

INHIBITORY AND EXCITATORY EFFECTS OF CATECHOLAMINE AND SYNTHETIC OPIATE ON GASTROINTESTINAL CONTRACTIONS IN CATTLE

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Introduction

Some of catecholamines (CA), i.e., dopamine, noradrenaline and adrenaline, caused inhibition of extrinsic reticulo-ruminal motility in the goat (Van Miert and Van Vugt, 1974). However, the site of action of opiates on gastrointestinal motility is still being debated. The administration of loperamide, a synthetic opiate, caused the increase of electrical activity of the duodenum and the inhibition of antral activity in sheep (Ruckebusch and Merritt, 1985), and it also inhibited cyclic ruminal motility in goats and sheep (Maas et al., 1986).

The present experiments were designed to determine the effects of CA, a synthetic opiate and an intrinsic opioid on the gastrointestinal contractions in conscious cattle.

Materials and Methods

Five adult Holstein cows weighing 400-552 kg were used. The cows were given hay and wheat bran twice a day. After intramuscular injection of xylazine, strain gauge force transducers were chronically fixed on the wall of reticulum, abomasum (body and antrum) and duodenal bulb by means of the paramedian laparotomy. Thereafter, another 4 force transducers were also fixed on the dorsocaudal sac of rumen, descending duodenum, jejunum and ileum by means of the right flank laparotomy at standing position.

Contractions were recorded continuously in all animals from 6-8 days after surgery for 4-6 weeks using Wheaston bridge amplifier.

The following drugs, dopamine (0.5 mg/kg, i.v.), noradrenaline (1.6 mg/kg, i.v.), adrenaline (10 mg/head, i.v.) and trimebutine malcate (1.0 mg/kg, i.v., Cerekinon) were administered into the jugular vein within 30 min after the end of phase

III in migrating contractions (MC) of the duodenal bulb.

Electro-stimulations (ES) were given to the lumbar spinal cord at 1-2 volt with 2 Hz. for 30 min under recordings of the gastrointestinal contractions. Blood samples were taken before and after ES to assay plasma CA and beta-endorphine in Special Reference Laboratories.

Results and Discussion

Administration of CA and trimebutine as well as the ES to the lumbar spinal cord inhibited the

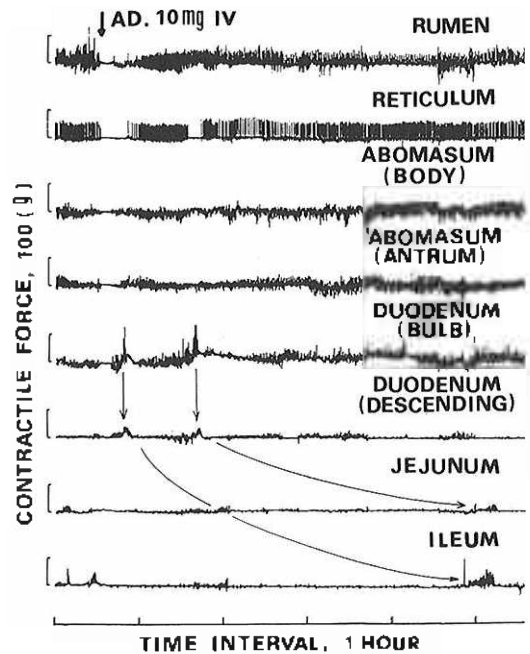


Figure 1. Effect of adrenaline (10 mg/head, i.v.) on contractile activity of gastrointestinal tract in a cow. AD: adrenaline

contractions of the rumen, reticulum and abomasum, but they induced to bring out phase III in MC of the duodenal bulb (figure 1). ES induced to increase plasma CA (figure 2) and beta-endorphine.

MC of the small intestine induced through force transducers correspond to the migrating myoelectric complex (MMC) obtained by the integration of myoelectrography in sheep (Ruckebusch and Bueno, 1977).

The inhibition of the forestomach motility seemed to be caused by dopamine acting centrally on a peripheral mechanisms via alpha-adreno-

receptors and dopaminergic receptors (Stafford and Leek, 1988).

It is suggested that excitation of the duodenal bulb contractions along with inhibition of the forestomach and nervous system caused by peripheral and central effects of intrinsic opioid and CA.

(Key Words: Gastrointestinal Contractions, Catecholamine, Electro-stimulation)

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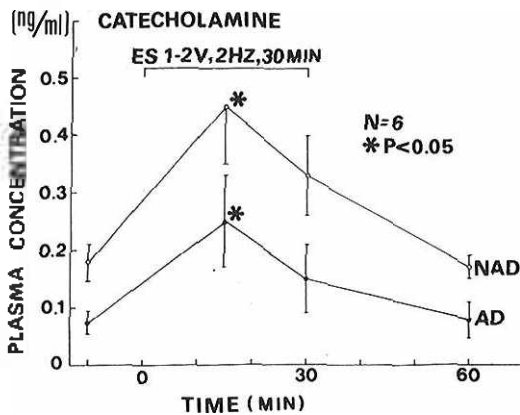


Figure 2. Plasma concentration of catecholamine under electro-stimulation in cows.
NAD: noradrenaline AD: adrenaline