SUMMARY

By employing in each half of the symmetrical input cascade of the amplifier a series combination of two triodes and a pentode as a total cathode load with a deep inverse feedback – it becomes possible to bring the rejection factor of such an amplifier up to one million (without the matching of tubes).

A portable double-channel preamplifier using such a circuit has been developed for work with an industrial double-beam oscillograph. With the aid of this preamplifier and electrodes of special construction it was possible to register the potential of nerve action of animals in short-term experiments without screening the room and object in usual laboratory conditions.

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A METHOD OF STUDYING GASTRIC AND DUODENAL SECRETION AT THE SAME TIME**

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I. P. Pavlov (1897, 1902) repeatedly drew attention to the development of methods which would enable the simultaneous observation of the work of several digestive glands in the same normal animal.

The performance of this task is often beset by difficulties: on the one hand it is necessary to obtain, measure and test the juice from each gland separately, and on the other hand, the juices must enter the digestive tract in the same quantities as were secreted by the glands both outside and during the experiment, otherwise the normal course of the digestive process would be disturbed.

* In Russian.

** Delivered (with a demonstration on a dog) at the meeting of the Riazan section of the Society of Physiologists on December 27, 1955.

*** Deceased.

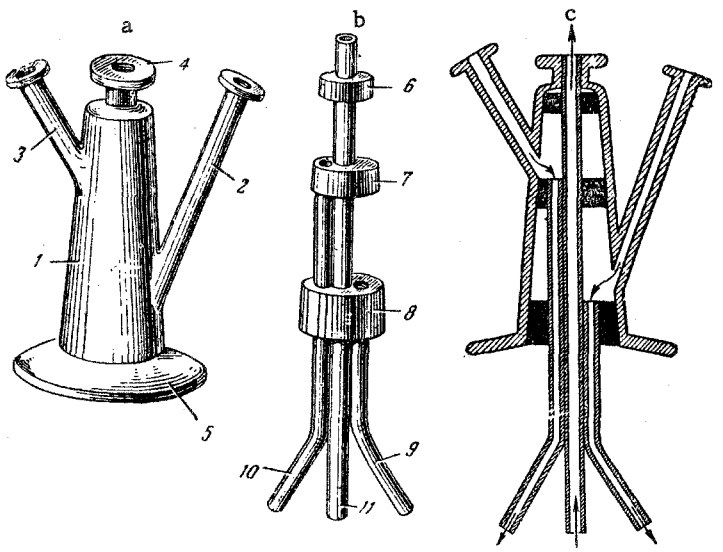

Fig. 1. a) Fistula tube; b) the "heart" of the apparatus; c) the fistula tube with the "heart" in situ (in section); 1) body of fistula tube; 2) first branch of fistula tube (for collection of gastric juice); 3) second branch of fistula tube (for collection of pancreatic juice); 4) upper ring of fistula tube, inserted in the duodenum; 5) lower ring of the fistula tube brought out onto the surface of the animal; 6) ring of the "heart," closing the upper orifice of the fistula tube; 7) ring of the "heart," closing the fistula tube between its first and second branches; 8) ring of the "heart," closing the lower part of the fistula tube; 9) drainage tube of the "heart" for collection of gastric juice; 10) drainage tube of the "heart" for collection of pancreatic juice; 11) central tube of the "heart" for returning to the intestine the digestive juices and for infusion of test substances.

It is particularly difficult to study simultaneously the work of the two most important and closely interconnected digestive organs – the stomach and the pancreas.

The difficulty of preserving the life of animals with an isolated stomach or with a pancreatic fistula, and of looking after them, is well known. These difficulties may be primarily responsible for the absence of work dealing with the study of the secretion of gastric and pancreatic juice by experiments on the same animal. We decided to attempt to overcome these difficulties.

In order to obtain gastric and pancreatic juice simultaneously we used the fistula tube suggested by one of us [4] (Fig. 1, a, b, c). In accordance with its new functions the construction of the tube was slightly modified.

The diameter of the body of the tube (1) was enlarged, and the orifices of its branches (2 and 3) and also of the drainage tubes of the "heart" (9 and 10) were widened.

The fistula tube is made from the plastic AKR-7, used for dentures, and it can be made in any dental prosthetic workshop. Tubes of this material are sufficiently firm, light and resistant to acids and alkalies. They differ from the heavy, metal tubes by not causing ulceration.

The "heart" is inserted in the fistula tube only at the time of the experiment. It is turned from stainless steel. The drainage tubes (9 and 10) are made either from stainless steel (which is better but more difficult) or from German silver. The central tube of the "heart" (11) is turned in one piece with its rings (6, 7, 8). It is very important that all three metal rings of the "heart" (6, 7, 8) should be well ground to the body of the tube (1). With poor grinding it is possible for juice to leak from one compartment of the tube to another. For hermetic sealing of the rings of the "heart" (6, 7, 8) they are smeared with a thin film of vaseline before being inserted in the fistula tube.

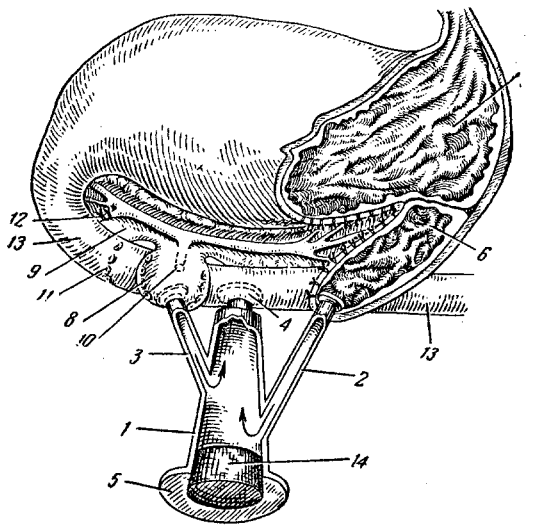

Fig. 2. Diagram showing the disposition of the fistula tube in the stomach and duodenum. Part of the stomach and the fistula tube are shown in section. The "outside the experiment" position is shown, when the fistula tube is closed with a rubber stopper. 1) Fistula tube; 2,3) see Fig. 1; 4) upper ring of the tube in the duodenum; 5) lower ring of the tube brought out onto the surface of the abdomen of the dog; 6) isolated stomach pouch (in section); 7) stomach; 8) isolated duodenal pouch for collection of pancreatic juice; 9) pancreas; 10) main pancreatic duct; 11) intestinal anastomosis; 12) accessory duct of the pancreas, ligated and divided; 13) duodenum; 14) rubber stopper closing fistula tube.

The operations on the gastrointestinal tract required in this method do not call for description, since they are carried out by the usual routine for preparation of an isolated gastric pouch [3, 6] and duodenal pouch [1, 2, 5]. It needs pointing out only that in contrast to the usual method the end of the isolated gastric pouch is not exteriorized to the surface of the animal but the branch of the fistula tube is fixed into it by means of a purse-string suture (Fig. 2, 2). Together with the fistula tube, the isolated gastric pouch is completely contained in the peritoneal cavity. The whole operation lasts 2-2.5 hrs if the surgeon is sufficiently well prepared.

Outside the experiment the fistula tube is closed by an ordinary rubber stopper. In this case the gastric juice from the isolated stomach pouch, and also the pancreatic juice are directed into the duodenum (Fig. 2). The digestive process proceeds normally outside the experiment.

At the time of the experiment when the "heart" is in position inside the fistula tube (Fig. 1), gastric juice from the isolated stomach pouch flows along the branch of the fistula tube (2) and also along the drainage tube of the "heart" (9) into one test tube, and the pancreatic juice from the isolated duodenal pouch along the branch of the fistula tube (3) and the drainage tube of the "heart" (10) into another test tube.

Every 5 min (for gastric juice – usually after 30 min) both juices, after measurement and taking of samples for analysis, are returned through a rubber tube and funnel and the central tube of the "heart" (11) into the duodenum.

Therefore, during the experiment also, both juices enter the digestive tract in almost their full amounts and at the right time, and digestion proceeds normally.

The great advantage of the method described is the tremendous simplification of the care of the dogs after operation. It is not necessary after giving the dog a meal to keep it for a long time, outside the experiment, in a stand as has to be done with dogs with isolated gastric pouches. No longer is it necessary to carry out daily washing of the abdomen and limbs of the animal, and to watch carefully for signs of inflammatory or ulcerative lesions of the skin of the abdominal wall due to the gastric and pancreatic juices, or to administer soda to the dogs daily to replace the loss of alkali. In practice the care of the dogs is no more complicated than in the case of animals with a Basov gastric fistula.

If the operation is carried out with sufficient care and leakage of juice along the track of the fistula can be prevented, the animals may live for a long time in good health and well-being, and can be used not only for research purposes but also for educational purposes.

SUMMARY

A method is described which allows obtaining of gastric juice from an isolated stomach pouch simultaneously with pancreatic secretion and then after measuring their quantity to return them into the duodenum. During the time between the experiments both juices enter the intestine.

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EXPERIMENTAL HETEROTRANSFUSIONAL SHOCK IN WHITE RATS ACCOMPANIED BY ACUTE PULMONARY EDEMA

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In the practice of medicine,cases are observed of death of patients after transfusion of incompatible blood as a result of acute edema of the lungs [2, 3, 7].

The pathological findings show that pulmonary edema in patients dying from blood transfusional shock [4] or other forms of shock [8] is very common. However, until our report [5] we could not find any reference in the literature to a study of the pathogenesis of pulmonary edema due to transfusion of blood from another species of animal. Accordingly we transfused foreign blood into various animals. In particular we injected white rats with blood from cattle, dogs, rabbits, sheep, goats, geese, pigeons and man. Preliminary experiments showed that blood from oxen, cows and calves causes shock which is accompanied by acute pulmonary edema.

EXPERIMENTAL METHOD

In the experiment we used white rats of both sexes, weighing from 52 to 329 g. Ox**blood was obtained from a slaughter house of the meat combine, observing aseptic precautions. Sodium citrate was used as an anticoagulant (0.3-0.5 g per 100 ml blood). As a rule the blood was used the day it was taken, after filtration through 6-8 layers of gauze. The blood was injected into the femoral vein of unanesthetized rats in a period of 30 sec. In some investigations we obtained tracings of the blood pressure in the carotid artery and of respiration. In a number of experiments we investigated variations in the size of the kidneys. The dead animals were examined post mortem and histological examinations were performed.

EXPERIMENTAL RESULTS

The first series of investigations consisted of 238 experiments in which rats were injected with ox blood in a dose of from 10 to 25 ml/kg; 223 of these experiments did not include kymographic recording. In 11 of these

* In Russian.

** In future,blood from bulls, cows and calves will be called ox blood.