A PRELIMINARY TRIAL ON THE USE OF BARIUM CHLORIDE FOR PREGNANCY DIAGNOSIS IN PIGS

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ABSTRACT

The reaction of urine collected from 40 non-pregnant and 40 pregnant Yorkshire X Landrace crossbred gilts/sows to 1% barium chloride solution was highly ($P < 0.01$) dependent on the pregnancy status of the pigs, the test being 100% and 81% effective in identifying non-pregnant and pregnant pigs respectively.

The sensitivity of the test in the gravid pigs was significantly ($P < 0.05$) influenced by, and tended to increase with, the stage of gestation with 59% of pigs in their first trimester of gestation being correctly diagnosed as pregnant, and 95 - 100% of pigs in their later stages of gestation being so correctly diagnosed.

Parity and time of day of performance of the test had no effect on urine reaction.

It was concluded that the test was a least 95% accurate when used as from about 39 days after breeding for pregnancy diagnosis in pigs.

Key words: Pregnancy diagnosis, barium chloride, urine, parity.

INTRODUCTION

The ability to promptly identify sows that may or may not have conceived after service or artificial insemination in commercial pig enterprises is vital to the pig producer as it permits a timely rebreeding of non-pregnant sows with minimal loss of oestral cycles. Since profitability in such establishments is closely related to reproductive performance of the breeding stock, any delay in rebreeding sows that return to oestrus can be quite costly (Holness, 1991).

Methods such as the use of ultrasound which are in common use in the developed world for

pregnancy diagnosis in pigs are yet to gain wide acceptance and use in the tropics probably because they are either too expensive to acquire and maintain or too complicated for the small holder, often illiterate, tropical swine producer. For a test to be of use in the tropics therefore, it should be cheap, readily available or accessible, uncomplicated and accurate.

Maslow and Smirnov (1965) reported a simple and cheap procedure which was 95 to 100% accurate 15 to 210 days after insemination for pregnancy diagnosis in cows. The addition of a few drops of 1% barium chloride solution to urine from non-pregnant cows produced a white precipitate which was absent with urine from pregnant cows. Using 2% barium chloride solution, Ohazurike (1990) reported similar urine reactions in sheep.

This study was therefore carried out to ascertain the possibility of using barium chloride for pregnancy diagnosis in pigs, and what effects stage of gestation, parity and time of day of performance of the test might have on the test.

MATERIALS AND METHODS

Eighty Yorkshire x Landrace crossbreed gilts and sows made up of 40 non-pregnant and 40 pregnant pigs were selected from the breeding stock of Mitchell Farms (Piggery Operations), Ovwor, near Ughelli in Delta State of Nigeria, based on the breeding records at the farm. The farm, located approximately 5.33°N and 6.00°E in the tropical rainforest zone south-west of Nigeria had, at the time of this study, an average daily temperature of about 28°C and a mean relative humidity of about 75%. The pigs were fed on a commercial diet (approximately 16% CP and 3322 Kcal/Kg) and were provided clean drinking water *ad libitum*.

Fourteen of the pregnant pigs were in their first

TABLE 1: THE EFFECTS OF PREGNANCY, STAGE OF GESTATION AND PARITY ON URINE REACTION WITH 1% BARIUM CHLORIDE SOLUTION IN PIGS.

*Parameters	n	Precipitate Present	absent	Chi square
1. Pregnancy status				
Non-pregnant	40	40.00± 0.00	0.00 ± 0.00 (0.00) ^b	51.51,**
Pregnant	40	7.60 ± 0.24	32.40 ± 0.24 (0.81) ^a	1 df
2. Stage of gestation				
1st trimester	14	5.80± 0.20	8.20 ± 0.20 (0.59) ^b	10.48,*
2nd trimester	12	0.60± 0.24	11.40± 0.24 (0.95) ^a	
3rd trimester	14	0.00 ±0.00	14.00± 0.00 (1.00) ^a	
3. Parity				
0	7	0.00 ± 0.00	7.00± 0.00 (1.00) ^a	9.18 ^{ns}
1	7	2.00 ± 0.00	5.00± 0.00 (0.71) ^a	
2	6	2.00 ± 0.00	4.00± 0.00 (0.67) ^a	
3	5	1.80 ± 0.20	3.20± 0.20 (0.64) ^a	
4	4	0.00± 0.00	4.00± 0.00 (1.00) ^a	
5	1	0.00± 0.00	1.00± 0.00 (1.00) ^a	
6	8	0.60± 0.24	7.40± 0.24 (0.93) ^a	
7	2	0.00 ± 0.00	2.00± 0.00 (1.00) ^a	

1. Entries are mean number of urine samples (SE) showing or not showing precipitate
Data refer to urine samples collected in the mornings.

n = number of pigs

* = $P < 0.05$; ** = $P < 0.01$; ns = $P > 0.05$

Figures in Parentheses are proportions of samples showing no precipitate with barium chloride.
Within each parameter, proportions with different superscripts differ significantly.

trimester of gestation (< 38 days post-coitum, with day of mating as day 0), 12 in their second trimester (39 - 76 days post-coitum) and 14 in their third (>77 days post-coitum). The pregnant pigs were also at different levels of parity (Table 1).

Urine was collected twice daily, once in the morning between 07.00 a.m. and 10.00 a.m. and once in the afternoon between 2.00 p.m. and 4.00 p.m. Nigerian time, for 5 days from each of the pigs. Five drops of 1% barium chloride (BaCl₂) solution were then added with a dropper to about 2 ml of each urine sample, shaken and left to stand for about 5 minutes. Urine samples which showed any degree of cloudiness or turbidity after 5 minutes were regarded as having shown precipitate with the reagent.

The mean number of urinary samples (±standard error) which showed or failed to show precipitate with BaCl₂ were organized into contingency tables (Table 1) and analyzed by the chi square procedure as outlined by Davore (1982). Yate's

correction for continuity was applied where degree of freedom for the test was 1. Proportions showing significance were separated using the Bonferroni confidence intervals procedure described by Devore (1982).

RESULTS AND DISCUSSION

The effects of pregnancy, stage of gestation and parity of the dam on the reaction of porcine urine with 1% barium chloride solution when the test was carried out in the mornings are presented in Table 1. All urine samples from the non-pregnant pigs showed precipitation with barium chloride, thus implying that the absence of pregnancy was correctly diagnosed in 100% of the pigs. However, only an average of 32.40±0.2 urine samples per day from the 40 gravid pigs (or 81%) failed to show precipitation with the reagent, as expected. This implies that pregnancy was correctly diagnosed in about 81% of the pregnant pigs with BaCl₂. The chi square test performed on the data (Table 1) showed that urine reaction with BaCl₂ was highly ($P < 0.01$) dependent on whether the

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animals were pregnant or non-pregnant implying that urine reaction in pregnant pigs differed significantly from that of non-pregnant pigs.

The proportion of pregnant pigs correctly diagnosed with the reagent as pregnant, however, significant ($P < 0.05$) depended on, and tended to vary with, stage of gestation. While only about 55% of pregnant pigs in their first trimester of gestation were correctly diagnosed as such, 95% of those in their second trimester were correctly diagnosed, the difference being significant ($P < 0.05$).

Furthermore, all (100%) of the pregnant pigs in their third trimester of gestation were correctly diagnosed. The difference between the second and third trimester proportion (95% and 100%) was however not significant ($P > 0.05$). The sensitivity with which pregnant pigs were correctly diagnosed therefore increased with stage of gestation. The test was about 58% accurate before 39 days after breeding, and 95 to 100% accurate thereafter. These results compare favourably with those reported for a recent ultrasonic pregnancy tester (Anon, 1989) which was 60% accurate when used at about 21 days of gestation and almost 100% after the 28th day of pregnancy. However, since modern ultrasonic devices have the disadvantages of being too expensive, not being readily available, and requiring much skill to interpret the acoustic or visual images produced (Laing, 1979), barium chloride holds a lot of promise among most tropical, small-holder swine producers.

Results obtained with urine samples collected in the afternoons were similar to those of the mornings. Consequently, the data for the former are omitted.

Parity of the pregnant pigs had no significant ($P > 0.05$) influence on urine reaction with BaCl_2 (Table 1).

The physiological basis for the differential reaction of urine from pregnant and non-pregnant pigs with 1% BaCl_2 is still unclear. Although Maslow and Smirnov (1965) attributed the differential reaction in cows to differences in urinary concentrations of oestrogen and progesterone due to gestation, a recent study by Ohazurike (1990) in which urine from non-pregnant sheep and goats in the follicular and luteal phases of their cycles (when blood

concentrations of oestrogen and progesterone respectively were high) always showed precipitation with BaCl_2 , suggests that other factors other than differences in the blood concentrations of these steroids may be involved. Further work is therefore required to identify the urinary factor(s) involved, and the nature of their interaction with the reagent.

In conclusion, the results obtained in this trial indicate that the test may be more than 90% effective when used as from about 39 days after mating in pigs.

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