same rats. Chronic infusions of OT produce the same conclusions as short-term infusions; that intrinsic OT does not alter the fluid balance in the DI rat.

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1 Sawyer, W. H., and Valtin, H., Endocrinology *80* (1967) 207.
2 Gellai, M., LaRochelle, F. T., and Valtin, H., in: Hormonal Regulation by Sodium Excretion, p. 121. Eds B. Lichardus, R. W. Schrier and J. Ponec. Elsevier/North Holland Biomedical Press, Amsterdam 1980.
3 Edwards, B. R., LaRochelle, F. T. Jr, and Gellai, M., Ann. N.Y. Acad. Sci. *394* (1982) 497.
4 Forsling, M. L., Brimble, M. J., and Balment, R. J., Acta endocr. *100* (1982) 216.
5 Peters, G., and Roch-Ramel, F., Int. Ency. Pharm. Ther., section 41, vol. 1 (1970) 229.
6 Valtin, H., Am. J. Med. *42* (1967) 814.
7 Balment, R. J., Brimble, M. J., and Forsling, M. L., Ann. N.Y. Acad. Sci. *394* (1982) 241.
8 Gash, D. M., Sladek, C. D., and Sladek, J. R. Jr, Peptides *1*, suppl. 1 (1980) 125.
9 Sladek, J. R. Jr, and Gash, D. M., in: Neural transplants: Development and Function, p. 243. Eds J. R. Sladek, Jr, and D. M. Gash. Plenum, New York 1984.
10 Amico, J. A., Seif, S. M., and Robinson, A. G., J. clin. Endocr. Metab. *52* (1981) 988.
11 Gash, D. M., Warren, P. H., Dick, L. B., Sladek, J. R. Jr, and Ison, J. R., Ann. N.Y. Acad. Sci. *394* (1982) 672.
12 Robinson, I. C. A. F., Clark, R. G., Fairhall, K. M., Jones, P. M., and Parsons, J. A., Ann. N.Y. Acad. Sci. *394* (1982) 285.

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Effects of PGE_2 and $PGF_{2\alpha}$ on the simulation by noradrenaline and oxytocin of human cervical muscle activity at term

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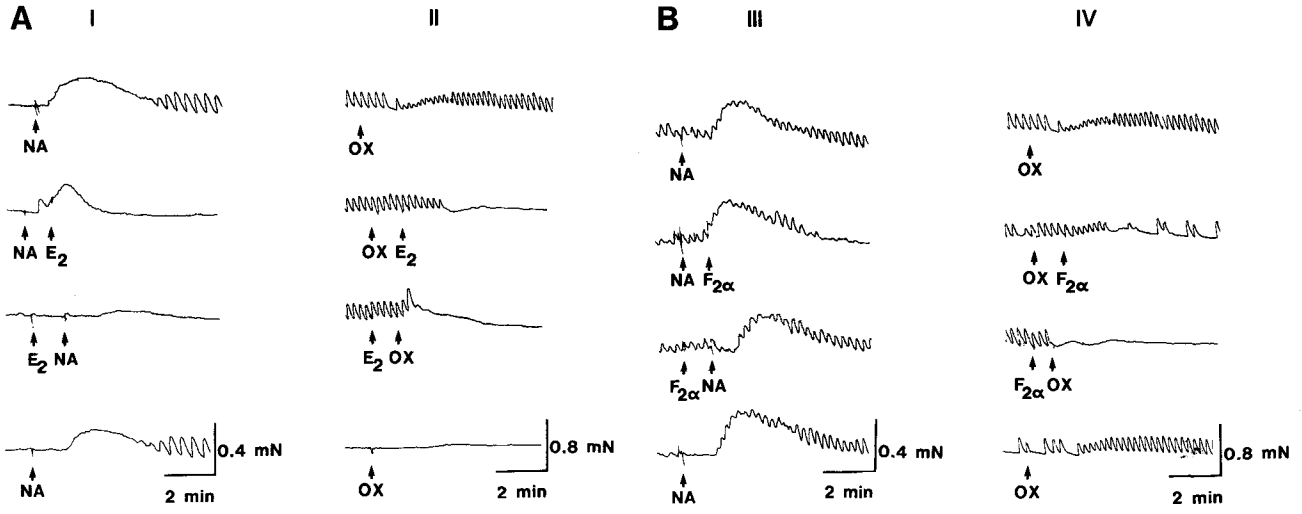
Summary. Cervical specimens were obtained by needle biopsy in connection with caesarean section at term pregnancy. The preparations were superfused in an organ chamber and contractions were registered isometrically. Prostaglandin (PG) E_2 and $F_{2\alpha}$ inhibited spontaneous contractions. The stimulatory action of noradrenaline was not influenced by $PGF_{2\alpha}$ but was reduced by PGE_2 whereas both PGs abolished the excitatory effect of oxytocin.
Key words. Prostaglandins; uterus; cervix; pregnancy; smooth muscle; catecholamines; oxytocin.

Clinical and experimental studies have documented the importance of prostaglandins (PGs) as regulators of contractile activity in the myometrium of the human uterine body[1]. With respect to the human cervix the interest has been mainly focused on the influence of PGs on 'ripening' processes in the cervical connective tissue. In a recent study, however, we investigated the influence of various natural PGs on cervical smooth muscle contractility in nonpregnant and early pregnant women[2,3]. PGE_2, PGI_2 and 6-keto-$PGF_{1\alpha}$ were all shown to inhibit muscle activity whereas $PGF_{2\alpha}$ did not affect contractility at all. The inability of $PGF_{2\alpha}$ to influence cervical musculature was an unexpected finding, since $PGF_{2\alpha}$ is known as a potent stimulator of smooth muscle not only within the reproductive tract but also in other organ systems[1,4]. The present work, conducted on cervical specimens obtained at term pregnancy, concerns the influence of PGE_2 and $PGF_{2\alpha}$ on contractile activity in relation to the action of noradrenaline and oxytocin.

Material and methods. Cervical tissue was obtained from 20 women undergoing elective caesarean section in the 38–40th week of pregnancy. The tissue was isolated by the use of a biopsy needle (Tru Cut, Travenol, Deersfield, Ill., USA), inserted via the transverse incision in the lower uterine segment, using one finger to identify the internal os. The specimens (approx. 1.5 × 15 mm) were placed in ice-chilled Krebs-Ringer bicarbonate (KRB) or HEPES (Sigma Chemical Co., St Louis, Miss., USA) buffer (pH approx. 7.38) and immediately transferred to the laboratory. Within 30 min muscle strips with a length of 4–5 mm were mounted in a tissue chamber superfused by KRB or HEPES buffer fortified with 10 mM glucose under continuous oxygenation (5% CO_2 in O_2 or pure O_2). One end of the strip was connected to a force transducer (Grass model FTO3) and contractile activity was registered isometrically under a passive tension of 5 mN. $PGF_{2\alpha}$ (Prostin®, Upjohn Co., Kalamazoo, Mi., USA), oxytocin (Syntocinon®, Sandoz AG, Basel, Switzerland) and noradrenaline (ACO Ltd, Sweden) were injected as minute volumes into the system via a plastic valve connected to the superfusion tubing[3].

Results. During the present series of experiments two different buffer systems were used. Neither the spontaneous muscle activity, nor the response to an added drug was dependent on the buffer used. $PGF_{2\alpha}$ (10^{-7}–10^{-6} g/ml, n = 6) and PGE_2 (10^{-10}–10^{-7} g/ml, n = 6) induced a total inhibition of spontaneous contractions. Noradrenaline (10^{-7}–10^{-6} M, n = 14), and oxytocin (10–100 mU/ml, n = 8), stimulated the contractile activity. PGE_2 (10^{-7} g/ml, n = 7) administered before or after administration of noradrenaline considerably reduced this excitatory response (fig.). $PGF_{2\alpha}$ (10^{-6} g/ml, n = 9), on the other hand, had no significant effect on the response to noradrenaline. The stimulatory effect of oxytocin, which was less powerful than that of noradrenaline, was totally abolished by PGE_2 (10^{-7} g/ml, n = 3) and also by $PGF_{2\alpha}$ (10^{-6} g/ml, n = 3).

Discussion. The present results document the fact that the musculature of the uterine cervix differs functionally from the myometrium of the uterine body. Thus, $PGF_{2\alpha}$ inhibits cervical muscle activity but stimulates contractions of the uterine fundus and has little effect on the lower uterine segment[5] during labor. This segmentally differentiated effect of $PGF_{2\alpha}$ appears to be highly appropriate from a biodynamic point of view with respect to parturition, although the mechanisms which underlie the divergent response to $PGF_{2\alpha}$ are unknown. The potency of $PGF_{2\alpha}$ as an inhibitor of cervical muscle activity was, however, considerably lower than that of PGE_2. The high sensitivity of cervical tissue to PGE_2 is interesting in view of the effectiveness of PGE_2 as a primer for cervical ripening[6]. This process, usually regarded as involving only the cervical connective tissue, may also involve the smooth muscle elements in the cervix. Accordingly, both



Effects of PGE_2 (A) and $PGF_{2\alpha}$ (B) on the stimulation by noradrenaline and oxytocin of cervical smooth muscle activity. The excitatory action of noradrenaline (NA 10^{-6} M, I) was reduced and that of oxytocin (OX, 100 mU/ml, II) abolished by PGE_2 (10^{-7} g/ml). $PGF_{2\alpha}$ (10^{-6} g/ml) did not influence the effects of noradrenaline (10^{-6} M, III) but inhibited the stimulatory action of oxytocin (100 mU/ml, IV). Flow rate was kept at approximately 1 ml/min. Calibration as indicated. The tracings shown represent continuous recordings from four experiments (I–IV). Tracings II and IV are registrations in the same cervical strip. The initial stimulation by oxytocin is shown in the upper panel.

PGE_2 and $PGF_{2\alpha}$ may contribute to cervical maturation at term not only by reducing the formation of collagen[7] but also by relaxing the smooth muscle.

Previous studies in this laboratory have documented the stimulatory action of noradrenaline on the cervical musculature and the relative predominance of α-adrenoceptors in the cervix of nonpregnant as well as early pregnant women[8]. Moreover, it was demonstrated that the blockage of prostaglandin synthesis by 5,8,11,14-eicosatetraynoic acid (ETYA) reduced both the spontaneous activity and the response to noradrenaline, suggesting that the effects of catecholamines may be mediated or modulated by PG products. Since PGE_2 and $PGF_{2\alpha}$ inhibit cervical muscle activity, the previously demonstrated effect of ETYA may be due to an inhibition of the formation of an arachidonic acid metabolite with an inherent excitatory action. Oxytocin also stimulated cervical contractile activity, though at concentrations higher than those required in the isthmus and corpus[10]. The observed inhibition by PGE_2 of the contractile responses to noradrenaline and oxytocin may be of physiological relevance. Its mechanism, however, remains to be studied.

1 Embrey, M.P., The prostaglandins in human reproduction. Churchill-Livingstone, London, New York 1975.
2 Bryman, I., Lindblom, B., and Norström, A., Lancet *2* (1982) 1471.
3 Bryman, I., Sahni, S., Norström, A., and Lindblom, B., Obstet. Gynec. *63* (1984) 280.
4 Horton, E.V., Br. med. Bull. *35* (1979) 295.
5 Wikland, M., Lindblom, B., and Wiqvist, N., Obstet. Invest. *17* (1984) 131.
6 Kirton, K.T., in: Dilatation of the uterine cervix, p. 355. Eds F. Naftolin and Ph. G. Stubblesfield. Raven Press, New York 1980.
7 Norström, A., Prostaglandins *23* (1982) 361.
8 Bryman, I., Lindblom, B., Norström, A., and Sahni, S., Obstet. Gynec. *64* (1984) 363.
9 Wikland, M., and Lindblom, B., Eur. J. Obstet. Gynec. Reprod. Biol. *16* (1983) 193.
10 Wikland, M., Lindblom, B., Wilhelmsson, L., and Wiqvist, N., Acta obstet. gynec. scand. *61* (1982) 467.

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Testosterone and eye-brain asymmetry for copulation in chickens

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Summary. Asymmetry of eye function has been demonstrated in the young chicken. Precocious copulation following intramuscular treatment with testosterone can be elicited by presentation of an appropriate stimulus to the left eye, but not to the right eye.
Key words. Eye-brain asymmetry; lateralization; copulation; testosterone; monocular testing; chickens.

Young, male chicks are known to display a precocious form of adult copulation following treatment with testosterone[1]. We have now found that the elevation in copulation which follows this treatment with testosterone is evident in monocularly tested chickens only on presentation of the stimulus to the left eye, but not the right. Lack of copulation in untreated males tested binocularly appears to be due to right-eye (left hemisphere) dominance, and testosterone shifts the dominance to the left eye (right hemisphere). This indicates that androgen treatment during development can alter functional asymmetry of the brain.

Based on previous reports of testosterone's effect on the neuronal development of sexually dimorphic structures, Geschwind