

VIII. *Experiments and Observations on the influence of the Nerves of the eighth Pair on the Secretions of the Stomach.* By B. C. Brodie, Esq. F. R. S. *Communicated by the Society for the Promotion of Animal Chemistry.*

Read February 10, 1814.

IN a paper formerly communicated to this Society by Sir EVERARD HOME, and since published in the Philosophical Transactions for the year 1809, some facts were stated which render it probable that the various animal secretions are dependent on the influence of the nervous system, and this opinion seemed to derive support from some physiological experiments which were afterwards instituted by myself, and in which it was observed, that after the functions of the brain had been destroyed, although the action of the heart continued, and the circulation of the blood was maintained as under ordinary circumstances, the secreting organs invariably ceased to perform their office.

It has been attempted by former physiologists to determine how far the nerves are necessary to secretion, but there are considerable obstacles in the way of this inquiry, and no observations, that have been hitherto made, appear to throw a great deal of light on the subject. The only method, which can be devised, of ascertaining by direct experiment, whether the nerves are really necessary to secretion, is that of dividing the nervous branches by which the glands are supplied.

But this, with respect to the greater number of the glands, is an experiment impossible to perform; and, with respect to others, can not be executed without so much disturbance and injury to the other parts, as must render it extremely difficult to arrive at any positive results. Perhaps in future investigations, some circumstances may arise, which will enable us to determine more satisfactorily this important physiological question. In the mean time, as the labours of physiologists have hitherto contributed so little to this purpose, any facts that tend to its elucidation may deserve to be recorded, and I am therefore induced to lay before the Society the following experiments, which afford one example of a secretion being dependent on the influence of the nerves.

The stomach derives its nerves principally from those of the eighth pair, or the *par vagum*; and the same nerves, as they assist in the formation of the semilunar ganglions, contribute to the supply of the rest of the alimentary canal, particularly of the small intestines. In an inquiry which I had formerly instituted, respecting the functions of the stomach, I divided these nerves in the neck of a dog, for the purpose of ascertaining the influence which they possess on the secretion of the gastric juice; but I was disappointed in my expectation, since the animals always died, in consequence of the disturbed state of the respiration, which the injury of the nerves occasioned, before there was an opportunity of ascertaining the effect produced on the process of digestion.

I had formerly ascertained, that in a dog poisoned by arsenic, there is a copious secretion of mucous and watery fluid from the mucous membrane of the stomach and intestines, which are in consequence found after death completely and preter-

naturally distended ; and it occurred to me, that although I could not ascertain the effect of the division of the nerves of the eighth pair on the natural secretions of the stomach, it might be possible to ascertain the effect on a secretion thus artificially produced. With this view I instituted the following experiments.

*Exp. 1.* The nerves of the eighth pair with the accompanying sympathetic nerves, were divided in the neck of a dog, and immediately afterwards ten grains of arsenic were inserted into a wound of the thigh. The breathing became laborious, as is usual where these nerves are divided, and afterwards the same symptoms took place, as commonly arise from the poison of arsenic, with this difference, that there was no discharge of fluid either from the stomach or intestines. He died at the end of three hours and a half. On dissection, the stomach and intestines were found to contain only food and fæces, there being none of the mucous and watery secretion usually met with in an animal which has been killed in the same manner. The mucous membrane of the stomach and intestines was highly inflamed.

*Exp. 2.* The experiment was repeated on another dog. He died at the end of nine hours, and on dissection the stomach and intestines were not found to contain any mucous or watery fluid. Their mucous membrane was inflamed.

*Exp. 3.* A dog, immediately after the division of the same nerves in the neck, was made to swallow two ounces of saturated solution of white oxide of arsenic in water. He died at the expiration of three hours : on dissection, the stomach and intestines were found slightly inflamed, and they contained no mucous or watery fluid.

In these experiments, the animals died from the application of the arsenic, and the poison produced the usual symptoms, with the exception of the copious mucous secretion, which takes place in other instances from the stomach and intestines. The obvious conclusion was, that this secretion was prevented in consequence of the nervous influence having been interrupted by the division of the nerves of the eighth pair; but as this injury always induces a disturbed and laborious respiration, it was desirable to ascertain how far this circumstance might have operated towards the production of this effect, and I therefore repeated the experiment, but with this difference, that the nerves were divided in such a way as not to interfere with the functions of the lungs.

*Exp. 4.* Having made an incision into the abdomen of a dog, immediately below the short ribs, I divided, by means of a bistoury, the stomachic ropes formed by the nerves of the eighth pair, where they are situated on the œsophagus, immediately above the cardiac orifice of the stomach. The wound was closed by sutures. The respiration was not in the least disturbed, but was performed as frequently, and with as much ease, as under ordinary circumstances. The animal was afterwards inoculated in the thigh with the white oxide of arsenic, and he died in a few hours after the application of the poison, with the ordinary symptoms, except that there were no fluid evacuations from the stomach or intestines.

On dissection, the mucous membrane of the stomach and intestines was found inflamed. There was no watery or mucous fluid in the stomach or small intestines. There was a small quantity of mucus in the colon.

The result of this being the same as that of the former

experiments, we may conclude that the suppression of the secretions in all of them was to be attributed solely to the division of the nerves: and all the facts which have been stated sufficiently demonstrate, that the secretions of the stomach and intestines are very much under the controul of the nervous system. We cannot indeed venture to deduce from them any positive conclusions respecting the necessity of the nervous influence to the secretions in general, but as forming one link in the chain of an interesting, but difficult physiological investigation, the circumstances which have been mentioned may perhaps be considered as possessing some value, and as worthy of being recorded.

It is proper to observe, that I have attempted to pursue the investigation, so as to ascertain the effect produced on the process of digestion by the division of the stomachic ropes on the termination of the œsophagus, but various circumstances, which it would be unnecessary to enumerate, have prevented my proceeding in the inquiry, and seem almost to render it impossible, to make any observations on this subject.