

Brief Communication

CORTICOSTEROIDS IN COW AND CALF AT PARTURITION

There is considerable evidence of the involvement of corticosteroid hormones in the termination of intestinal absorption of immunoglobulin in suckling rats. The following investigations were carried out to see if calves have low serum levels of corticosteroids in utero and receive a corticosteroid "shock" at parturition, which may be responsible for the termination of the immunoglobulin absorptive phase in newborn calves.

Cortisol, cortisone and corticosterone were determined in serum using a double isotope derivative method which was developed for human serum or plasma (Buus 1968).

In preliminary investigations the following concentrations of cortisol, cortisone and corticosterone were found in the blood serum of a cow of the Black and White Danish breed (SDM), which was not lactating and was due to calve two months later: 0.45, 0.29 and 0.34 $\mu\text{g}/100$ ml serum. In a 2 hrs. old calf of the same breed the concentrations were 8.2, 1.4 and 0.47 $\mu\text{g}/100$ ml, respectively. To investigate the origin of these relatively high levels of cortisol and cortisone in the serum of the newborn calf the corticosteroid levels in an "unborn" calf and its dam were analyzed.

Cesarian operation was performed on a non-lactating cow, which was expected to calve within the next 1 to 3 days. The operation started at 1420 hrs., Feb. 10th, and serum samples were collected as shown in Table 1. The first sample from the calf was obtained from the jugular vein, while only the head and neck was free from the uterus and the placental circulation still unaffected.

Table 1 confirms that non-lactating, pregnant cows have low concentrations of the three corticoids in serum. The increase during the time of operation, especially in the cortisol concentration, is interpreted to result from the unavoidable stress situation into which the operation brings the cow. The serum of the calf contained a high concentration of cortisol in the first sample,

Table 1. Concentration of corticosteroids in serum of a cow and its calf delivered by cesarian operation ($\mu\text{g}/100$ ml serum).

| Day | Hour | Cow 335 | | | Calf 335 | | |
|-----------|------|---------------|----------------|--------------------------|---------------|----------------|--------------------------|
| | | corti- sol | corti- sone | corti- coste- rone | corti- sol | corti- sone | corti- coste- rone |
| Feb. 6th | | 0.25 | 0.36 | 0.58 | | | |
| Feb. 10th | 1420 | 0.49 | 0.41 | 0.71 | | | |
| Feb. 10th | 1517 | | | | 4.3 | 0.61 | 0.55 |
| Feb. 10th | 1523 | 3.5 | 0.55 | 0.87 | | | |
| Feb. 11th | 1700 | 1.21 | 0.35 | 0.52 | 1.78 | 0.50 | 0.57 |

but still only about half the concentration found in the naturally-born calf. The calf showed a decrease in the cortisol level quite like its mother during the day following birth.

Knowing that corticoids can cross the placenta (Cope 1965), it seems likely that calves do have low serum levels of corticoids in utero. It cannot be determined on the basis of the presented results whether or not the apparent cortisol "shock" is what induces changes in the differentiation of the intestinal epithelium, leading to a gradual loss of the ability to absorb immunoglobulin over approximately the first two days after birth. However, it has been found that the termination of macromolecular absorption in 18 to 20 days old suckling rats is associated with a marked increase in the plasma corticosterone levels, whereas the cortisol levels remained low and constant (Daniels *et al.* 1972). It has also been shown that injection of certain corticosteroids induces a premature cessation of absorption (Halliday 1959, Clark 1959, 1971), while adrenalectomy has been found to delay the cessation of absorption (Halliday & Mihailović 1968, Daniels & Hardy 1972).

The observations on calves reported here are in keeping with the hypothesis that the adrenal cortex is involved in the maturation of the small intestine (Clark 1971, Daniels *et al.*).

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