

CHANGES OF PLASMA DIGESTIVE HORMONE LEVELS IN BOVINE FOETUSES AND THEIR DAMS

P. Guilloteau, R. Toullec and A. Mouats
INRA, 65 rue de St-Brieuc 35042 Rennes, France
V. Coxam, M.J. Davicco and J.P. Barlet
INRA, Theix, 63122 Ceyrat, France

and

J.A. Chayvialle and C. Bernard
INSERM, Hôpital Edouard Herriot, 69374 Lyon, France

Introduction

Few data are available of digestive regulation before birth especially in ruminants (Lichtenberger et al., 1981; Shulkes et al., 1981). The aim of this work was to compare the changes of plasma digestive hormone levels in bovine foetus and in their dams during the last 2 months of pregnancy.

Materials and Methods

Five 5-year-old pregnant Holstein-Friesian cows whose gestational age was accurately known were used. Between 210-263d of gestational age, 16 samples of foetal and maternal bloods were collected from a catheter inserted in a cotyledonary artery and by puncture in an external jugular vein, respectively, as described by Coxam et al. (1987). The plasma immunoreactive concentrations of seven digestive hormones [gastrin, cholecystokinin (CCK), secretin, vasoactive intestinal peptide (VIP), gastric inhibitory peptide (GIP), motilin and somatostatin] were determined by radioimmunoassay. Significances of differences between foetuses and dams' values were assessed by couple t-test.

Results

The seven peptides were always found in immunoreactive form in the plasma from the first blood sampling. Since no significant effect of gestational age could be evidenced, the results are presented as general means in figure 1. The concentrations of gastrin, CCK, secretin and GIP were respectively 1.8-, 1.8-, 2.5- and 3.9- fold higher in foetuses than in dams ($P < 0.01$). In contrast, motilin concentration was 1.6-fold lower

in foetuses ($P = 0.07$) whilst VIP and somatostatin concentrations were not significantly different in the two groups of animals.

Discussion

The ontogeny of gut peptide depends on the peptide, the part of the digestive tract and the species. For example, most of the peptides studied here can be detected in human tissues as soon as the end of the first fifth of foetal life, whilst in rat there are displayed later (Thompson et al., 1987). Therefore, it would have been interesting to start our observations on the calf earlier.

In our study, the plasma concentrations of gastrin, CCK, secretin and GIP were higher in foetuses than in dams. Also in the lamb, Lichtenberger et al. (1981) and Shulkes et al. (1981) evidenced a higher level of circulating gastrin at the end of the foetal life than in the dam. This observation did not appear to be due to a decreased catabolism since gastrin clearance rate was normal in the foetus (Shulkes et al., 1981). Also in the man the intestinal tissue concentration of secretin was found to be larger in the late foetus than in the dam but, in contrast to our results in bovine plasma, GIP tissue level reached adult value only just before birth (Thompson et al., 1987). The lower plasma concentration of motilin in the foetal calf was in agreement with the trend observed for intestinal tissue level in the human foetus. In contrast, the similarities between foetal and maternal plasma values for VIP and somatostatin in the bovine were at variance of the results obtained in the man where foetal tissue concentrations were both found to be higher. These discrepancies about GIP, VIP and somatostatin could result from species differences or from a

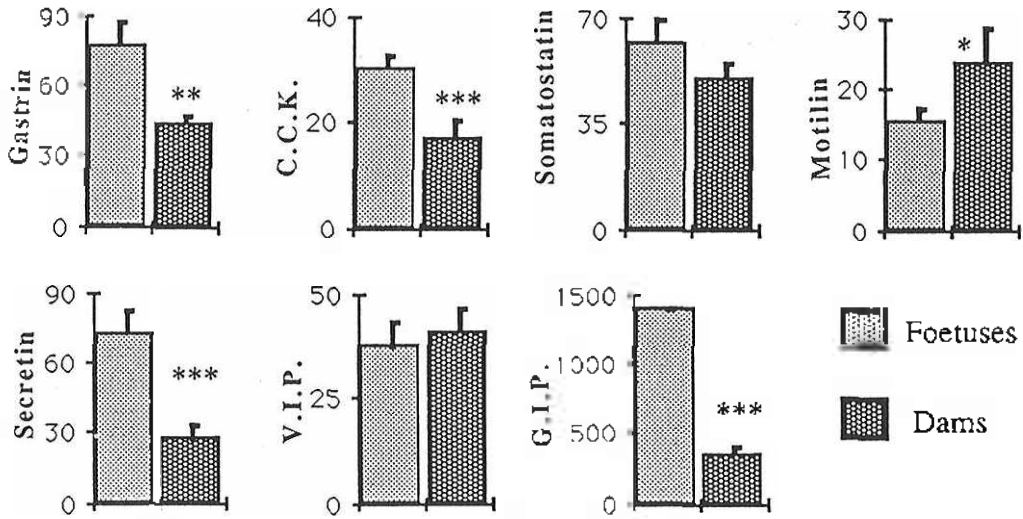


Figure 1. Changes of plasma digestive hormone levels (pg/ml plasma) in bovine foetuses and their dams between 210 and 270 d of gestation (means and standard errors).
 *, **, ***: Significant differences at $p \leq 0.07, 0.01, 0.001$, respectively.

lack of correlation between circulating and tissue concentrations. It is not surprising that somatostatin level was not higher in our foetuses since during the same period of foetal life lower values were even found in calves than in dams by Coxam et al. (1987).

The presence of high concentrations of digestive hormones in the plasma of 210-263 d-old foetal calves suggests they modulate the development of the digestive functions during the foetal life. However, Thompson et al. (1987) underlined the paucity of details about the effect of these peptides in the foetus. Gastrin 34 has been reported to enhance the growth and the maturation of the digestive tract and of the pancreas in the young animal (Johnson, 1977). This form was found to represent one third of total immunoreactive gastrin in the antral gastrin of the foetal lamb (Lichtenberger et al., 1981). Receptors are claimed to be scarce at birth, but at least gastrin receptors should be present in the foetal lamb since pentagastrin injection was shown to stimulate acid secretion in the abomasum (Shulkes et al., 1981).

In conclusion, during the last 2 months of pregnancy the plasma concentrations of six digestive hormones were at least as high in the bovine foetus than in the dam. Only motilin level was found to be lower in the foetus. These hormones could

have important effects on the early maturation of the digestive function.

(Key Words: Digestive Hormones, Bovine, Foetus, Dam)

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