

that disease fatal by means of their tendency to hasten the destructive inflammatory processes.—*Syd. Soc. Bienn. Retrospect*. 1869, from *Klin. Vorträge über d. Lungenschwindsucht*, Berlin, 1867.

19. *The Causes of Cough*.—Dr. NOTHNAGEL has made a series of experiments in order to determine the question what parts of the respiratory apparatus are sensitive in such a manner that their irritation causes a cough. His experiments were made upon cats and dogs. 1. A young strong cat had the hyothyroid membrane opened, and a piece of the thyroid cartilage cut out above the vocal cords, so that one could look down clearly upon the cords. When the mucous membrane was gently irritated, or even pretty strongly excited with a sound, no trace of cough was produced; nor when the irritation was extended to the posterior part of the epiglottis, and the whole extent of the vocal cords. But when once the posterior wall of the larynx was irritated through the glottis there was violent coughing. From this we learn that irritation of the healthy mucous membrane of the windpipe above the two cords, and of the upper surface of the latter, does not produce cough. A further series of experiments were made to determine whether cough could be produced by irritating the mucous membrane of the trachea. It was discovered that this irritation did produce cough, but the cough was not so immediately and easily produced by irritation of the windpipe as of the higher parts. While the slightest irritation of the larynx produced energetic cough, it was necessary to be very much more rough in exciting the trachea in order to produce the same effect. It is also striking to see how quickly the trachea, when opened, loses its sensibility, so that after a time it is impossible to produce a cough. In this way it is easy to see how some experimenters have discovered different results from Nothnagel's.

These results obviously bear upon clinical experience. We know, for instance, that in a tolerably severe and recent catarrh of the throat pressure on the sides of the neck, and upon the manubrium, immediately produces cough. Irritation of the bifurcation of the windpipe produces much more energetic coughing than that of the trachea; in fact, this part is as irritable as the larynx. This fact also corresponds with the well-known clinical experience, that in the deep-seated catarrh pressure on the manubrium will often cause cough.

In order to test these results, further experiments were now made on section of the superior laryngeal nerves, and the trunks of the vagi above the point of their origin. When both vagi were divided irritation of the larynx produced cough, but irritation of the trachea and its bifurcation had no effect. When the superior laryngeal nerves were divided the larynx might be irritated to any extent without the least cough; but irritation of the trachea and its bifurcation produced coughing. These experiments show undoubtedly that it is not only the superior laryngeal nerve whose irritation causes cough, but that yet deeper branches of the vagus, whose terminations supply the mucous membrane of the windpipe, are also capable of causing cough in a reflex manner.

We now come to the question whether irritation of the bronchial mucous membrane causes cough. It is no use to test this question by irritation from above, as by a tracheal fistula. The experiment which Nothnagel devised was as follows: He wounded the lung substance through an opening in an intercostal space. The animal did not cough, but on his making a second puncture it coughed suddenly and violently. Dissection proved that the needle on the last occasion had penetrated a bronchus of medium size. In the next experiment, on a cat, portions of two ribs were cut away, and the collapsed lung was drawn out through the opening and fastened with a thread. A bit of the lung was now cut off with sharp scissors. The surface showed one or more bronchial tubes. These were irritated. When the experiment is lucky one may chance to cut a bronchus partly lengthways, and irritation can then be well applied. The result leaves no doubt that irritation of the bronchi will cause cough directly; nevertheless, it must be confessed these experiments are not so exact as those on the trachea and larynx. It is, of course, impossible to experiment upon the smallest bronchial tubes, but it may be assumed that irrita-

tion of these also would cause cough. It is impossible to form any conclusion as to the result of irritation of the alveoli.

In another series of experiments the result of irritation of the pleura was tested. A dog was experimented upon, a puncture being made through the muscles of an intercostal space. A sound was then introduced so as to cause a pneumothorax, and the sound was moved about in the pleural cavity. No cough was produced. The opening was then enlarged, and further irritation was set up, but no cough occurred. However, it might be said that, although the healthy pleura did not give rise to cough when irritated, an inflamed pleura might produce cough by its irritation. Accordingly a dog was thrown into narcosis with morphia, and in this condition a solution of croton oil in olive oil was injected into the pleura. The skin was closed. When the animal came to itself it winced and cried, but did not cough. The same evening the pleura was irritated, as in the above experiments, in every direction, and there was evidence of pain, but not the least tendency to cough. In order to correct the experiment, the trachea was opened. Irritation of the larynx and the trachea at its bifurcation produced violent cough. Dissection showed intense pleurisy, with considerable exudation and effusion of blood in both pleuræ.

The results thus obtained undoubtedly seem in curious contradiction with the commonly observed fact that cough sometimes attends pleurisy; but the fact is, in all probability, that exact observation would show that in simple pleurisy there really seldom is cough. The probability is, in fact, that in those cases where cough is present there is simultaneous affection of the lung or of the bronchi.

Some observers, for instance, Krimer and Romberg, state that irritation of the vagus trunk causes cough. Most experimenters contradict this, and also deny that irritation of the trunk of the superior laryngeal nerve causes cough. A series of experiments have convinced Nothnagel that the latter opinion is correct. In no single case have we got evidence that irritation either of the uninjured trunk or of the central end of the vagus or of the superior laryngeal causes cough. It is impossible to say what the sources of mistake may have been. The result to which Nothnagel's experiments led entirely corresponded with the physiological law, that irritation of branches of a nerve much more easily produces reflex phenomena than irritation of the trunk. It shows also a remarkable difference between reflex coughing and reflex vomiting. The latter symptom is easily induced, not merely by irritation of the stomach, but of many other places, and of the nervous centres. People have indeed spoken of a centrally produced cough, but their observations are very doubtful and inconclusive.

In conclusion, the author remarks that there are some other important points yet to be observed as to the origin of cough; for instance, many people talk of a stomach cough, and of the cough in pericarditis. So far he has made no experiments upon these points, but on the whole he is inclined to disbelieve these statements, especially in view of the results obtained by experimenting on the pleura. However, the fact is established that in many individuals cough may be produced by irritation of many particular places. A small branch of the vagus is here probably the medium of irritation.—*Syd. Soc. Bienn. Retrospect.* 1869, from *Virchow's Archiv*, iv. 1, 1868.

20. *Inflammation and Suppuration.*—The most important researches on this subject which have been made for many years are those of СОHNHEIM. In an elaborate paper (*Virchow's Archiv*, Sept. 1867) he brings out the following facts. Referring to the researches of His and Strnre, he illustrates the results of artificially produced inflammation of the cornea. It is generally believed that under these circumstances the stellate corneal corpuscles increase in size and develop either by splitting of the nuclei and cell-substance, or by the production of young elements from within, which are pus-cells.

More careful examination shows that the new cellular elements are not only pus; on the contrary, it can be seen that the ordinary corpuscles of the cornea are present in exactly their ordinary distribution. The pus-cells exhibit a great variety of shapes, corresponding with their natural contractility. At a