

should readily absorb the latter and sink, and the water should not acquire either an acid or an alkaline reaction (evidence of proper purification)."

Purified cotton is daily employed by the apothecary as a rapid filter or strainer for turbid solutions; it is also employed in the laboratory of the bacteriologist as a stopper for the tubes in which his "cultures" are made; but for this purpose it has to be specially "sterilized" by heat or other means. It is also used in the preparation of the aromatic "Aqua" to distribute the essential oils over, in order to insure their most complete solution. It is also very extensively used, either with or without medication, as a surgical dressing. Dried from a solution of boric acid, 1 to 100; corrosive sublimate, 1 to 1,000; or carbolic acid, 1 to 20; or impregnated with powdered iodoform, it can be rendered antiseptic; but such preparations need to be recently made, especially that with the carbolic acid. Exposure to a heat of something more than 100° C. (212° F.), for say half an hour, renders it practically aseptic, and in this condition it is very largely used as a dressing in antiseptic surgery. Nearly all surgical bandages, compresses, and gauze materials in this country are made from cotton.

The only preparation of purified cotton is the following, with its preparation, collodion:

COTTON, GUN, or GUN COTTON; SOLUBLE GUN COTTON; PYROXYLINUM; PYROXYLIN; COLLOXYLIN; DINITRO-CELLULOSE (U. S. P.). The following is the official formula and method of preparation:

℞ Purified cotton	100 gm.
Nitric acid	1,400 c.c.
Sulphuric acid	2,200 "
Alcohol,	
Ether,	
Water	āā q.s.

Mix the acids gradually in a glass or porcelain vessel, and, when the temperature of the mixture has fallen to 32° C. (90° F.), add the purified cotton. By means of a glass rod imbue it thoroughly with the acids, and allow it to macerate, until a sample of it, taken out, thoroughly washed with a large quantity of water and subsequently with alcohol, and pressed, is found to be soluble in a mixture of one (1) volume of alcohol and three (3) volumes of ether. Then remove the cotton from the acids, transfer it to a larger vessel, and wash it, first with cold water, until the washings cease to have an acid taste, and then with boiling water, until they cease to redden blue litmus paper. Finally, drain the pyroxylin on filtering paper, and dry it in small, detached pellets, by means of a water bath or steam bath, at a temperature not exceeding 60° C. (140° F.).

Keep the pyroxylin, loosely packed, in well-closed vessels containing not more than about 25 gm., in a cool and dry place, remote from lights or fire.

Pyroxylin owes all its usefulness in medicine to the fact that it can be dissolved by a mixture of alcohol and ether, and forms with it an adhesive varnish which dries to a waterproof film or coating, that can be made to cover and protect or hold injured surfaces, or be used as a vehicle for certain medicaments. The following is the formula for collodion (*Collodium*, U. S. P.):

Pyroxylin	30 gm.
Ether	750 c.c.
Alcohol	250 "
Dissolve and decant.	

The film produced by this collodion as it dries contracts with considerable force, and is sometimes useful where a local compression is desirable; but for most purposes this quality is an objection, and it is partially overcome in the next preparation, flexible collodion (*Collodium Flexile*, U. S. P.):

Collodion	92 parts.
Canada turpentine	5 "
Castor oil	3 "

Styptic Collodion (*Collodium Stypticum*, U. S. P.), is a preparation of collodion, alcohol, and ether, containing twenty per cent. of tannic acid.

Cantharidal Collodion or *Blistering Collodion* (*Collodium Cantharidatum*, U. S. P.) is a preparation of collodion containing the active constituent of 60 gm. of cantharides, extracted by chloroform, for every 100 gm. of the preparation. Henry H. Rusby.

COUCH GRASS.—TRITICUM. *Dog-grass.* "The rhizome of *Agropyrum repens* (L.) Beauv. (fam. Gramineæ), collected in the spring and deprived of its roots" (U. S. P.) It is a perennial grass with a straggling, zigzag stem, and a two-rowed ear of pointed spikelets. It spreads principally by means of long subterranean, horizontal rhizomes of most remarkable vitality and persistence of growth. Introduced from Europe and Asia, it has become a troublesome weed in some parts of this country. The drug comes principally from Germany. The dried rhizome is generally cut in short pieces (1 cm. or so long), about 2 mm. in diameter. It is hollow excepting at the joints, dull-yellow, and odorless, or having a slight mixed smell of hay and earth; taste sweetish, not remarkable. There is nothing notable in its composition or medical qualities, still it has some reputation in chronic inflammation of the bladder and kindred disorders. It is a favorite article for preparing patients for operations for cystic calculi. It contains sugar, gum, and *tritacin*, which is very similar to inulin. We have an official fluid extract, dose 2 to 8 c.c. (℥. ʒ ss. to ij.), and it is commonly given in decoction. Henry H. Rusby.

COUGHING.—According to Webster, the English word cough (Lat., *tussis*; Fr., *la toux*; Ger., *der Husten*) is of Anglo-Saxon origin, and comes from the Dutch, *Kuch*—M. H. Ger., *kuchen*, to breathe; N. H. Ger., *keuchen*—whence the German term, *Keuchhusten*, for whooping-cough.

Cough is primarily a physiological act, protective in character. Under pathological circumstances it occurs as a symptom of local or general morbid conditions, and may be of mechanical or reflex origin. It is essentially a quick and forcible expiratory effort or series of such

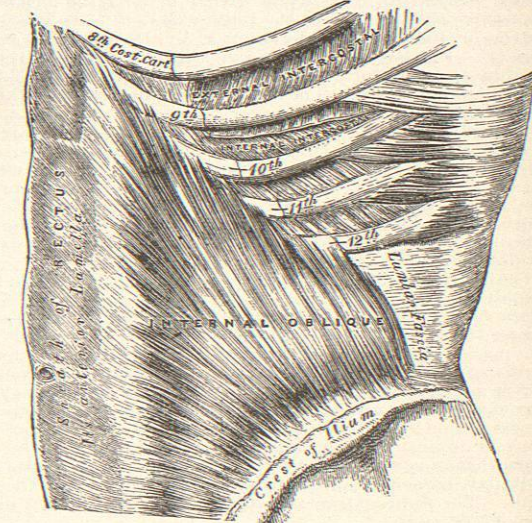


FIG. 1523.—Attachments of Rectus and Internal Oblique Muscles.

efforts, performed with complete or partial closure of the glottis, and is usually preceded by one or more deep inspirations. It has for its object the removal from the air

passages of obstructive or irritating materials. It may be excited by irritation of the nerves when there is nothing to be extruded, and is most annoying and persistent

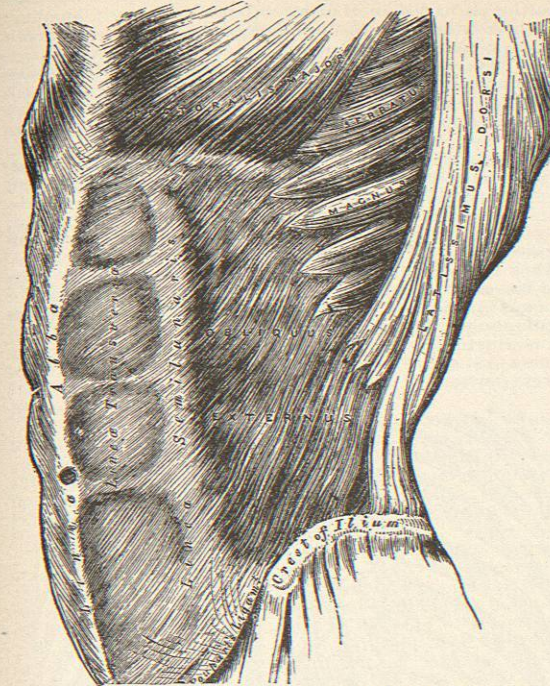


FIG. 1524.—Attachments of Rectus and Lateral Oblique Muscles.

under such circumstances. Its mechanism is thus described by Westbrook in the first edition of this Handbook.

"The mechanism of cough is as follows: When a foreign body or other irritant comes in contact with the peripheral expansion of the pneumogastric nerve (or of those with which it is intimately connected), impulses are generated which, travelling along the afferent fibres, are conducted to the respiratory centre in the medulla oblongata. In the ganglion cells of this centre the impulses are translated into others, which are conducted through the efferent fibres of certain cerebral and spinal nerves to the muscles of respiration, whose force they liberate.

"A study of the muscular relations of the thoracic walls shows that, while the muscles of *inspiration*—with the exception of the diaphragm and some small ones, e.g., the *levator costarum*—are attached to, and act upon the upper ribs, the *expiratory* group make their principal traction upon the lower portions of the thorax. This is particularly the case with those auxiliary muscles which are brought into play in forced respiration. The expiratory group, in which we are especially interested, are, anteriorly and laterally, the *triangulares sterni* above, and the *recti*, *obliqui*, and *transversales abdominis* below.

"The action of the *triangularis* is simple, and does not require special notice. Arising from the sternum and xiphoid appendix, its fibres pass upward and outward, to be inserted into three or four of the costal cartilages. It reinforces the natural resilience of the cartilages, helping to restore them to the expiratory position. It may also have some effect in counteracting the displacing force of the muscles on the exterior of the chest, e.g., the *pectoralis minor*. The action of the *rectus* is equally simple. Its sole influence over the respiratory movements is to draw the sternum downward, and so to diminish

the size of the anterior wall of the abdominal cavity. The action of the *obliqui* is more complicated. In the first place their posterior portions, which pass directly from the crest of the ilium to the ribs, exert an immediate and powerful downward traction upon the thoracic walls, not only diminishing the size of the lateral walls of the abdomen, but acting as *adductors* to the ribs, which have been put in the position of *abduction* during inspiration. In the second place, the more anterior portions have a crossed action, and make diagonal traction across the abdomen. This has been well described by Henle. It will be seen by reference to Figs. 1523 and 1524 that the upper portion of the *external*, and the middle portion of the *internal oblique* muscles of opposite sides, attached, as they both are, to the intervening sheath of the *rectus*, are equivalent to one long diagonal muscle, which passes from the ribs on one side to the iliac crest on the other, and is capable, by its contraction, of drawing the ribs downward and inward, so as to contribute much toward the expiratory diminution of the thoracic cavity. It acts upon the abdomen as well. The function of the *transversalis* is equally important. Its middle portion is attached by a strong fascia to the transverse processes of the lumbar vertebrae; while the fibres below arise from the iliac crest and outer half of Poupart's ligament. Above, it arises from the inner surfaces of the costal cartilages.

"The fibres of this part of the muscle pass horizontally across the abdomen, and, by the mutual attachment of those from the opposite sides at the *linea alba*, one continuous muscle is formed, the contractions of which strongly adduct the lower costal cartilages and thus diminish the epigastric angle. The middle portion of the *transversalis* acts directly upon the abdominal wall. This is best illustrated in a horizontal section of the trunk just above the level of the umbilicus (see Fig. 1525).

"In its contraction the *transversalis* acts from the outer border of the *quadratus lumborum*, as that muscle fixes its tendon in the lumbar region. It tends, first, to draw the *linea alba* toward the fixed point; but the antagonism of the muscles of the opposite sides prevents lateral displacement, and simply allows the anterior abdominal wall to approach the vertebral bodies, shortening the antero-posterior diameter. The muscular fibres intermediate between the anterior and posterior attachments, which, during distention of the abdomen, are sharply curved, become straightened during contraction and make strong lateral compression.

"The lower fibres of this muscle, when they contract, tighten the line across the inferior abdominal regions, and compress the intestines. The *transversalis*, then, by its

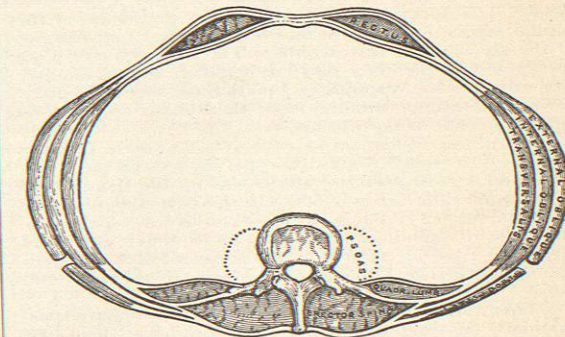


FIG. 1525.—Horizontal Section of Trunk Illustrating the Action of the Transversalis.

contraction, first, assists in diminishing the size of the thorax; second, it contributes, more than any other muscle, toward the diminution of the abdominal cavity; and, third, it acts in a manner analogous to that of the lower portions of the oblique muscles.

"Posteriorly, the most important muscles of forced expiration are the *erectores spinæ*, *serrati postici*, and *quadratus lumborum*.

"The *erector spinæ* is easily divisible into an outer and an inner portion, viz.: the *ileo-costalis* and *longissimus*

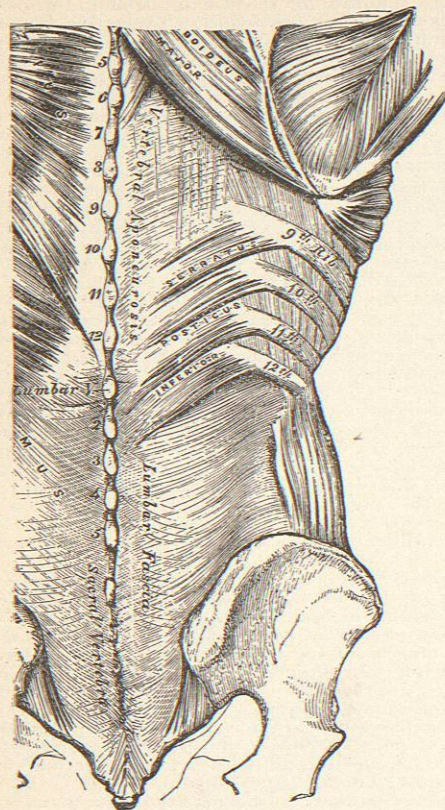


FIG. 1526.—Accessory Muscles of the Back—Serratus Posticus, Quadratus Lumborum.

dorsi. The former is connected below, by means of the lumbar aponeurosis, to the iliac bone; above, to the angles of the six or seven lowest ribs. The *longissimus* is more complex, but the only part of it which is prominently concerned in the respiratory function consists of a number of digitations running from the lumbar aponeurosis below to eight or ten ribs above.

"When the *erector spinæ* contracts, it draws the ribs forcibly downward toward the pelvis, lessens the transverse and antero-posterior diameters of the thorax, and at the same time tends to shorten the perpendicular axis of the abdomen. Those accessory muscles which reinforce the divisions of the *erector spinæ* above, act upon the upper ribs, but their strength is far inferior to that of the *ileo-costalis* and *longissimus dorsi* (Figs. 1526 and 1527).

"When these powerful muscles of expiration are spasmodically contracted in the act of coughing, their first effect is to adduct and depress the ribs, and by so doing diminish the size of the thorax in all its diameters. The adduction shortens the transverse diameter. The depression of the ribs and sternum shortens the antero-posterior diameter, and lessens the longitudinal axis of the general body cavity. But, as the abdominal walls only yield in the upward direction, and as the contents of the abdominal cavity are practically incompressible, its roof, up-

ward toward the trachea. If the displacement of the air is so sudden that the pressure in the trachea is greater than in the bronchial tubes of the upper lobes, the current will be reversed in the latter, and the superior and anterior parts of the lungs will be inflated; for the apices and anterior borders of the lungs are very little subject to the expiratory force, and only expel their tidal and supplementary air properly when the movements of the thorax are sufficiently deliberate to allow of an adjustment of pressure throughout. The forcible distention of the apices is seen in those suffering from violent spasmodic cough, as in bronchitis, phthisis, and pertussis. During the paroxysms, the supraclavicular spaces are seen to bulge, sometimes to a very remarkable degree, partly from swelling of the large veins in those regions, but partly also from distention of the apices. The same thing can frequently be seen in the upper intercostal spaces, near the sternum.

"This study of the action of the muscles during forced expiration will make plain the effects of coughing upon the lungs and other viscera. As has been already stated, the forcible expiration is preceded by a more or less deep inspiration, by which a large quantity of air is obtained for use in expelling the offending substance. The glottis is then partially closed, so as to narrow the route of exit and increase the friction of the escaping air against the mucous membrane of the larynx, trachea, etc. This is accompanied by the sudden and strong expiratory effort, during which the lower ribs are drawn quickly downward and inward, lessening the capacity of the lower portion of the thorax. The pressure upon the

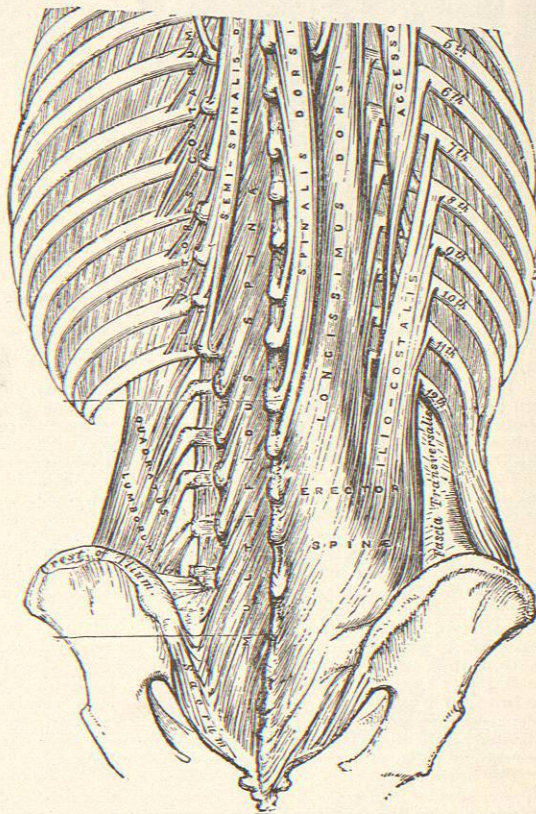


FIG. 1527.—Attachments of the Erector Spinæ. Mass—Ilio-Costalis and Longissimus Dorsi.

abdominal viscera drives them against the diaphragm, and pushes the floor of the thorax upward against the bases of the lungs. The lower lobes are then suddenly and violently pressed upon from all sides, and their contents driven in the direction of least resistance, viz., up-

ward toward the trachea. If the displacement of the air is so sudden that the pressure in the trachea is greater than in the bronchial tubes of the upper lobes, the current will be reversed in the latter, and the superior and anterior parts of the lungs will be inflated; for the apices and anterior borders of the lungs are very little subject to the expiratory force, and only expel their tidal and supplementary air properly when the movements of the thorax are sufficiently deliberate to allow of an adjustment of pressure throughout. The forcible distention of the apices is seen in those suffering from violent spasmodic cough, as in bronchitis, phthisis, and pertussis. During the paroxysms, the supraclavicular spaces are seen to bulge, sometimes to a very remarkable degree, partly from swelling of the large veins in those regions, but partly also from distention of the apices. The same thing can frequently be seen in the upper intercostal spaces, near the sternum.

"In acute bronchitis we find, as a result of increased expiratory efforts, both in breathing and coughing, a temporary distention of the alveoli of the superior and anterior parts of the lungs, manifested by prominence and increased resonance on percussion. It is a temporary functional emphysema which subsides as the attack passes away."

DIAGNOSIS.—The most important point for a physician to determine in relation to cough is its cause, and the diagnostic possibilities, therefore, should be carefully considered. Its semeiological relations are by no means confined to diseases of the nose, throat, and lungs, although it is most frequently indicative of disease somewhere in the respiratory tract.

It may be caused by the inhalation of irritants, as dust, smoke, fumes, gases, volatile oils, and, in susceptible subjects, certain pollens, and odors. Changes of temperature, and excessive dryness and excessive moisture of the atmosphere may give rise to cough without exciting visible inflammation. It may be caused by undue heat or pungency of food or drink, or by even minute drops of fluid entering the larynx. It may cause or be caused by vomiting, or, as in nervous diseases, cough and vomiting may be due to a common cause. Similarly, cough may provoke or be provoked by laryngeal, pharyngeal, œsophageal, pulmonary, or gastric hemorrhage, or may be excited by blood from a nasal hemorrhage entering the larynx; or cough and hemorrhage may have a common origin. In such associations, therefore, care must be taken to examine the patient thoroughly, and to weigh duly all the facts of the case.

Coughing may be reflex in origin, as from the irritation of teething; or it may be due to foreign bodies in the ear, or to the existence of a tumor, inflammation, or other irritative disturbance in any portion of the auditory apparatus; or to foreign bodies, polypi, enlarged turbinates, and other abnormalities in the nasal cavities, or to adenoid vegetations in the naso-pharynx. An elongated uvula, or a relaxed palate, or enlarged glands, or distended veins at the base of the tongue, may give rise to cough by mechanical irritation of the epiglottis; while cysts or other tumors upon the latter structure may produce either direct or indirect irritation, or provoke spasmodic cough with symptoms of strangulation by becoming incarcerated between the ventricular bands or the vocal bands. Foreign bodies or tumors in any portion of the throat (including under this heading, pharynx, larynx, and œsophagus), retropharyngeal abscess, a foreign body or a tumor in a bronchus, enlarged bronchial glands, a tumor or abscess of the thyroid gland, goitre, mediastinal tumor, aneurism of the thoracic aorta or its early branches, or of the right carotid or right subclavian artery, the pressure of a distended lung apex in emphysema,—any one of these may excite cough mechanically or by reflex irritation of the pneumogastric trunk or of one of its branches. Cough may likewise be due to cerebral disease, to tabes or other spinal affection, to neurasthenia, or to hysteria.

It may arise reflexly from irritation in any part of the digestive tract, including the liver, or may be due to congestion or œdema, secondary to disease of the liver, of

the kidney, or of the heart. Its remote cause may be gout or alcoholism, and the most brilliant successes in treatment are sometimes due to the recognition of its gouty origin.

Cough occurs most frequently, however, as a symptom of inflammation, whether of the upper or lower respiratory tract: thus in sore throat of various localization, in epiglottitis, in laryngitis, in croup, in tracheitis, in bronchitis, in pneumonia (croupous or catarrhal), and in pleurisy; also in emphysema and in asthma. It is usually a marked feature in advanced cases of pulmonary tuberculosis, and sometimes in early cases, although in some instances pulmonary tuberculosis has been known to run its course from beginning to end with little or no cough.

The mere enumeration of these varied conditions, which, moreover, do not exhaust the list of possibilities, is sufficient to show that the cause of any cough must be carefully sought for both locally and in general conditions, and that unless both local and general examination has been made, no diagnosis can be considered beyond question. Laryngoscopy should never be neglected. Moreover, as in all other diagnoses, all of the facts in the case must be considered, and the decision based upon their association, rather than upon any individual symptom or sign.

Indications of greater or less significance may perhaps be given by the character of the cough. Thus a *ringing, metallic cough* is usually associated with pressure upon the pneumogastric nerve or its branches, and will thus be found in aneurism, mediastinal tumor, and similar conditions. A cough of this character or a peculiar *hoarse, stridulous cough* without expectoration, and associated with paralysis of the left vocal band, raises a very strong suspicion of aneurism even in cases in which all or most of the ordinary physical signs are lacking; and I have verified two such diagnoses, the one by fluoroscopy, and the other by post-mortem examination. A *muffled cough* suggests the presence of membrane within the larynx, and if the voice also be muffled, a high degree of probability is given to the diagnosis of membranous croup or diphtheria. The so-called *croupy cough*, or *croaking cough*, may be found not only in membranous croup and diphtheria, but in catarrhal and spasmodic laryngitis (false croup), and in laryngismus stridulus. The cough of asthma is of a hoarse, *wheezing character*. The *whoop* of pertussis is *sui generis*, and hence both characteristic and pathognomonic. Hysterical cough is often *staccato*, as is sometimes the cough of the insane, especially in the early stages of general paresis. It may, however, in hysterical subjects, assume almost any character, and the imitation of the cries of animals, more particularly the barking of a dog, or of the crowing of a rooster, is not uncommon. J. Solis Cohen has described an epidemic of hysterical barking in a seminary for young women.

Cough is said to be *moist* when accompanied by more or less pronounced sounds of agitation of fluid in the air passages, and in such cases it is usually associated with expectoration; though in the case of pulmonary œdema and other asthenic conditions, expectoration may be deficient. Cough is *dry* when not accompanied with expectoration, or when expectoration occurs only with difficulty and fluid sounds are absent. Cough is *productive* when it brings out a quantity of phlegm and ceases with such relief. It is unproductive when not so accompanied. Productive cough is sometimes termed *free*. The terms *prolonged* and *short, hard and tight*, are self-explanatory. Coughs of the foregoing characters are usually associated with inflammatory conditions in some portion of the air tract, and their character may be an indication of the character of the causative inflammation. By *hacking cough* is usually meant a short, dry, unproductive cough, caused by mechanical irritation, or of reflex origin. "Hawking" of mucus from the nose or naso-pharynx into the throat should not be mistaken for cough. Sometimes cough is so severe as to cause the patient to become red in the face, and this is usually the case in spasmodic affections. A cough is *suppressed* or *deficient* when, in diseases that are ordinarily accompanied by free coughing