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Short Communication ***Pharmacology***

Effects of the intra-uterine administration of *Montanoa tomentosa* extracts upon Postpartum Metritis in the dairy cow

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ABSTRACT

Montanoa tomentosa aqueous crude extract has been used for the last five centuries for the induction of labor, regulation of fertility, treatment of postpartum bleeding problems and to induce menses. In the present study, the hypothesis that the aqueous crude extract of *M. tomentosa* alleviates the metritis of dairy cows was tested. Adult Holstein Friesian dairy cows were diagnosed by gynaecological palpation as positive to postpartum metritis and single individual treatments of *M. tomentosa* or oxytetracycline were intra-uterine administered. Results showed that intrauterine administration of crude extracts of *M. tomentosa* alleviates the postpartum metritis without altering the ovarian activity. Present data reveal an emmenagogue action of the *M. tomentosa* extract in dairy cows that suffer postpartum metritis.

Keywords: metritis, emmenagogues; dairy cows; Mexican plant; traditional remedy

INTRODUCTION

Postpartum metritis is one of the most frequent disorders that severely affect dairy cows with an ample etiological origin that includes dystocic parturition, nutritional impairments and retained placentas [1-3]. In México this pathology represents at least 10 to 20 percent of reproductive ailments [4] with secondary consequences as the presence of persistent corpus luteum [4, 5]. Common treatments of postpartum metritis include antibiotics such as tetracyclines but collateral effects reduce the possibilities of commercialization of the milk. Thus, alternative schemas to solve this pathological state and its consequences have been proposed.

M. tomentosa aqueous crude extract has been used for at least the last five centuries for the induction of labour, regulation of fertility, treatment of postpartum bleeding problems and to induce menses [6, 7]. In laboratory animals (rats, guinea pigs, rabbits, dogs) and humans, this extract does not modify the hematological, blood lipid, protein and electrolytic status or the function of the liver, kidney and thyroid gland [8] and lack of influence upon the general endocrine status [8], other than its oxytocic-like effects [7,8]. Likewise effects on female reproductive function are obtained with the administration of more purified fractions derived from this plant [8,9]. In the present study, the hypothesis that the aqueous crude extracts of this plant could be used to cure the postpartum metritis of dairy cows by exerting an oxytocin- like effect was tested.

MATERIALS AND METHODS

Animals

One hundred and eleven Holstein Friesian multiparous cows (averaging 50 months old aproximately) were used. Animals (400-450 Kg body weight) were housed individually under a natural light/dark cycle 12:12 hr, at 18° and with free access to food and water. Clinical history of all animals revealed that all of them presented persistent placental residues. Previous to experimental testing all animals were clinical

diagnosed by gynaecological palpation and animals showing the conventional signs of metritis such as delayed uterine involution and mucupurulent exudates were selected and grouped for further administration of the selected treatment.

Preparation of Cihuapatli aqueous crude extracts

M. tomentosa was collected when flowering during summer of 2005 in its natural habitat and was authenticated by the Jardín Botánico Universitario from the Universidad Autónoma de Tlaxcala. Leaves and flowers were collected and shade-dried during twenty days. Once dried, the material was ground into a fine powder, 200 g of which were mixed with 1 l of distilled water. This mixture was then warmed up approximately 10 min, just to avoid boiling. The obtained infusion was filtered and oven dried at a temperature of 55° C and the brownish residue of the extract yield was calculated to be 7.67 g corresponding to a consistent percentage of 16.5%. The dried extract of the plant was maintained at 3° C and then used to prepare the stock solutions of 150 mg/ml. Infusions were prepared 40 min previous to its administration diluted in saline solution and applied directly into the uterus to animals via a catheter 1 h after the onset of darkness in a final volume of 500 ml. Similar final volume was considered for antibiotic treated animals.

Treatments

A control group (G1; N= 37 cows) of animals were included and consisted of normal cycling non infected cows. Cows suffering metritis were randomly assigned to one of the following groups (N = 37, each): G2 received single conventional treatments with oxytetracycline 2.5 g diluted in saline solution; and G3 received single treatments with *M tomentosa* extracts diluted in saline solution. Single treatments were applied at 48 hrs intervals during one week until the resumption of metritis which was featured by absence of purulent material from the vaginal tract and advanced uterine involution. The parameters recorded for each cow were the number of effective treatments, first postpartum oestrus, days to uterine involution, days from the parturition to the first service, days from the parturition to conception open days, and services by conception.

Statistical analysis

All numerical values were expressed as means ± SE. Mean values were calculated for group and quantitative comparisons between groups were calculated from those means. A Kruskal-Wallis one-way ANOVA followed by the Dunnett' test, when necessary, were used. The Sigma Stat program (version 2.03) was used for all statistical analyses.

RESULTS

Data of the present study showed no significant differences in both treated groups (P= 0.182) in the number of intra-uterine treatments necessary to ameliorate the metritis. We observed that both treatments were effective in reducing the necessary time to involution with mean values similar to that registered in non metritic non infected animals. Both treatments promote the presentation of the first postpartum visible oestrus which however was facilitated in the *M. tomentosa* treated animals. These values were consistently similar to that registered in control animals. Besides, the first effective postpartum artificial insemination was applied at a similar period in both treated groups which was not significantly different reaching similar values to that registered in normal cycling animals. When compared to the number of services for conception among groups a significant reduction (P=<0.001) in the number of services per conception in *M tomentosa* treated animals was evident. When compared to control animals whose mean values were 1.56±0.12, significant effects were observed in the oxytetracycline treated animals and a significant increase in the number of services per conception was obtained in antibiotic treated animals (P=<0.001 each). The days open registered in the animals treated with the plant extract but not with the antibiotic were significantly reduced (Table 1) when compared with control animals (P<0.001, for both animal conditions).

Table 1: Effects of intrauterine administration of *Montanoa tomentosa* aqueous crude extract on the postpartum metritis of dairy cows.

Treatment	Number of treatments	Days to uterine involution	First postpartum oestrus	First postpartum artificial insemination	Services per conception	Open days
Control animals	0	38.16±0.90	45.16±1.40	76.94±2.90	1.56±1.20	94.97+3.60
M. tomentosa treated animals	3.45±1.30	40.00±9.90	40.83±13.80	79.8+24.50	1.40±0.64	85.6±32.10
Oxytetracycline treated animals	3.72±1.10	41.3+10.00	48.24±9.18	74.02±13.10	2.2±0.77[a]	111.81±24.70[a]

Oxytetracycline (2.5 g/ animal). Services per conception: Dunnett's test vs. control and *M tomentosa* (150 mg/ kg) treated animals [a] P=<0.001. Days open: Dunnett's test vs. control and *M tomentosa* treated animals [a] P=<0.001.

DISCUSSION

Postpartum metritis is a common pathological process that affects dairy cows with high incidence and serious reproductive repercussions that reduces the general production by the use of antibiotics. To solve this problem we have proposed the intra-uterine use of natural products without antibiotic activity to improve the reproductive function of dairy cows suffering postpartum metritis. Present results show that the intra-uterine administration of the aqueous extract of *M. tomentosa* exerts an emmenagogue effect on the reproductive tract of dairy cows that alleviate the postpartum metritis and permit the normal ovarian activity. A similar effect on the ovarian activity was not observed in antibiotic treated animals. In fact, the *M. tomentosa* treated animals not only exhibited a quasi normal ovarian function as reflected in the presence of the first postpartum oestrus but a facilitatory effect was evident in the number of services per conception. Thus, we propose that the *M tomentosa* alleviate postpartum metritis in the cow without exerting antibiotic-like residual side effects. At present we have no explanation to these striking findings. However, it could be thought that, given the oxytocine-like properties of *M. tomentosa*, that the intrauterine administration of the aqueous crude extract exerts local actions upon the uterus and the ovaries by producing a luteolytic effect. Present data support this notion and suggest that medicinal properties of the aqueous crude extract of cihuapatli could be exerted at the corpus luteum level by exerting a luteolytic action. As to the mechanisms involved in other biological actions of *M. tomentosa* they appear to be similar to those produced by oxytocin [7,9] and by the activation of β-adrenoceptors [7,9]. It is well known that both, oxytocin and noradrenaline, certainly among other neurotransmitter systems, play a role in the ovarian function of ruminants [10]. Hence, based on the renowned oxytocin-like capacity of *M tomentosa* it is probable that main effect of this plant extract could target the oxytocinergic ovarian system to promote its effects on ovulation. A similar conclusion could be drawn for the adrenergic system. In support to this notion, it has been demonstrated that significant changes in oxytocin receptor of preovulatory follicles take place around the gonadotropin surge and ovulation in cattle [11]. Besides, it is possible that *M. tomentosa* exerts its stimulating effects upon endometrial glands to promote the PGF2α production to induce its luteolytic effects. However, we did not discard the possibility that other system could be influenced by the extract if it crosses the uterine tissues. Specific experiments are necessary to test this hypothesis.

In conclusion, present findings reveal that when intra-uterine administered the aqueous extract of *M. tomentosa* effectively prevents the reproductive problems resulting from intrauterine infection such as the delay in the expression of the first postpartum oestrus, and a significant increase in the number of services per conception and in the days open. Thus, present data show that given its oxytocine-like properties, the *M. tomentosa* aqueous crude extract is an adequate treatment that can be used to alleviate the postpartum metritis and to prevent its consequences upon the reproductive tract.

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