

ANATOMY AND PHYSIOLOGY.

ON THE REFLEX FUNCTION OF THE BRAIN.

By Dr. LATCOCK.

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Every nerve has its peculiar endowments, and its own machinery of action within the central axis. This is true even of those of the surface—the “true spinal” nerves—which carry the sensations of heat and cold, and of pain from pricking, tearing, or other mechanical stimuli, for all reflex acts are more decided when the tactile apparatus is irritated. It has been comparatively easy to experiment on these, because their ordinary excitants are readily applied to them; but the optic, olfactory, and acoustic nerves are utterly insensible to stimuli of this kind. Pricking or tearing them, or burning them with strong acids would in no degree excite changes like those induced in the retina by light, after traversing an exquisitely constructed optical instrument; nor excite changes in the acoustic nerve, like those produced by the undulatory strokes of the atmosphere, curiously modified in the auditory apparatus. Experiments on the termination or trunk of these nerves, similar to those made on the nerves of the general surface would therefore be useless. The nearest approach is where galvanic action excites flashes of light, or an acid taste—sounds duly modified must impinge on the auditory nerve, light duly modified on the optic nerve, if we would ascertain their excitatory powers; and physiology and pathology can only supply suitable facts. The symptoms of hydrophobia will perhaps best present the required illustration. In hydrophobia, as in poisoning by strychnia, a poison acting on the blood performs the office of a physiological microscope. But there is this difference, that the former exalts the functions of the sensory track, the operation of strychnia is confined to the motor. The symptoms of this disease constitute a series of excited motor acts, observed with sufficient accuracy, and so well marked as to leave no doubt of their character. The excito-motor nerves whose functions are disordered, are (according to Dr. Hall’s views) the trifacial and glossopharyngeal, the pharyngeal and laryngeal branches of the pneumogastric, and in some instances the posterior spinal nerves. The reflex motor are the motor branches of the fifth, and of the pneumogastric, and the spinal accessory, and other spinal respiratory nerves. The phenomena excited are spasm of the respiratory muscles, and gasping, convulsions of the face, and occasionally of the trunk or limbs, and an extraordinary development of the instinct of conservation. The patient is ever on the watch, and distrusting all around him.

The true state of the lungs in the hydrophobic gasp appears to be that of complete vacuity of air; and hence the distressing sensation of want of breath, or the “besoin de respirer.” That this is the fact appears from a consideration of the phenomena themselves; but in a case related by Dr. Babington, (Vide ‘Records and Researches of a private Medical Association,’ p. 117; London, 1798,) the patient having been put into a warm bath had a convulsive gasp just when being taken out, and immediately sank to the bottom, and as Dr. Babington states, would have been “suffocated” or drowned, if immediate assistance had not been given; thus proving that the lungs at the moment of the convulsion were emptied of air. Now to do this, the contractile tissues of the lungs themselves must be brought into energetic action, as well as the muscles of respiration, so that the excito-motory phenomena of hydrophobia extend to the muscular fibres of the air-passages.

The acknowledged excito-motory phenomena of hydrophobia may be induced, firstly, through the sensory nerves of touch, as by the contact of water with the surface of the head, hands, chest, the lips and pharynx; 2d, by a current of air impinging on the face or chest. In the majority of cases, the slightest breath of air will bring on gasping and convulsions. These causes act undoubtedly on the incident nerves mentioned. But, thirdly, a bright surface, as a mirror; fourthly, the sight of water; or fifthly, the sound of water dropping; or sixthly, the idea of water, as when it is suggested to the patient that he shall drink; all most indubitably induce excito-motory phenomena as decided and distinct as the first and second causes. Here we have three classes of irritations inducing the reflex acts of gasping and spasm of the respiratory muscles: 1, the contact of water and air with the surface of the face, chest and mouth; 2, the contact of reflected light with the retina; 3, an idea excited by the sound of water dropping, or by the mention of water. I need scarcely remark

that the dreadfully painful gasp in hydrophobia is strictly involuntary. The following examples may be mentioned as illustrative of these statements.

Effects of the contact of reflected light with the retina. “On Monday, the 26th of September, at half-past nine in the morning, a looking-glass being presented to her, she jumped off her mother’s knee in great agitation, and became convulsed.” (Case of Eliza Kittle, aged 3 years, by Sir A. Carlisle, in Gilman’s ‘Prize Essay on the Bite of a Rabid Animal,’ p. 171.)—“When a mirror was presented to him he complained in a few seconds of its hurting his eyes. The same convulsive sobbing took place as in the attempt to swallow water, and he turned his head aside with great expression of fear. I gave him money to induce him to look at it a second time, and endeavoured to gain his attention by desiring him to point out to me by the mirror, which of the sores had given him the greatest uneasiness at the time of dressing them; but before he had looked in it a minute, the same effect was produced as before.” (Case of John Dyke, aged 9 years, by Dr. Beddoes, ‘Med. and Phys. Jour. vol. xx, p. 198.)

The idea of water excites convulsion. “On suggesting that he should swallow a little water, he seemed to be frightened, and began to cry out. He turned suddenly in bed, and was simultaneously seized with a momentary clonic spasm of the trunk, greatly resembling emprosthotonos; however, by kindly encouraging him, he soon manifested a willingness to accede to my wish, but the sound of the water as it was poured into the teacup, again brought on a similar convulsive action.” (Case of Edward Lloyd, aged nearly 11, by Mr. Thornhill, ‘Lond. Med. Gaz.’ vol. xvii, p. 270.)—“On our proposing to him to drink, he started up and recovered his breath by a deep convulsive inspiration..... On being urged to try, he took a cup of water in one hand, and a spoon in the other..... With an expression of terror, yet with great resolution, he filled the spoon and preceeded to carry it to his lips; but before it reached his mouth, his courage forsook him, and he was forced to desist. He repeatedly renewed the attempt, but with no more success. His arm became rigid and unmovable whenever he tried to raise it towards his mouth, and he struggled in vain against this spasmodic resistance.” (Case of Odell, aged 23, by Dr. Marcet, in ‘Med. Chir. Trans.’ vol. i, p. 133.)

The sight of water induces convulsions. “Sensibility to touch markedly acute; an embrocation to the external fauces produced convulsions; passed urine of a lemon colour easily, could view it without horror in a black earthen pot; in a glass the sight produced instant convulsions.” (Dr. Vaughan’s case of Thomas Nourse, aged 14, in Dr. Hamilton’s ‘Remarks on Hydrophobia,’ vol. ii, p. 434.)—“Desirous of cold air, but it constantly renewed his distress; sight of water excited convulsions.” (Dr. Vaughan’s case of a farmer, aged twenty-five, in *ibid* p. 439.)—“Sobbed deeply at the sight of water, turning away with perturbation.” (Dr. Vaughan’s case of a boy, aged 8 years, bitten by a cat, *ibid*, p. 441.)—“On water being poured from one basin to another before him..... it excited convulsions, and caused him to dash himself against the head of the bed, as if endeavouring to escape from the sight.” (*Ibid*, p. 466. Case of a man, aged 36.)—“Some ale being brought to Dr. Adam while he talked with the patient, he started up from the table at the sight of the mug, and ran away.” (Dr. Adams’ case of a farmer, aged 40. *Ibid*, p. 468.)

I shall not now refer to the pathological action of colours, especially of red, on the motor part of the nervous system, because the facts may possibly be disputed. The physiological action is beyond question. The incident excitatory influence of odours in inducing convulsions, &c. is however, well substantiated. So common is this result at Rome, that Sir J. Clark has noticed the fact in his classical work on *Climates*, and his observation is especially worthy notice, “that it is not disagreeable odours which produce such effects on the nervous system, but the more delicate, and to northern nations, agreeable odours of flowers and other perfume.” So that the results cannot be analogous to those induced by stimulants applied to the nostrils.

Having thus adduced facts proving that the sensory nerve are incident exciters, I need only refer to the phenomena of hydrophobia to show farther, that the impressions made on them at their periphery pass on to the central axis, and there induce the necessary changes in the posterior gray matter, so that excito-motory acts shall result.

I have stated that the idea of water, whether obtained through