

the patients and of their relations, the brain also becomes affected, coma or delirium supervenes, and the patient soon succumbs.

At the autopsy I found, in one case, a medullary carcinoma, which filled up the whole anterior mediastinum, and extended over the anterior part of the right lung, without having occasioned secondary nodules in any other organ. In the second case, a cystosarcoma, of the size of a large fist, simply compressed, but did not involve the lungs and heart. In both, marked hydrothorax, but only slight ascites, were present.

The dyspnoea of these children, which was extremely distressing to themselves, and for others to witness, could temporarily be mitigated in a very surprising manner by large doses of morphia, gr.  $\frac{1}{2}$  to  $\frac{1}{2}$  pro die.

(11.) WHOOPING-COUGH (*Tussis Convulsiva*—*Pertussis*).—Whooping-cough is an epidemic, contagious bronchial catarrh, with peculiar convulsive paroxysms of cough. *Hippocrates* has not described it accurately. The delineations of the epidemics of the former centuries are not exactly applicable to the group of symptoms as it is now observed, and only since the eighteenth century have more correct views been entertained in regard to this disease in the different countries where it has prevailed. Besides the denominations above given, it has received a number of others, such as *coqueluche*, *affection pneumo-gastrite-pituiteuse*, *broncho-céphalite*, *catarrh convulsif* (in France); chin-cough (England); *pertussis*, *tussis suffocativa*, *spasmodica*, *strangulans*, *clangosa*, *ferina*, *blauer Husten* (blue-cough), *Schaafshusten*, *Eselshusten* (Germany). We have to deal here with no simple anatomical alteration, but with an acute cosmical disease, and, in fact, from the class of the so-called atmospheric pestilences.

**Symptoms.**—Three stages of whooping-cough can be distinguished with tolerable accuracy—(1) a stadium catarrhale, (2) a stadium convulsivum, and (3) a stadium decrementi.

(1.) *Stadium*. The phenomena of the *stad. catarrhale*, or prodromum, or invasionis, are those of a simple bronchial catarrh, sometimes complicated with gastric symptoms. Some hoarseness, tickling of the throat, dry cough, sneezing, profuse flow of mucus from the nose, lachrymation and redness of the eyes, are together or singly observed in almost every child with commencing whooping-cough. If febrile symptoms supervene, as frequently happens, such as hot skin, frequent pulse, depression, general *malaise*, and loss of appetite, then we have a perfect picture of the stage of incubation of measles, a fact which, when whooping-cough and measles prevail simultaneously in one place, we shall do well to keep in mind, on account of its bearing on the prognosis. The cough, from the very commencement, assumes

a peculiar, hollow, metallic clang, soon becomes paroxysmal, and, if no preëxisting pulmonary affections are present, is always totally dry. This stage lasts from three days to three weeks, is more or less distinctly marked, and can be observed in every case of whooping-cough.

(2.) *Stadium*. The *stad. convulsivum* or *nervosum* is distinguished by the cough recurring in violent paroxysms, and which is of such a peculiar character that it is never forgotten again when it has once been heard. Somewhat older children have a premonition of the occurrence of the attack. They experience a tickling sensation in the throat, oppression of the chest, feel nauseated, breathe anxiously and quickly, sit upright in bed, or run, when they are awake, to a chair or some other support, in order to be able to offer a stronger resistance to the attack. The paroxysm itself consists of a great number of short, rapidly-recurring, not perfectly uniform, spasmodic coughs, and is at length interrupted by a protracted, whistling, sipping attempt at inspiration. The French designate this whistling inspiration by the word "reprise." Immediately after the first one, the convulsive expirations begin anew, last ten to fifteen seconds, whereupon another "reprise" follows, and thus these two acts alternate with each other several times in such a manner that an entire paroxysm, from the beginning to the reappearance of the normal respiration, may last from one to fifteen minutes. At the beginning of the paroxysm, the single cough-exclamations follow each other with the greatest rapidity, and without any intervals, and the child seems to be in imminent danger of dying by suffocation. And in fact, during the fit of coughing up to the "reprise," no air whatever gains entrance into the lungs, a fact of which one can easily convince himself by auscultating the dorsal surface of the thorax. At the "reprise" the glottis is evidently in a state of momentary constriction, either in consequence of spasm, or of paralysis, as has been already more thoroughly explained during the study of croup, and all the auxiliary respiratory muscles of the neck and abdomen are called upon to perform an active part. Serious stag-nations of the circulation are produced by the choking acts of coughing; the blood stagnates in the pulmonary artery, and then occasions dilatation of the right side of the heart and of the entire peripheral venous system, a condition that is especially distinctly to be seen in the large veins of the neck. Finally, the children become bluish red over the entire head and face, from which also the designation of "Blauhustens" (blue-cough) has originated. The eyes become injected, and protrude somewhat from their sockets. The face swells up, and is covered with a cold perspiration; the movements of the heart and of the pulse are feeble and unequal; the urine and fæces are often involuntarily ejected by the violent contractions of the ab-

dominal muscles; hernia and prolapsus of the rectum are also sometimes occasioned thereby. The venous stasis gives rise to frequent hæmorrhages; the most common are those from the mouth and nose. Whether the larger quantities of blood vomited and coughed up come from the lungs, as some believe, is very questionable, because very often no consecutive alterations of the lungs whatever, and no aggravation of the general condition, ensue therefrom, and a perfectly colorless mucus is expectorated in the paroxysms of cough that come on a few minutes thereafter. We know, however, that after an hæmoptysis, for instance in tuberculosis, the sputa continue to be bloody for several days. Extravasations of blood upon the conjunctiva bulbi, or into the loose cellular tissue of the eyelids, frequently take place, where the extravasated blood undergoes the same changes of color that we observe in external injuries. *Bouchut* relates a case where a child cried with real bloody tears, and states also that the hæmorrhages in pertussis may sometimes become so profuse as to endanger life, an occurrence that I have never yet experienced. So, too, the bleedings from the ears, of which mention is made in most of the text-books, I have never observed; nevertheless I do not doubt that they have been seen, especially in cases of otorrhœa, and ulcerations of the external meatus. *P. Frank* reports a remarkable case of a patient who was obliged to sneeze one hundred times or more at every paroxysm. Nervous children may be seized with general convulsions during these paroxysms of cough.

Vomiting usually forms the *finale* of every paroxysm, which, at the beginning of this second stage, only results in the expulsion of a little mucus, while much liquid food and gastric juice are thrown up. The longer the whooping-cough has lasted, and the nearer it approaches to the third stage, the more profuse becomes the secretion from the bronchi, and, finally, with every paroxysm of cough, partly by the act of coughing, and partly by the act of vomiting, a large quantity of colorless, tenacious mucus is expectorated.

When the attacks are of much duration, protracted for ten to fifteen minutes, the children feel very much exhausted after them, complain of pain in the breast, breathe for a long time anxiously and hurriedly, and, finally, fall asleep. Generally, however, when the paroxysms are only moderately severe, they forget their sufferings immediately after they have ceased, and, to the great surprise of their inexperienced parents, resume their play, or even their meals. Simple pertussis is unattended by fever, but the supervention of fever and anorexia always indicates a complication.

The number of paroxysms in the twenty-four hours varies from four to sixty; generally, however, not more than eighteen to twenty-

four occur during that period. No regularity in the successions, nor equality in their intervals, is ever to be observed. They are more violent, and occur oftener in the evening, when, generally, various external exciting causes, such as heating, mental excitement, eating and drinking, coöperate. The attacks come on either wholly spontaneously in children who maintain a perfectly quiet attitude, or they are induced by crying, mental excitements of all kinds, laughing, swallowing, particularly the swallowing of dry, irritating morsels, cold or impure air, etc. When several children affected with whooping-cough are together, and one of them begins to cough, the mere sight will, in most instances, infect the rest, and soon all join in this most distressing concert.

In healthy children, and under favorable circumstances, this stadium lasts four weeks, but it may, under other circumstances, be prolonged for eight weeks, or more. A remission in the severity and frequency of the paroxysms, attended by an augmentation of the secretion, indicates a speedy transition to the third stage.

*3d Stadium.* In this stadium *criticum, s. decrementi*, the paroxysms of cough have lost their severity. The paroxysms are not so long, and the acts of coughing not so rapid; the "reprise" ceases entirely, and, although retchings may still be present, no liquid food is vomited, the vomited matter consisting of an enormous quantity of bronchial mucus. This mucus is mostly yellowish or greenish colored, and, with every attack of coughing, nearly a tablespoonful is expectorated. About this time nocturnal perspirations become superadded in most of the children, and sometimes an eczema also breaks out. In healthy children, when the cough has reached this stage, it will cease completely in from two to three weeks, but in tuberculous and scrofulous children, on the contrary, it may still last for many weeks. In this stage, short relapses often also occur, and the patient is thrown back into the second stage; but, generally, these relapses are of short duration.

The complications of this disease are numerous, and, generally, they are of a dangerous character.

The most frequent complication liable to occur is an affection of the pulmonary parenchyma, which may very readily become developed from the retention and decomposition of large quantities of bronchial mucus. It usually appears as a lobular pneumonia, only exceptionally as lobar pneumonia, and is to be dreaded in proportion to the age of the child at which it occurs—the younger, the more dangerous. Children under one year of age, who lie much upon the back, and have not muscular ability to properly cough up the mucus from the bronchi, are extremely often attacked during pertussis with symptoms of

pneumonia, such as hot skin, rapid pulse, frequent, painful breathing, accompanied by a loud noise during expiration, and elevation of the *alæ nasi*. The paroxysms lose their characteristics, and a dry cough, combined with a painful distortion of the countenance, supervenes. Most of these children perish in a few days of convulsions and marked cyanosis. In a few solitary instances only do the symptoms of the lobular pneumonia subside and give place to the former pertussis, and, even when this occurs, there is always still the greatest danger of relapses.

Other children suffer from gastric complications. They get a coated tongue, anorexia, fever, suffer from general debility, and putrid smell of the *feces*. The ulceration of the *frænum linguæ*, long known in Germany, is a very peculiar occurrence. *Gambarini*, of Mailand, has lately recalled the attention of the profession to it. The ulcer almost always extends in a transverse direction to the long axis of the *frænum*, and very often is seen in whooping-cough in children of from one to two years of age, never in very young children and seldom in older ones. It seems that this condition depends upon a mechanical cause; namely, the tongue, in the violent acts of coughing, is thrust out forcibly, and the *frænum* is, so to speak, sawn off by the sharp lower incisor teeth. Hence the reason why it is never met with in the still toothless infant nor in older children who have already somewhat blunted their incisors, and who are not in the habit of thrusting out the tongue during the attacks. It is, however, absent in a large number of severe cases of whooping-cough, and is also observed in children with simple bronchitis, as well as in those without any cough, in the form of aphthous ulceration, especially during dentition. This ulcer does not heal, no matter what treatment be adopted, so long as the convulsive cough lasts, but will heal spontaneously as soon as a mitigation in its intensity has taken place.

Again, in other children, marked cerebral symptoms supervene in consequence of the venous stasis; in general, however, this complication is much less frequently observed. The children become lethargic, frequently carry their hands to the head, complain of severe headache, and other similar signs, which appear to render the pertussis a secondary affair. Grating of the teeth, hydrocephalic vomiting, convulsions, and coma, finally set in, though death but extremely rarely ensues, and when it does there is found a cerebral disease, acute hydrocephalus or purulent meningitis, but which is not directly connected with the pertussis.

Other though rare complications are pleurisy, pericarditis, and pemphigus. *Jadelot* saw pemphigoid vesicles occur in numerous epidemics, and in every instance death resulted.

The most frequent sequelæ are chronic bronchitis, goitre, hernia, prolapsus of the rectum, dropsy, tuberculosis, and aneurism.

Death, as the direct consequence of an attack, is extremely rare, and notwithstanding the numerous severe epidemics that I have witnessed I am unable to recollect a single instance. On the other hand, the majority of the patients affected with pneumonia died, and children under one year of age may, even without the superaddition of an acute fever, become so atrophic from pertussis as not to be able to rally.

Whooping-cough has no power to protect its subjects from any other epidemic disease. Pertussis patients may acquire all possible diseases, acute exanthemata, intermittent fever, typhus fever, cholera, etc.; but occasionally chronic skin-disease disappears in a very remarkable manner while the whooping-cough lasts.

The diagnosis of whooping-cough is very easy to make. The cyclical course, the peculiar cough, with the prolonged, loud inspiration, the vomiting at the close of the paroxysm, and particularly the epidemic occurrence, as well as its often demonstrable contagiousness, are such constant symptoms, that their presence leads with certainty to the diagnosis. Moreover, a paroxysm may be induced at will in every child with whooping-cough, by pressing the root of the tongue with the finger, a fact which is often very advantageous for clinical purposes. The retching thus produced is almost always followed by a violent paroxysm of cough, which instantly indicates the true diagnosis where the descriptions of attendants have given no clew to it.

**Pathological Anatomy.**—When an apparently healthy child with whooping-cough dies in consequence of an injury or some acute disease, in the convulsive stage, the air-passages will sometimes be found injected, but sometimes again perfectly normal; but, if death occur during the last stage, the trachea and large bronchi are filled with that mucus which during life was expectorated in such large quantities. Not the least morbid alteration is to be detected about the glottis.

The bronchial glands are sometimes, but by no means invariably, swollen. Owing to the supposition, which prevailed for a long time, that a neurosis was the cause of this disease, the brain and spinal cord, as well as the pneumogastric nerves, were often subjected to a thorough examination, but this, in the majority of the cases, proved to be perfectly fruitless, and only a few investigators speak of a redness of the pneumogastric, which most probably is to be regarded as a *post-mortem* imbibition, for, on account of the rarity of the condition, it cannot be regarded as pointing to the cause of pertussis.

The most frequent consecutive effects found are lobular and lobar pneumonia, cylindrical dilatation of the bronchi, partial pulmonary emphysema, pleuritis, pericarditis, meningitis, and tuberculosis of the pulmonary and bronchial glands.

**Etiology.**—Whooping-cough is *contagious*, and attacks an individual *but once*. The contagiousness of a disease becomes evident when a great number of cases follow from direct contact with persons affected. This has so often happened in pertussis as to establish the fact, and therefore it is very wrong to attempt, by single cases in which no contact with whooping-cough could be proved, to maintain a spontaneous origin for the affection. Indeed, we do not know whether the contagion be not so intense as to be transmissible by a third person, an adult, for example, himself remaining perfectly well. The mild and feverless character and the long duration of the disease, in consequence of which the sick children are much upon the streets and in public places, favor contact and communication more than is the case in any other contagious disease. Most experienced and reputable physicians express themselves emphatically, that genuine pertussis attacks children only once. The assertion of a few others, who claim to have observed it twice in the same person, is probably founded upon the circumstance that some tuberculous patients suffer from pertussis-like paroxysms, or perhaps they have met with a case that, already in its decline, has suffered a relapse.

This contagious property, and the immunity following therefrom, result in rendering whooping-cough almost exclusively a disease of childhood. It very rarely occurs in adults, and then mainly among the wealthy, who have always been much separated from children, and have thus escaped infection. Nevertheless, parents of children with whooping-cough, and the nursery-maid, frequently suffer from a milder kind of spasmodic cough, which seems to be due to their being with the patient, for these persons often are not the least predisposed to a cough, and lose it as soon as they have absented themselves for some time from the infected atmosphere. Infants before the commencement of dentition are less susceptible than those several months older; still, exceptional instances of perfect whooping-cough occur in the former, which usually becomes complicated with lobular pneumonia and terminates fatally.

It is not possible to state with certainty of what kind its contagious principle is. Most probably it is confined to the particles of mucus expectorated, which, becoming dry, are diffused in the surrounding atmosphere, a supposition that also seems to be borne out by experience, for, in the last stage, children infect with greater certainty.

The stage of incubation lasts but a short time, barely ever more than three or four days.

In addition, its purely nervous contagious character, induced by simple imitation, as are gaping, vomiting, chorea, hysterical convulsions, etc., may deserve attention. The constitution, the manner of living, and the season of the year, have no marked influence upon the origin or prevention of the disease.

By its contagiousness, then, the epidemic propagation of pertussis is brought about, so that in the course of a quarter, or at the most half of a year, the entire juvenile population, or, at least, the greater portion of it, has been infected by this disease. Schools and children's hospitals are to be regarded as the most prolific channels for its propagation. In the latter institutions in particular, it will often rage for years, after it has died out in the cities, for new children are constantly admitted for surgical or other internal diseases, and then acquire pertussis.

**Treatment.**—The prophylaxis consists entirely in the removal of the children from the place in which whooping-cough is just appearing, for a perfect isolation is only carried out with the greatest difficulty, and never affords as good a guarantee as an actual change of place does. *Jenner* made the interesting observation, that children recently vaccinated escaped whooping-cough, and that vaccination exercised a favorable abortive influence on patients. Owing to the circumstance that we usually perform vaccination in the first months of life, and that young children are less liable to sicken with pertussis than those that are a year or more old, the contingency in which this prophylaxis is applicable is a limited one. I have as yet vaccinated only two young patients with pertussis, one of which was sick for two, the other for three weeks: in both the course was a regular one; in the first the actual paroxysms lasted ten, in the second seven days, so that, if six weeks were calculated as requisite for the full course, then quite an abbreviation of the process was effected here. The internal administration of *belladonna*, and the suspending from the neck of small bags containing various kinds of strong aromatic substances, moschus, camphor, etc., have long ago proved to be totally useless as prophylactic measures.

The rational treatment of the established disease consists in the prescribing of an appropriate regimen, in treating the individual paroxysms, and in the attempt, by the aid of proper remedies, to bring about an abbreviation of the entire process.

As regards the manner of living, that depends upon the season of the year. In winter and during the prevalence of sharp, rough winds, the permitting children with whooping-cough to go out is