the following facts are of importance: 1. The work of the heart is increased by the vaso-motor contraction and consequent increase of the peripheral resistance, *i. e.*, the blood pressure. That this results from the administration of nicotine has been amply demonstrated by experiments. But, so far as the writer is aware, it has not been shown to result in habitual smokers from each indulgence. Such proof is all the more needed since smoke contains pyridine as well as nicotine, and the effect of the former is to reduce, and not to raise, the blood pressure. 2. Any such additional work has to be done by a heart hampered by the disturbing action of the drug on the nerve centres and muscle fibres. 3. The heart is at the same time further embarrassed by decrease of its blood supply through contraction of the coronaries. That this takes place has not been conclusively demonstrated by experiments, though the work of Beyer points in this direction, but it is accepted clinically by Huchard, Farvarger, and others.

It is probable that in far the greater number of cases the cardiac symptoms of chronic nicotine poisoning are due to functional disturbances without gross pathological lesions. Occasionally, however, after long-continued abuse, hypertrophy may result from the above-mentioned factors, especially the first. Fatty degeneration and other forms of myocarditis have been attributed to the myocardial ischemia. Huchard believes that the constantly repeated vascular contractions and rises of blood pressure may result in arteriosclerosis. Tobacco is not ordinarily considered to be one of the causes of this common condition. There is, however, just a suggestion in some recent experimental work that such may be the case. If, as Huchard believes, the sclerosis may involve the coronaries, myocarditis and true angina might result as from the same conditions due to any other cause.

The symptoms most commonly seen are those of "irritable heart." They are often associated with digestive disturbances. Palpitations are commonly complained of, with dyspnoea, ordinarily mild. Asthmatic symptoms may be present. Heart pain is common; it is usually slight and transient, but every gradation exists from the mildest to the terribly severe attacks justly described as anginal. Pallor, cold extremities, cold sweating, tremor and muscular weakness, small and feeble pulse, vertigo, headache, amnesia, psychical irritation, and even aphasia or transitory hemiplegia (spinal or cerebral anemia) are considered by Huchard to result from the contraction of the vessels of the organs involved. To say the least, many of these symptoms are extremely uncommon.

Physical examination of the heart may show absolutely nothing abnormal. Generally there is irregularity or

intermittence, which may be very marked. Rapidity is common, and is especially shown in the undue degree and permanence of the increase in pulse rate on suddenly sitting up or after slight exertion. The symptoms and signs of hypertrophy, fatty degeneration, and arteriosclerosis need not be described here, since they are at best rare and doubtful results of tobacco, and do not differ from the same conditions produced in other ways.

Attacks of heart pain, severe enough to be classed as true angina pectoris, are extremely rare. Osler states (1897) that he has seen but two cases as results of tobacco. Huchard describes three forms: (1) Functional (*angine spasmo-tabagique*), due to spasm of the coronaries. (2) Organic cases (*angine scléro-tabagique*), due to organic stenosis of the coronaries. (3) A benign form (*angine gastro-tabagique*), precipitated by gastric disorder. The first of these, though the symptoms may be very severe, almost always recovers in a fortnight after the withdrawal of tobacco; the second is always fatal; the third is the most benign of all, and disappears on withdrawal of the tobacco or curing the indigestion.

The following are among the peculiarities of the angina due to tobacco mentioned by Huchard: Vaso-motor symptoms are common—pallor, vertigo, small pulse, syncope. Other evidences of nicotine poisoning, like amblyopia, may be seen. Irregularity and rapidity of the pulse are more common than in angina due to other causes. The attacks are more apt to be slight or abortive, and are usually spontaneous.

Various effects on the central nervous system have been ascribed to tobacco. Vertigo, headache, muscular tremor, and debility are not uncommon. Tobacco as a rule favors sleep, but an unusually strong cigar may have the opposite effect. Huchard attributes all these things to ischaemia of the nerve centres, as he does the rare cases of aphasia and transient hemiplegia. In the experiments of Vas, already alluded to, degenerative changes were noted in the cells of the spinal and sympathetic ganglia similar to those caused by certain other poisons. Peripheral neuritis and neuralgia are described, but it is probable that serious nervous diseases of an organic nature, such as locomotor ataxia or general paralysis, are never caused. Insanity has been attributed to tobacco and a peculiar psychosis is mentioned. Its rarity may be judged by the fact that Kraepelin says he has never seen anything of the kind. Any influence that tobacco has in this respect is probably an indirect one, due to the general physical depression, or to the marked injury of some particular organ.

The effect of tobacco on the eyes is universally recognized. An amblyopia of a specific type may certainly result from the abuse of tobacco, though alcohol is often an auxiliary factor. It is commonest in men beyond the age of thirty-five, and is said to be more common in smokers than in chewers. Dowling found some evidence of amblyopia in 45 out of 150 tobacco workers, all of whom smoked or chewed. Hirschberg found 7 cases in an ophthalmic clinic of 18,000; Galezowski, from 5 to 15 in 1,000; Landolt, 12 in 2,771. Pathologically the amblyopia is considered by some to be a retrobulbar interstitial neuritis, involving the papillo-macular bundle. Recently several investigators have attributed the cause to retinal changes taking place in the macular region, the degenerative changes in the papillo-macular bundle being secondary.

There is dimness of vision, not improved by glasses. The patient may see best at night or in a dim light. The most characteristic finding is the central scotoma for color, a condition which is almost pathognomonic of toxic amblyopia. The ability to distinguish green is usually lost first, then red, and finally blue. The scotoma may later exist for form as well as for color. The periphery of the visual field remains normal. With the ophthalmoscope the papilla is normal at first or slightly congested, then evidences of atrophy appear on the temporal side of the disc and finally become general.

Certain French writers have claimed that tobacco may cause sexual impotence, and have found experimental

evidence of degenerative processes in the testicles. Symptoms of this sort are certainly not common, and again there is difficulty in establishing the fact that tobacco is the cause.

As to the effects of tobacco on the general development, the puppies to whom Vas continuously administered nicotine lost weight very decidedly, while the rabbits, to whom Adler administered tobacco, retained perfect health for months. The statistics for one of the Yale classes is said to have shown that the men who did not use tobacco gained much more rapidly in weight, height, chest girth, and lung capacity than the moderate smokers, while the latter exceeded the excessive smokers. Thus the popular belief that tobacco "stunts the growth" appears to have some support.

In some diseased conditions the use of tobacco is undoubtedly injurious, though here, if a patient has always used tobacco, the hardship entailed by giving it up may be more deleterious than its continuance in moderation. In mental diseases Bucelli considers that its use is inadvisable, particularly in convalescents. As regards tuberculosis the views of different writers have varied from those of Melier and Ruef, who considered that tobacco was beneficial, to that of Benjamin Waterhouse, who, in 1805, thought that tobacco was the cause of the prevailing ill health of Harvard students, and especially of the increase in phthisis. Recently Stern has shown that the use of tobacco may aggravate an existing glycosuria, and even, though infrequently, cause it.

Tazzinari has subjected various pathogenic organisms to the action of cigar smoke, and shown that it very decidedly retards the development of some pathogenic bacteria, and wholly prevents that of certain others. The effect was most marked on the organisms of Asiatic cholera, typhoid, and pneumonia. Some have inferred that smoking is of value in the prophylaxis and treatment of such diseases as diphtheria.

Arguments in favor of the use of tobacco on this or similar grounds have little weight. Its great value, after all, is the pleasure and mental satisfaction it affords. That tobacco is of great service to humanity in this way there can be no doubt. Most military writers admit that it is of value to soldiers, helping to pass the time in monotonous camps and acting as a nervous sedative in times of hardship and anxiety, as well as preventing the sense of hunger when food is scarce. Socially it has objections on account of its odor and in the habit of promiscuous spitting. It need not be expensive. Used in moderation by healthy adults it will seldom do serious harm. Surely it should not be classed with alcohol and morphine, but more properly with tea and coffee. The commonest of the more serious injuries are those having to do with the heart and the eyes.

The prognosis of the functional disorders resulting from over-indulgence in tobacco is good. They usually disappear promptly on ceasing the habit. If organic changes have taken place the prognosis is more grave. Thus the general or coronary arteriosclerosis, if such a lesion does result from tobacco, will not improve. The amblyopia usually recovers completely if proper treatment is instituted early enough; but, if the habit is persisted in, a high grade of ocular deficiency may become permanent.

**Treatment.**—Physicians should do all in their power to prevent the excessive use of tobacco, especially by women and young persons. Moderation, or better abstinence, should be observed by persons convalescing from acute diseases, those suffering from anemia, gastric disorders, cardiac abnormalities, especially myocarditis, and other depressed states, even though they may have previously smoked with impunity. The combination of alcohol and tobacco is especially dangerous. Smokers will decrease the dangers if they will use pipes with long stems and keep them well cleaned. Notoriously strong tobacco should be avoided. The smoke should not be inhaled. Cigars should not be smoked too close to the end, nor held too long in the mouth. "Cold smoking" and chewing the ends of cigars are to be avoided. Athletes in

training should avoid tobacco. Farvarger advises smoking only after meals. This decreases the quantity of tobacco smoked, and any irritating saliva which is swallowed comes into less intimate contact with the mucous membrane of the stomach.

When any of the symptoms of chronic tobacco poisoning appear, especially if the heart, nervous system, or eyes are affected, the habit should be given up entirely. This is difficult, but there is no particular danger in sudden withdrawal as "abstinence symptoms" do not occur in the same sense as they do after sudden withdrawal of alcohol or morphine. Abstinence must be prolonged, since, when symptoms have once begun, they are prone to recur. Alcohol must also be absolutely forbidden. Other predisposing conditions should receive attention. An abundant supply of easily digested food should be given and fresh air and general tonic treatment instituted.

For drugs strychnine is of value in full doses. Iodide of potassium is also recommended for the amblyopia. Tobacco angina and the other cardiac manifestations are to be treated by rest, small doses of digitalis and other heart stimulants, iodide of potassium, nitroglycerin or inhalations of amyl nitrite as in the same conditions from other causes.

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**TOLENAS SPRINGS.**—Solano County, California. These well-known springs are located about five miles north of the town of Suisun in Solano County, adjoining the famous Tolenas onyx quarries. They are reached by rail from San Francisco or Sacramento to Suisun, and thence by stage over a good level road. The resort is 1,253 feet above the sea, and is pleasantly located. On a clear day the State Capitol, Suisun Bay and Valley, and many other points of interest are easily seen. There are nineteen springs in all at Tolenas, flowing between six hundred and seven hundred gallons per hour. The temperature of the water varies from 60° to

65° F. The springs have had a local reputation for over thirty years, and of late the water has been bottled and sold extensively all over the State. The resort is at this time in a very flourishing condition. Two analyses have been made, one by J. Hewston, Jr., and the other by Dr. Winslow Anderson. They show no important difference in their results. Following is Anderson's analysis:

One United States gallon contains (solids): Sodium chloride, gr. 194.16; sodium carbonate, gr. 46.93; sodium bicarbonate, gr. 6.45; sodium biphosphate, gr. 19.13; potassium chloride, gr. 6.47; potassium iodide, gr. 1.75; magnesium carbonate, gr. 11.58; calcium carbonate, gr. 49.80; ferrous carbonate, gr. 0.89; alumina, gr. 1.10; silicates, gr. 1.92; organic matter, a trace. Total solids, 340.18 grains. Free carbonic acid gas, 31.27 cubic inches. Temperature of water, 61.5° F.

Hewston's analysis shows 360 grains of solid matter to the gallon. The water is warmly indorsed by many who have used it. In chronic skin affections, eczema, scrofula, and syphilitic infections it seems to act well. Chronic gastric disturbances, kidney and bladder diseases also improve under its use. The water is gently aperient and strongly diuretic.

James K. Crook.

**TOLIPYRINE.**—This substance differs from antipyrin only in the substitution of the methyl group, CH<sub>3</sub>, for one atom of hydrogen in the phenyl group. It is a white crystalline powder very similar to antipyrin in its physical as well as its therapeutic qualities. The indications for its use are the same as those for antipyrin, the dose being somewhat less—one part being equal to one and a half parts of the older drug. Its dose is given as from eight to thirty grains.

A salicylate of tolipyryne has been prepared to which the name of *tolysal* has been given. It bears the same relation to tolipyryne that salicyryne does to antipyrin. It is a crystalline, almost colorless (faintly pinkish) substance, lustreless, and with a bitter taste. In doses of fifteen grains every two hours it is said to be of much value in acute rheumatic attacks.

Beaumont Small.

**TONGUE, DISEASES OF.**—In health the tongue varies greatly in appearance, but usually it is of a rosy-red color, moist, covered with minute papillae (thread-like papillae and larger round papillae), free in its movements, and almost constantly changing in form. Very many persons, especially smokers and those engaged in such occupations as tea-tasting, have a more or less coated tongue even when apparently in perfect health. The volume of the tongue also varies greatly within normal limits. In some the organ is narrow and pointed at its tip, while in others it is large and flabby, with thick and rounded tip and margins which often show indentations made by the teeth. In nervous individuals the tongue is protruded quickly and as quickly withdrawn; in others of a more phlegmatic temperament the motions of the tongue, like those of the other voluntary muscles, are sluggish. In old age the tongue is almost always coated and is less moist than in youth, becoming often very dry and glazed upon the advent of even the slightest ailment. This is a point of some importance, for the physician called to see an aged person may be led to exaggerate the gravity of the condition if he take into consideration the evidence furnished by the state of the tongue alone.

The appearance of the tongue is not modified in every abnormal state, and it frequently presents no change in cancer of the stomach, or in gastralgia or enteralgia. It also often presents a normal appearance in simple jaundice, nasal catarrh, and many other slight ailments unaccompanied by fever.

**MOVEMENTS.**—The movements of the tongue are sluggish in all adynamic conditions, in mental hebetude, and when the organ is dry. In paralyzes of various kinds the muscles of the tongue are often affected and then the organ lies like an inert mass in the mouth, and cannot be protruded. In paraplegia one side of the tongue may be paralyzed, and then, when protruded, it deviates toward the paralyzed side, being pushed that way by the sound

muscles. A trembling of the tongue is seen in adynamic conditions, in alcoholism, lead poisoning, and paralysis agitans, and when the individual is under the influence of various emotions, such as fear, anger, etc. Fibrillary contractions are sometimes observed in progressive muscular atrophy, in general paralysis of the insane, and in locomotor ataxia. Convulsions involving the lingual muscles have been observed in hysteria, epilepsy, and chorea, and in tuberculous meningitis in infants.

**COATING.**—A furred tongue is usually the condition which attracts the most attention. This occurs in many conditions, and the presence of a fur is almost always indicative of some abnormal state. In perfect health the tongue is clean, as a rule, although some seemingly healthy individuals have an habitually furred tongue. A thin whitish coating is almost always seen also in smokers. The fur is ordinarily composed of mucus, epithelium, particles of food and micro-organisms. It is due to increased production of the epithelium, owing possibly to reflex hyperæmia, or to any cause which prevents the removal of the cells normally cast off. When normal secretion is interfered with, as in fevers or in adynamic conditions, there is less chance for the detached epithelia to be washed away, and the coating is further increased by the collection of the inspissated mucus. A dry tongue is almost always coated, and when the mouth is open the dust collects from the atmosphere and helps impart a brownish tinge to the fur. Sometimes, when the fur is light or when the papillae are enlarged, the latter project above the surface of the coating as little red points, presenting the appearance known as "strawberry tongue." This is seen in its most typical form in scarlet fever, and is recognized as one of the diagnostic points of that affection; it is also commonly present in Rôtheln.

In dyspepsia the red fungiform papillae will be seen to slope toward the tip, while in scarlatina they stand erect, their rounded summits suggesting the nodular surface of the fruit.

The fur is variously colored in different conditions, and these various colors often furnish valuable diagnostic indications. Thus, a thin white coating indicates febrile disturbance, or slight indigestion; a yellowish tinge points to hepatic disturbance; and a dry, brown fur, except in mouth-breathers, is usually a sign of profound dyscrasia. The fur may be moist or dry, the former condition prevailing in apyretic gastric disturbances, the latter in marked febrile conditions which have persisted for a long time and in which the vital forces of the patient are greatly depressed. In such states the tongue becomes covered with a thick, dry, brown or blackish coating, which is often furrowed and cracked, being perhaps partially detached in places, and showing a deep red color beneath. In disordered digestion the coating is thick, moist, and often brownish in color. A sign of some importance in the diagnosis of gastric ulcer from cancer of the stomach is the presence of a coated tongue in the first-named affection, and its absence in the second, unless there is fever. A clean tongue in the early stages of a continued fever should cause the physician to hesitate in making a diagnosis of typhoid fever. A hemorrhagic coating results from the imbibition of the coloring matter of the blood. It is usually accompanied by great dryness of the tongue, and the blood escapes from the fissures in the mucous membrane which result from the contraction of its epithelial covering. In diphtheria a false membrane occasionally, though rarely, forms on the tongue. As the coating is often the result of hyperæmia of the tongue, it may be seen in local diseases of the organ, and frequently a yellowish fur forms on one side in consequence of the irritation caused by a carious or broken tooth. In certain cerebral affections, especially in apoplexy, the tongue is covered with a thick sticky fur, and it is also coated and foul in chronic alcoholism.

**COLOR.**—In anæmia and allied conditions the tongue is pale, as it is also after profuse hemorrhages and in wasting diseases. In various diseases, such as icterus, Addison's disease, etc., the tongue participates in the general pigmentation and approaches the skin in color. The

tongue is abnormally red in scarlatina, in inflammatory fevers, and often in the beginning of smallpox. A red, moist tongue indicates debility, such as occurs in consequence of long-continued exhausting discharges. In chronic conditions affecting permanently, in a measure, the digestive organs, the tongue is often intensely red, more or less dry, and sometimes presents a glazed appearance, as if varnished. In gastritis and in inflammation involving the other organs of digestion, the tongue is ordinarily redder than normal, dryish, narrowed, and pointed; sometimes it is furrowed and becomes of a brownish-red color. It presents a more or less purplish venous hue in all cases in which there exists an impediment to the circulation, or in which there is interference with hæmotosis. Thus we see this color in many cases of heart disease, in cholera, in croup, in pulmonary affections causing asphyxia, and when large effusions are present in the pleural or abdominal cavities. In malarial fevers the tongue is often purple at its margins, and in plethoric conditions the same venous hue is generally present.

**SURFACE.**—Normally the upper surface of the tongue is somewhat convex, and is slightly rough from the projection of its papillae. When moderately dry it is smooth and presents a glazed appearance from the presence of inspissated mucus. When very dry the epithelium contracts and the surface is marked by rhagades of greater or less depth. Fissures of the tongue, without any furring, dryness, or change in color, are sometimes observed to occur in gastric disturbances. In some individuals, however, the organ is normally fissured even when moist. In syphilis the tongue is often ulcerated and fissured, and after healing there remain persistent whitish cicatrices. Wounds of the tongue caused by the teeth are seen in epilepsy, and may be of considerable diagnostic value in cases in which the convulsions are nocturnal.

An *impetiginous stomatitis*, in which the tongue, along with the buccal surface of the cheeks and lips, is covered with a tenacious exudation, and at times fissured, has been described by Sevestre and Gaston.<sup>1</sup> It occurs in debilitated infants with gastro-intestinal diseases, measles, pertussis, and impetigo. The *Staphylococcus aureus* was found in eight cases.

**MOISTURE.**—The tongue is moistened by the secretion of its glands and by the saliva. In ptyalism there is an increase in the secretion of the lingual as well as of the salivary glands. A return of moisture is a favorable sign in adynamic conditions. Dryness of the tongue is constantly present in a slight degree in some individuals, in whom it seems to be a normal condition. It is noticed in obstruction of the nasal passages, and in dyspnoea (phtisis, pneumonia, heart disease, etc.), when the patient is compelled to breathe rapidly and through the mouth. Certain drugs, such as belladonna, cause dryness of the tongue as well as of the other mucous membranes of the head. Long-continued speaking also induces dryness of the tongue, and the same condition occurs as a result of fasting. In prolonged febrile conditions, especially when the temperature remains constantly at a high elevation, the secretions of the tongue become diminished. In acute inflammation of the abdominal viscera, in intestinal obstruction, etc., and in typhoid conditions, the tongue becomes very dry, and often fissured. Such a condition indicates that the vital forces are ebbing.

**VOLUME AND FORM.**—The tongue is swollen oftentimes when there is interference with the return circulation of the head in consequence of heart disease, pulmonary affections, or compression of the veins of the neck from any cause. In chronic diseases of the chylipoietic system the organ is often considerably enlarged and indented. In idiots and in those suffering from certain mental affections the tongue is often large and flabby. In general paralysis, in paraplegia, and sometimes even in hemiplegia, the organ is large, soft, and flabby, its dimensions being such as sometimes to prevent closure of the mouth. In anæmia the tongue is broad and flabby, and shows the marks of the teeth. A similar condition is seen in small-

pox, typhus fever, scurvy, and various blood dyscrasias, and in mercurial poisoning. Inflammation with turgescence of the organ occurs as a result of the local action of certain irritant and corrosive poisons.

A broad, flat, square tongue, nearly filling the mouth, points to myxœdema. In acromegaly, too, the organ may become so enlarged as to prove of serious inconvenience. Abnormally long tongues have been described as malformations.

Enlargement occurs, too, from œdema, which, among other conditions, is seen in *stomatitis epidemica*, an affection in which the excessive swelling may be followed by necrosis. Enlargement is encountered also in urticaria, and occasionally it is due to quinine.

Changes in the shape of the tongue are owing, in many cases, to the absence of moisture, the organ becoming frequently concave on its upper surface from contraction of the dried epithelial layer. According to Gubler, there is a contraction of the transverse muscular fibres in fevers, so that the organ is less broad than normal. In hemiplegia the shape of the tongue is altered in consequence of the unilateral paralysis. The affected side is soft and flat, and after a time may become reduced in volume.

**ARTIFICIAL DISCOLORATIONS** may have diagnostic significance.

Rigal gives a table showing that black discoloration may be produced by ink, iron, mulberries, and some kinds of cherries; yellow by saffron, laudanum, rhubarb, nitric and chromic acids; red by rhatany, quinquina, and citrate of mercury, etc.; grayish-white by sulphuric, carbonic, and oxalic acids; white or pearl-gray by nitrate of silver and corrosive sublimate.

Corrosive acids, blackberries, tobacco, and rhubarb must also be mentioned as common discoloring agents. Caustic potash produces a gray and gelatinous appearance.

Tea-tasters are said to acquire a smooth, orange-tinted coating.

**DEFORMITIES** of the tongue may be either congenital or acquired, and consist principally in a complete absence of the organ, a split or bifid condition, a chronic state of prolapsus, hypertrophy, atrophy, adhesions, etc.

**Aglossia.**—Absence of the tongue has been recorded as a congenital condition in a case seen by Jussieu,<sup>2</sup> and in one mentioned by Förster<sup>3</sup> and as the result of disease in a number of recorded cases.

**Atrophy** of one-half the tongue, with nodules near the root, was observed by Lewin. The tongue deviated toward the affected side, and could scarcely be projected or elevated to the palatine vault. There was great difficulty in chewing, swallowing, and in pronouncing the letters *d*, *t*, *l*, *n*, and *r*. At the autopsy two gummata were found in the cranial cavity; one situated directly upon the hypoglossal nerve. Such cases may also, but more rarely, be due to peripheral causes.

**Hemiatrophy** has also been described by Ballet,<sup>4</sup> who says it may be the first evidence of central disease.

Atrophy of the whole organ is very rare compared with that of one side. The affected side in hemiatrophy is noticeably decreased in size, shrivelled up, and the mucous membrane covering it is thrown into folds. Atrophy of the whole tongue may follow a bilateral paralysis of the organ.

Hemiatrophy can be produced in the dog by cutting the sensory portion of the trigeminus. It may follow lesions of the intramedullary and intra- and extracranial hypoglossus. As a progressive condition it has been observed in facial hemiatrophy, possibly depending upon a low type of degenerative neuritis. It has been noted in a number of patients having locomotor ataxia, and the drawn-up ridges on one side may be among the earliest signs of that disease.

**Adhesions** of the tongue, causing the common tongue-tie or bridled tongue of infancy, are not very rare. Ankyloglossus is another term which has been applied to this congenital condition when due to an abnormal development in breadth of the mucous fold beneath the tongue, called the frænum, or to its too high attachment.

All movements are restricted and suction is almost impossible.

Adhesions causing more or less complete immobility can also be due to accident.

Lateral adhesions have been noted as a congenital condition, and also as a consequence of mercurial gingivoglossitis, noma, scurvy, etc. In all of these cases section with scissors is advised.

Children may be born with the dorsum of the tongue attached to the roof of the mouth, but such instances are exceedingly rare.

*Bifid, or split tongue*, a normal condition in some animals and birds (the seal and raven), has occasionally been seen. Barling reports a case of congenital division of the tongue with a median lobe.

**HYPERTROPHY.**—Though a predisposition to hypertrophy probably exists in many cases, it seems to be determined by some acute process, such as abscess or ranula, or one of the exanthemata. When of large size the organ protrudes from the mouth, the saliva constantly flows, the gums swell, and the teeth become loose. It must not be confounded with acute glossitis, with mercurial stomatitis, nor with tumor in the substance of the tongue.

Virchow describes the hypertrophied tissue as forming a lymphatic cavernous tumor, and it is now the accepted theory that the lymph vessels are dilated and the connective tissue is increased, but the muscular tissue is not hypertrophied. There appears, however, to be a form of muscular hypertrophy which constitutes a separate disease. Billroth says there is a fibrous form. In some cases the blood-vessels as well as the lymphatics are enlarged.

As regards treatment, Freteau has had good results from the application of a bandage in such a manner as to make even pressure from the tip backward. A cure may be effected, so long as the organ does not protrude, by applying pressure in the manner recommended by Butlin, *i. e.*, by inducing the patient to keep the mouth constantly and firmly closed upon the tongue. The application of a bandage to the mouth aids in the accomplishment of this purpose.

*Hypertrophic Cicatrix.*—False keloid is almost as rare as true keloid upon the tongue. Gevert<sup>5</sup> has presented an instance following a burn.

*Hypertrophy of follicular glands* in the posterior portion of the dorsum near the papillae vallate, and in the sinus epiglotticus, is often attended with some inflammation, causing the sensation of a foreign body in the throat, with its attendant symptoms of "hacking," attempts to clear the throat, irritative or pertussis-like cough, painful or discomforting deglutition, dyspnoea, asthmatic attacks, and voice-tire.

The finger may detect the swelling, and the laryngoscope shows the reddened and swollen follicles lying over the epiglottis and in the glosso-epiglottic fossa.

*Hypertrophy of the lingual tonsil* in the adult may reach such a degree as to suggest a new growth or polypus. To remove the adenoid vegetations a snare, linear écraseur, sharp spoon, or caustics may be used. Repeated applications of iodine often give good results.

*Hypertrophy of Papillae.*—Because of the papillary nature of the surface of the organ hypertrophic enlargement of papillae is not uncommon. This may, in rare instances, implicate a single papilla, more commonly, however, a small group of papillae is involved, a wart-like tumor, or *papilloma*, resulting. Such a growth sometimes represents a congenital condition.

When a papilloma of the tongue has existed for some time it may become firm, verrucous, and even horny. At times the whole dorsum is studded with hypertrophic papillae, giving an open, fig-like appearance.

In the same way hypertrophied filiform papillae, when kept erect by the action of the teeth, may stand out like small porcupine quills. The x-ray has a decided effect on the reduction of papillary hyperplasia and overgrowth, and I have removed a large-sized papillary tumor by its exclusive use.

*Hypertrophy of Pigment.*—In Addison's disease dark or

black-colored areas are found near the tip of the tongue. The pigment lies in the deep cells of the epidermis. In jaundice the tongue is yellow. I have observed that the fungiform papillae, which in the white races are pale or red, have naturally a brown, bluish, and sometimes black color in negroes, Indians, and dark-skinned Cubans. Maynard found that thirty-two per cent. of coolies had pigmented tongues. At times each fungiform papilla will be found surrounded by a bluish or brownish rim. Dark spots are found at times in melanosis and in malarial cachexia.

*Prolapsus Linguae.*—In a few rare cases the tongue has been found too long, so that it constantly protruded from the mouth. This condition is also found as a result of hypertrophy and inflammatory action, and must not be confounded with the rarer congenital increase in length.

**FUNCTIONAL DISTURBANCES.**—The tongue is protruded with difficulty in low fevers, apoplexy, and sometimes in paralysis; in the latter condition the sound muscles force the tongue over toward the paralyzed side, and there may be loss of tactile sense. In chorea there may be a positive inability to protrude the tongue; it may be constantly thrust far out of the mouth. Here, as in epilepsy, the tongue is often bitten by the patient, and deforming scars may result.

*Abnormal mobility of the tongue.*—When at birth the frænum is too long, it has happened that the infant has swallowed the tongue or drawn it so far back as to cause suffocation and death. This may also happen after dividing the frænum. Treatment consists in replacing the tongue with the finger, and exercising care in feeding. There has been reported a case in which the patient, who experienced much inconvenience from the accumulations of mucus on the posterior wall of the pharynx, succeeded in cleansing the naso-pharyngeal cavity with his tongue. The frænum, in this case, was found ruptured in several places.

*Ageusia and parageusia* are derangements of the special sense of taste, which is lost for such substances as sugar, salt, acids, etc., in the first, and perverted in the second. Ageusia of an incomplete character is seen in some facial paralyses and in hysteria. It may also result from injury of the trigeminal or the glosso-pharyngeal. Both conditions may arise from irritation of the nerves of taste, and be a symptom in catarrhal diseases. Perverted taste is also seen in hysteria.

*Treatment.* Antiseptic and stimulating mouth washes and electricity. If the cause can be found and removed, the taste will speedily return.

*Anæsthesia* of the tongue may interfere with its functions. There may be gustatory anæsthesia or a loss of ordinary sensation in the tongue. This, like paralysis, may be due to a central or a peripheral cause. Loss of taste may depend, according to Butlin, upon failure of conduction in the nerves of taste.

*Glossoplegia.*—Paralysis may affect the muscles of one or of both sides of the tongue. That of one side alone has been observed by Lewin and others. One case, accompanied by symptoms almost identical with those of a bulbar paralysis, recovered promptly under corrosive sublimate injections. If due to cerebral lesion, glossoplegia will be apt to be attended by the same symptoms of headache, dizziness, etc. In hemiplegia of the body, the tongue is protruded, as I have already said, toward the affected side, and this is also true of monoplegia. I have seen a woman paralyzed on both sides, whose tongue lay as an inert body in the floor of the mouth, the ragged borders quivering when an ineffectual effort was made to protrude the organ, which had become atrophied from disuse. Speech was wholly impossible, and mastication very difficult.

Glossoplegia is the initial symptom in progressive bulbar paralysis, with indistinct speech and feeble protrusion of the tongue. Later on, the dorsum becomes furrowed and wrinkled. Galvanism to the neck may benefit. When the condition is due to intracranial disease, and also when it is perhaps associated with hemiplegia,

even though there may be no evidence of lues, iodide of potassium freely given may be of great benefit.

*Hyperæsthesia* of taste is seldom met with, but pain located in the tongue alone is quite common. Aside from the pain attending many diseases, elsewhere considered, we have some rare neuralgias limited to this organ, and, as a rule, to one side only.

*Spasm of the Tongue.*—*Clonic spasm* is a rare affection observed by Erb and others. The tongue may be protruded involuntarily, being pushed forward against the dental arch, or it may show involuntary muscular contractions on one or both sides. Clonic spasm is seen in hysteria and in the epileptic seizure. Bromide of potassium and electricity are recommended. The condition may be looked upon as a neurosis of the hypoglossus.

*Chorea-like movements*, limited to the tongue, have been reported as occurring in hemiplegia to the extent of interfering with speech. The movements grow less as the paralysis improves.

*Tonic spasm* is seen in hysteria, and in other conditions, probably due to reflex irritation.

*Unilateral spasm* of the tongue has been observed by Wendt. The attacks would last for several minutes at a time, the right half of the organ becoming suddenly hard and contracted by repeated twitchings. The patient recovered under galvanism.

**INFLAMMATORY CONDITIONS.**—The causes which may be active in producing inflammations of the tongue are multiple. Thus it may follow a great variety of injuries, bites and stings of insects, and the application of irritant substances, and it may be found in eruptive and other fevers. It may be acute or chronic. When deep-seated, inflammation of the tongue may endanger life through suffocation, and in the acute form its onset is often sudden and may end in pus formation, and the subsequent abscess may press upon the epiglottis and thus also threaten life.

In two instances I have seen glossitis result from the accidental taking of ammonia. The tongue, under these circumstances, is first made white, becomes much enlarged and painful, and then subsequently casts off its coating of epithelium. In one of the cases referred to, the patient, who was a sufferer from asthma, mistook the hartshorn for the whiskey bottle at night, and by the time I reached him the thickened tongue filled and protruded from the mouth, causing difficulty of breathing, which, added to that of the asthma, was distressing in the extreme.

*Abscess of the tongue* may be the result of acute inflammation of the tongue; in such cases it is deeply seated, and has been mistaken for cancer, the tongue having been removed on account of it. The more chronic forms are usually circumscribed and deep-seated, and may occur without preceding glossitis or herpes. The swelling is firm and elastic, and there is no superficial discoloration, so that it may readily be mistaken for a cyst. The abscess is generally situated toward the anterior portion of the tongue, near the edge, and is usually very chronic. An exploratory puncture quickly clears up the diagnosis when fluctuation is not clear or "pointing" is delayed. Treatment by longitudinal incision rapidly brings the case to a favorable conclusion.

Early operation to prevent suffocation is sometimes indicated, though spontaneous cure after rupture occurs in most cases; and if the patient is seen early the application of ice and cooling lotions or emollient washes prevents the more serious condition.

*Actinomyces* now and again occurs as a primary disease in the tongue, developing as a deep-seated inflammation of the base, with a wood-like hardness of the entire suprahoid region. The occupation of the patient may lead to suspicion, and confirmation will be found in the discovery of the characteristic yellow granules. As is well known the tongue, in actinomyces in herbivorous animals, is frequently affected with nodular swellings of various sizes; and as the affection is becoming more and more frequent in man, and as infection usually takes

place by way of the mouth, it will not be surprising if tongue cases become more numerous.

*Anthrax.*—Malignant pustule occurs in connection with lesions upon the external surface, or, in the œdematous form, upon the tongue with formation of pustules. It occurs also in rare cases as a primary lesion, as reported by Rammstedt.<sup>6</sup>

*Chancroid* may begin as a reddened fissure, to be followed by ulceration and attended with submaxillary adenopathy.

*Syphilis.*—The most common form in which the syphilitic poison manifests itself upon the tongue is that of the mucous patch. The primary sore may occur upon the tongue, and in the later stages we have the gummy tumor and ulceration, fissures, plaques, and tertiary ulcerations. Men are more prone to suffer relapses than women, probably owing to their greater use of tobacco and alcohol.<sup>10</sup>

Chancre of the tongue is commonly located at or near the tip. It may run its course before a diagnosis is made. Chancre is apt to be hollowed out, bowl- or crater-shaped, with sides gently sloping to the centre, while a tuberculous ulcer has irregular borders and base, and shows granulations which make it uneven, while here and there at the periphery are little yellow points somewhat suggesting miliary abscesses. From chancroid it is recognized by its red or rosy color, while the latter has a yellow base.

Condylomata as well as papillomata are found in syphilis; the distinction between the two being that the former are more flattened and, besides the hypertrophy of papillae, there is a tumefaction of the intervening tissue making a more firm or solid as well as a more flattened tumor.

Gummata, which may be confounded with primary sclerosis, occurs upon the surface or within the substance of the tongue. They are rather late manifestations. Nodules the size of a pea or smaller occur upon the posterior part of the dorsum, and might escape notice if they remained unirritated. When single and laterally situated, beginning cancer is simulated. Those located within the parenchyma are not so easy of diagnosis. They may reach the size of a large hickory nut and are not very sensitive. For some reason they occur most often in men. Carcinoma is single and situated at the border, while a gummy tumor is apt to be multiple and more centrally located. Chronic abscess of the tongue is more clearly defined than gumma.

Treatment by large doses of iodide of potassium almost invariably brings about speedy resolution and cure, and this may at times prove of value as a diagnostic test. Locally, nitrate of silver stick, lightly applied, will in most cases soon cause them to disappear. If this does not act well, a solution of chromic acid (strength of from ten to fifty per cent.) will almost always bring about a rapid cure.

*Cysticercus* cyst of the tongue is more frequent than the echinococcus. The diagnosis is established only on incision or after suppuration. Though the occurrence of this parasite in the tongue is common in animals it is certainly rare in man. In one case the larva of the *Tænia solium* was found upon incision of a painful tumor of the tongue.

*Echinococcus* disease involves the tongue in rare instances. The diagnosis can be made only after incision or by the coincident involvement of other parts.

*Diphtheria* at times presents patches upon the tongue; never, however, unless the throat is coincidentally affected.

*Erysipelas* involves the tongue by extension from neighboring parts. Primary erysipelas of the tongue has been reported by a number of observers, but while some maintain that the organ does not become tumefied, others describe the swelling to be of such a size as to render it impossible to close the mouth.

*Erythema Exudativum Multiforme.*—Lesions of the exudative form of erythema occur at times upon the tongue, but the quickly rupturing bullæ would be difficult of recognition were no lesions present on the skin.