

## Determination of transforming growth factor- $\beta$ 1 and TGF- $\beta$ 2 in porcine colostrum and milk

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Maternal milk is rich of not only nutrients but also various bioactive compounds, such as growth factors. It has been suggested that milk-borne growth factors may play an important role in regulating postnatal development in the suckling young, particularly its gastrointestinal development (1). In a more recent study we detected transforming growth factor beta (TGF- $\beta$ ) activity in porcine colostrum using a bioassay technique (2). In this report we examined further the concentrations of TGF- $\beta$ 1 and TGF- $\beta$ 2, two different isoforms of TGF- $\beta$ , in porcine milk at different stages of lactation using enzyme-linked immunosorbent assay.

Porcine milk was collected from four sows at different stages of lactation. Milk samples were defatted by centrifugation at 1,000 g for 10 min and milk whey fraction was collected for further analysis. The concentrations of TGF- $\beta$ 1 and TGF- $\beta$ 2 in the samples were determined using ELISA kits (R&D Systems Inc., Minneapolis, USA). Total and active TGF- $\beta$  concentrations were determined from samples with or without pre-activation by acid treatment. The percentage of TGF- $\beta$  in latent form was derived from the differences between the total and the active TGF- $\beta$  concentrations.

| Stage of lactation (n=4) | TGF- $\beta$ 1   |                 |                  | TGF- $\beta$ 2   |                 |                  |
|--------------------------|------------------|-----------------|------------------|------------------|-----------------|------------------|
|                          | Total (ng/mL)    | Active (ng/mL)  | % in latent form | Total (ng/mL)    | Active (ng/mL)  | % in latent form |
| Day 0                    | 51.03 $\pm$ 4.05 | <sup>1</sup> UD | 100              | 26.90 $\pm$ 4.26 | 1.56 $\pm$ 0.19 | 94               |
| Day 3                    | 12.03 $\pm$ 3.33 | <sup>1</sup> UD | 100              | 13.08 $\pm$ 2.01 | 0.83 $\pm$ 0.11 | 96               |
| Day 7                    | 2.39 $\pm$ 0.31  | <sup>1</sup> UD | 100              | 4.19 $\pm$ 0.75  | 0.30 $\pm$ 0.04 | 93               |
| Day 14                   | 1.45 $\pm$ 0.13  | <sup>1</sup> UD | 100              | 3.74 $\pm$ 0.04  | 0.28 $\pm$ 0.04 | 93               |

<sup>1</sup>UD = undetected

It was observed that both TGF- $\beta$ 1 and TGF- $\beta$ 2 were detectable in porcine milk and the concentration of TGF- $\beta$ 1 was twice of that for TGF- $\beta$ 2 during early lactation. The concentrations of both TGF- $\beta$ 1 and TGF- $\beta$ 2 declined rapidly during the first three days of lactation and continued to decline up to two weeks of lactation. Interestingly, all TGF- $\beta$ 1 in porcine milk existed in latent form while about 6 % of TGF- $\beta$ 2 existed in active form. The stability and activation of milk-borne TGF- $\beta$  in gastrointestinal lumen in neonatal animals following oral ingestion are currently being investigated in our laboratory. Physiological significance of milk-borne TGF- $\beta$  in regulating postnatal development in suckling neonates remains to be revealed.

1. Xu RJ. Development of newborn GI tract and its relation to colostrum/ milk intake: a review. *Reprod Fertil Dev* 1996; 8:35-48.
2. Xu RJ, Doan QC, Register GO. Detection and characterization of transforming growth factor-beta in porcine colostrum. *Biol Neonate* 1999; 75:59-64.