The effect of tumor necrosis factor-α (TNF-α), interleukin (IL)-1β and IL-6 on prostaglandins (PG)F₂α and E₂ secretion from maternal placenta in pigs

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Abstract

The aim of the present study was to determine the effect of tumor necrosis factor-α (TNF-α), interleukin-1β (IL-1β) and interleukin-6 (IL-6) on prostaglandin (PG)F₂α and PGE₂ secretion as well as on cyclooxygenase-2 (COX-2) protein expression in maternal placenta collected on days 25, 30 and 40 of pregnancy in pigs. Maternal placental slices were incubated for 16 h with TNF-α, IL-1β and IL-6 and (1 or 10 ng/ml of medium) or two combinations of the three cytokines (1 or 10 ng/ml of each cytokine per combination). We demonstrated the stimulatory effect of TNF-α, IL-1β and IL-6 and on PGF₂α and PGE₂ secretion by the porcine maternal placenta. The medium content of these PGs depended on the cytokine type, its concentration and day of pregnancy. Cytokine stimulation of PGE₂ was more pronounced than that of PGF₂α. Additionally, an increase in PGF₂α and/or PGE₂ secretion was usually associated with the augmentation of COX-2 protein expression. Our study shows that TNF-α, IL-1β and IL-6 increase production of PGF₂α and PGE₂ by porcine maternal placenta from 25, 30 and 40 day of pregnancy. These results further confirm the possible role of cytokines in modulating secretion of PGs by maternal placenta during the first trimester of gestation.

Key words: maternal placenta, cytokines, PGF₂α, PGE₂, COX-2, pig

Introduction

Tumor necrosis factor-α (TNF-α), interleukin (IL)-1 and IL-6 are cytokines associated with such pathological processes as inflammation or septic shock. The cytokines are synthesized and released not only by immunocompetent cells in response to lipopolysaccharides (LPS; Lee et al. 1992) but also by many tissue and cell types including those of female reproductive system (Hunt et al. 1993). In the pregnant females they are produced by bone marrow-derived cells, particularly macrophages and endometrial cells (Yu et al. 1998, Chabot et al. 2004) as well as fetal membranes (Tabizadeh 1991). The local synthesis of TNF-α, IL-1 and/or IL-6 in human (Tabizadeh 1991, Kim et al. 1998), murine (De et al. 1992), rat (Xia et al. 2007) and porcine (Yu et al. 1998, Chabot et al. 2004) uterus fluctuates during pregnancy.

Prostaglandins (PG)F₂α and E₂ which are also produced in reproductive tract and conceptuses are of great significance for establishment and maintenance of pregnancy. However, nothing is known about the role of the above cytokines in modifying the secretion of PGs by maternal placenta during gestation.