ROLE OF BODY TEMPERATURE ON GLOSSOPHARYNGEAL NERVE RESPIRATORY RESPONSE IN DOGS

By

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Teitelbaum and Ries (1935) studied the effects of stimulation of the central end of the glossopharyngeal nerve on respiration in dog. They observed a variable response consisting of inhibition or acceleration of respiration occuring separately in different dogs, or occuring together in the same dog on stimulation of the different pharyngeal branches of the glossopharyngeal nerve. As the dogs regulate their body temperature through respiration, it was thought that body temperature might be conditioning the variable glossopharyngeal respiratory response. Since this aspect of the problem has not been investigated it is proposed to study it in this work.

METHODS

Ten healthy dogs of both sexes weighing from 4.25 kg. to 7.25 kg. were used. Chloralose was adminstered intravenously to the dog under ether anaesthesia, the dose being 80 mg. per kg. of body weight. The pharyngeal branches of the glossopharyngeal nerve were dissected out on both sides and cut as close to the pharynx as possible. The central end of the cut branches was stimulated one at a time for 30 seconds by induced current from the induction coil fed by 5 volts current in the primary coil, and the secondary coil placed at a distance of 10 cms. from the primary. Body temperature was recorded by a Centigrade thermometer placed deep into the rectum. The body temperature was lowered by ice packs, and raised by applying radiant heat from carbon bulbs placed all round the animal. The respiration was recorded by placing and inflating a balloon between the liver and diaphragm, and connecting it to a recording tambour. In the figures, the upper tracing is of blood pressure, the second one of respiration, the third one signalling the stimulation of the nerve, and the lowest one of time in 10 seconds.

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RESULTS

Stimulation of the central end of the cut pharyngeal branches of the glossopharyngeal nerve produced inhibition of respiration in all the ten dogs. At subnormal body temperatures down to 34°C, the respiration inhibition consisted of complete apnoea even out lasting the duration of the stimulus (Figure 1). When the body temperature was raised the duration

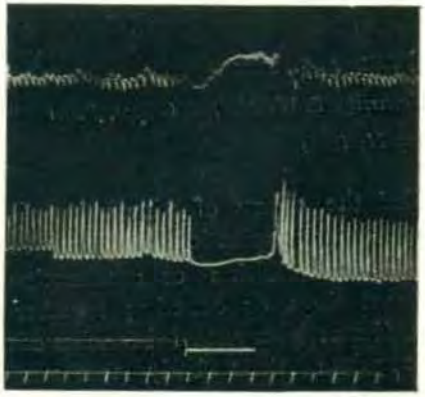

Fig. 1. Dog 4. Shows the response at 34°C body temperature.

Fig. 2. Dog 4. Shows the response at 41°C body temperature.

of apnoea gradually decreased upto a body temperature of 41°C, and the apnoeic period was replaced by slow and deep respirations of the apneustic type (Figure 2). Above 41.5°C the apnoeic period completely disappeared and was replaced by only slow and deep respirations (Figure 3). In one dog at a temperature of 42°C the usual response was observed (Figure 4); but later on stimulation of the nerve in the same dog and at same temperature showed apnoea lasting for the duration of two to three respirations (Figure 5). Stimulation of all the pharyngeal branches of the glossopharyngeal nerve on both sides produced the same result. Respiratory acceleration as reported

by Teitelbaum and Ries (1935) was not observed in any of the experiments.

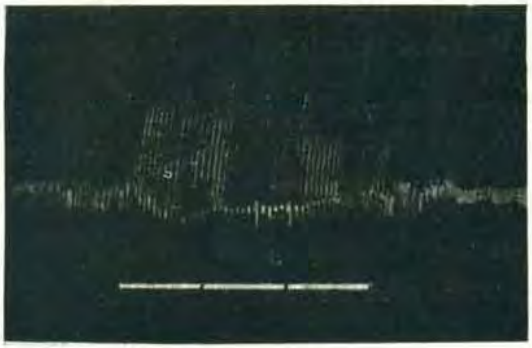

Fig. 3. Dog 4. Shows the response at 41.5° body temperature.

Fig. 4.

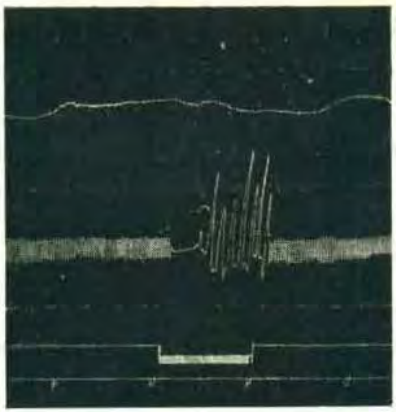

Fig. 5.

Dog 8. Both the responses are at 42°C body temperature. Fig. 4 shows the usual respiratory response as seen in figure 3, but later on inhibitory response was observed (Figure 5).

DISCUSSION

At subnormal body temperatures (34-35°C) stimulation of the central end of the cut pharyngeal branches of the glossopharyngeal nerve produced complete apnoea, but on raising the temperature these apnoeic periods gradually reduced, till at 41.5°C there was no apnoea at all, and the rhythm of respiration became slow and deep. Body temperature, therefore, appears to be a factor conditioning this inhibitory response. In the response observed by Teitelbaum and Reis (1935), the body temperature factor appears

to have been missed, since no mention of body temperature was made in their work.

The complete disappearance of glossopharyngeal apnoea in the experiments at about 41.5°C body temperature suggests that the respiratory inhibition of the glossopharyngeal nerve is suppressed by the respiratory attempts for the heat loss. In one animal the original glossopharyngeal inhibitory reflex reappeared at 42°C showing failure of the mechinery for heat loss. This observation supports the earlier observation of Kumar (1953) who found that the reflex acceleration of respiration rates in dog on opening the mouth also disappeared at 42°C body temperature.

SUMMARY

1. Experiments were done on the healthy dogs of both sexes under chloralose anaesthesia.
2. Stimulation of the central end of the cut pharyngeal branches of the glossopharyngeal nerve caused complete apnoea only at subnormal body temperatures, and at raised body temperatures a decrease in the rate and an increase in depth of respiration.
3. Body temperature appears to be a factor conditioning the respiratory inhibitory response of glossopharyngeal nerve stimulation.

REFERENCES

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