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## PULSATILE ADMINISTRATION OF GONADOTROPIN RELEASING HORMONE (Gn-RH) TO LACTATING SOWS USING A PORTABLE AUTOMATIC PUMP ("ZYKLOMAT")

By

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ROJANASTHIEN, S., A. KUNAVONGKRIT, S. EINARSSON and B. THORELL: *Pulsatile administration of gonadotropin releasing hormone (Gn-RH) to lactating sows using a portable automatic pump ("Zyklomat")*. Acta vet. scand. 1985, 26, 442—448. — The object of this investigation was to study the feasibility of using a "Zyklomat roller peristaltic pump" for pulsatile administration of gonadotropin releasing hormone (Gn-RH) in primiparous lactating sows. Four primiparous sows were used. The pump catheter was inserted into a jugular vein on day 8 or day 22 of lactation. The pump delivered a 1 min Gn-RH pulse of 10 µg every 89 min for 7 days. The pump worked without any complication or detrimental effect on the sows throughout the experimental period. Two sows showed standing oestrus during lactation and one of them ovulated. It can be concluded that the "Zyklomat" pump can be used for pulsatile infusion of Gn-RH in lactating sows.

LH-RH; infusion device.

The lactation period in the pig is usually associated with suppression of the ovarian activity (*Burger 1952, Kunavongkrit et al. 1982*). The peripheral plasma level of LH increases gradually from the first to the fifth week of lactation (*Kunavongkrit 1984, Kirkwood et al. 1984*). The isolation, identification and purification of gonadotropin releasing hormone (Gn-RH) from porcine hypothalamus was reported in 1971 (*Schally et al. 1971*). Suckling and lactation suppress the production and/or release of hypothalamic Gn-RH (*Cox & Britt 1982*). Administration of Gn-RH to lactating sows causes release of LH and FSH (*Bevers et al. 1981, Stevenson et al. 1981*) with an increased response in LH to

Gn-RH from the first to the third week of lactation (*Bevers et al.* 1981). Pulsatile intravenous administration of Gn-RH caused the requisite endocrine changes for ovulation in lactating sows (*Cox & Britt* 1982).

Portable automatically timed pumps are used for pulsatile Gn-RH therapy in women (*Leyendecker & Wildt* 1984, *Chambers et al.* 1984). To our knowledge, no report of pulsatile Gn-RH administration using an automatically timed pump in swine has been published. In this paper we describe the technique and the site of use of the infusion device ("Zyklomat roller peristaltic pump", Ferring, West Germany) for pulsatile administration of Gn-RH in lactating sows.

## MATERIALS AND METHODS

### *Animals*

Four primiparous sows of Swedish Yorkshire Breed were used in this experiment. They were purchased from commercial herds and brought to the Department of Obstetrics and Gynaecology approximately 4 weeks before expected farrowing. The sows were housed in individual pens throughout the experimental period and fed according to the Swedish breeding stock standard. Oestrous detection was performed once or twice daily in the presence of a boar throughout the experimental period. The sows nursed 9–14 piglets for 5 weeks. They were on average 13 months old and their mean body weight was 166 kg at the be-  
of the experiment.

### *Portable pump*

A portable Zyklomat pump (30×65×70 mm O.D.) delivered by Ferring GmbH, Kiel, West Germany, was used in this experiment. It consists of a roller peristaltic pump, a computerized timing device and a sterile disposable plastic reservoir (Zyklomat set). The weight of the pump including 4 batteries is approximately 140 g. The timer is set in action for a period of 1 min every 89 min. The pump infuses about 50 µl solution per pulse out of the bag via a catheter (0.95 mm O.D., 0.58 mm I.D.).

The Gn-RH (Lutrelf lyophilisate, Ferring, West Germany) was dissolved in 9.8 ml physiological saline to the designed concentration and 1000 IU heparin in another 0.2 ml physiological saline in order to prevent clotting in the tube system. The tube

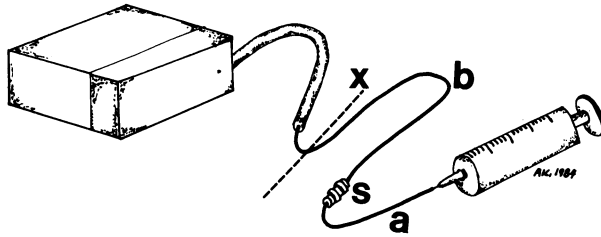


Figure 1. Diagram showing Zykloamat pump connected with infusion set. a = vein catheter, b = body catheter, s = connecting sleeve, x = point of cutting and closing by fire.

system of the Zykloamat set was connected aseptically to the vein catheter (Fig. 1). The Gn-RH solution was thereafter filled into the bag via a catheter. The body catheter was cut (near the pump tube, compare Fig. 1) and closed by fire.

*Method of permanent connection of the pulsatile pump to the sow*

Both jugular veins were catheterized. One vein was catheterized for blood collection 3 days before the connection of the pump (Rodriguez & Kunavongkrit 1983). Blood sampling was performed throughout the experimental period for analyses of LH, oestradiol- $17\beta$  and progesterone. The result of the hormone analyses will be presented elsewhere. The other vein was catheterized for connection to the Zykloamat pump. This surgical operation was done under general anaesthesia with thiopental sodium. After insertion of the vein catheter into the jugular vein, the sleeve connecting the vein catheter to the body catheter was fixed to the vein as in Fig. 2. The body catheter was thereafter passed subcutaneously to the postero-dorsal part of the neck by way of a stainless steel probe and emerged onto the skin after rotation of the sow to lateral position. The blind end of the body catheter

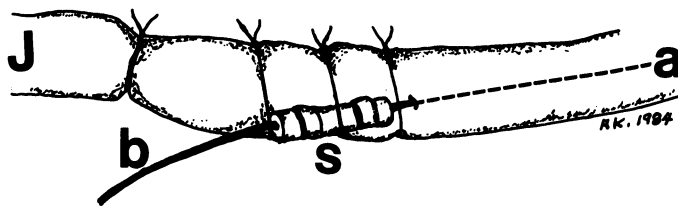


Figure 2. Diagram showing position of catheterization of jugular vein. a = vein catheter, b = body catheter, j = jugular vein, s = connecting sleeve.

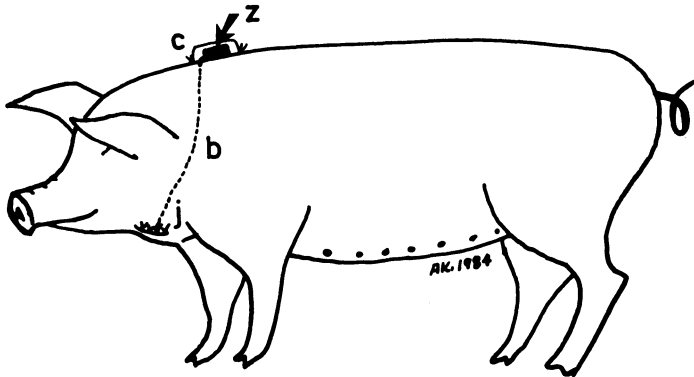


Figure 3. Diagram showing the area and position of connection of the pump to the sow. b = body catheter, c = cotton bag, j = catheterized jugular vein, z = Zyklomat pump.

was opened and connected to the catheter from the bag with a sleeve. This arrangement allowed that the catheter system was filled with Gn-RH at the constant concentration and the first delivering from the pump was at the right dose. To protect the pump, it was put into an outer plastic box and thereafter into an easily openable cotton bag which was sutured to the skin (Fig. 3).

#### *Gn-RH administration*

The pump was connected to the sows either on day 8 (sows 1 and 2) or day 22 of lactation (sows 3 and 4). The pump delivered a Gn-RH pulse of 10  $\mu\text{g}$  every 89 min for 7 days. When the pump was delivering, a buzzing tone was heard. The pump was checked once or twice daily. After disconnecting the pump the position of the catheter in the vein was confirmed by drawing a blood sample.

#### *Examination of the genital organs*

Laparoscopic examination of the ovaries and uterus was performed before and after the Gn-RH administration, and also at weaning. The genital organs were examined at slaughter of the sows.

## RESULTS AND DISCUSSION

The pump operated 7 days in all 4 sows without any complication and the vein catheters remained patent for about 4—5 weeks.

The pump infused Gn-RH every 89 min during the whole period. The size and weight of the pump had no detrimental effect on the sows in this experiment. The pump bag, however, requires careful filling to avoid air inclusion.

The postero-dorsal part of the sow's neck seems to be a suitable area for attachment of the pump. One of the sows seemed irritated during the first 2 days, while none of the other sows showed any reaction to the pump.

#### *Clinical results from individual sows*

Sow 1 showed standing oestrus for 5 days beginning on day 7 of the Gn-RH administration (day 15—day 19 of lactation). Laparoscopic examination on day 4 of standing oestrus revealed big follicles ( $\varnothing$  10—12 mm). She did not ovulate and they disappeared from the ovaries, which was confirmed by laparoscopy on day 24 of lactation. After weaning, the sow developed leg weakness and was slaughtered 4 days after weaning. At post mortem examination, her ovaries were inactive.

Sow 2 did not show any oestrous symptoms during or after the Gn-RH administration. At laparoscopic examination 5 days after the end of administration the ovaries showed only small follicles ( $\varnothing < 5$  mm). After weaning she showed standing oestrus on days 13—15. At post mortem examination on day 2 after the end of standing oestrus the ovaries contained 10 newly ovulated follicles and 2 large follicles ( $\varnothing$  14, 18 mm).

Sow 3 showed standing oestrus on days 5 and 6 of the Gn-RH administration and ovulated, which was confirmed by laparoscopy 2 days after standing oestrus. She showed another oestrus beginning on day 13 after weaning (interval behaviour oestrus is 21 days). At post mortem examination the ovaries contained 19 corpora lutea and 2 luteinized follicles ( $\varnothing$  12, 14 mm).

Sow 4 did not show any oestrous symptoms during or after the Gn-RH administration. Laparoscopic examination revealed only small follicles ( $\varnothing < 5$  mm) throughout the lactation period. She developed high fever on days 11—12 after weaning and was slaughtered on day 18 after weaning. At post mortem examination her ovaries were inactive.

The number of treated sows presented in this paper is small. The study is however proceeding and a bigger material with primiparous sows treated during two phases of the lactation period (see above) will be presented in the near future. The

results obtained hitherto are promising and comparable with those of *Cox & Britt* (1982). It can be concluded that the "Zyklo-mat" pump can be used for pulsatile administration of Gn-RH to sows.

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## SAMMANFATTNING

*Pulsativ infusion av GnRH till digivande suggor med hjälp av en bärbar automatisk pump ("Zyklomat").*

Ändamålet med föreliggande undersökning var att fastställa om det är möjligt att tillföra Gn-RH till digivande ungsuggor med hjälp av en bärbar pump benämnd "Zyklomat roller peristaltic pump". Fyra digivande ungsuggor användes i försöket. Katetern till pumpen placerades i ena jugularvenen på dag 8 eller dag 22 av diperioden. Pumpen injicerade 10 µg GnRH under en minut var 89:e minut under 7 dagar. Pumpen fungerade utmärkt och suggorna visade inga tecken på oro eller besvär av att ha pumpen apterad på ryggen. Två suggor visade brunst med ståreflex under diperioden, en av dessa två ovulerade. Sammanfattningsvis visade denna studie att "Zyklomat"-pumpen är användbar för pulsativ infusion av Gn-RH till digivande suggor.

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