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Therapeutic effect of bee venom in sows with hypogalactia syndrome postpartum

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The objective of this study was to determine the clinco-therapeutic effect of whole bee venom in hypogalactic sows postpartum. Sows after parturition were assigned to treated and nontreated control groups. In the treated group, 22 sows were bee acupunctured once a day for 3 consecutive days. Honeybees (*Apis mellifera L.*) for bee acupuncture were about 15 days after metamorphosis. One live bee was used to sting the acupoints known as Yang-ming (ST-18, 1.5 cm lateral to the base of the last 2 pairs of teats) and Jiao-chao (GV-1, at the indentation between the base of tail and the anus). In the control group, 20 sows were intramuscularly injected with a standard dosage of penicillin G (400,000 IU/head) once a day for 3 consecutive days. At post-treatment, 85.0% of the drug-treated control and 90.9% of the bee venom-treated group recovered from hypogalactia syndrome. The advantages of apitherapy were that the patients did not have stress because they were not restrained for a long period. The result suggested that apitherapy using bee venom is an effective treatment for sows with hypogalactia syndrome postpartum.

Key words: Apitherapy, bee venom, hypogalactia, sow

Introduction

Since ancient times people have speculated about honey's curative properties. The ancient Greeks, Romans, Chinese and Egyptians used honey to heal wounds and to cure gut disease [25].

Apitherapy involves the medicinal use of honeybee products, and it is as old as beekeeping itself. Hippocrates wrote about it, and there is mention of it in Chinese texts that are 2,000 years old [2]. Apitherapy began as a part of folk medicine, and even today, most of the people using it is therapy either do it themselves or do so with the help of lay practitioners who administer the live bee sting. Furthermore, honeybee venom has been domesticated and a number of its antimicrobial peptides have been isolated, making it the one used most often for treatment.

Acupuncture, moxa, point bleeding and massage proved to be effective within a few days in cases of acute mastitis, breast abscess, and breast carbuncle in women [7,12,24]. Acupuncture cured mammary fibrocystic disease in women within 3 weeks and can be used in the differential diagnosis of fibrocystic disease from mammary carcinoma [3]. Acupuncture was also effective in mammary hyperplasia [9], and primary agalactia and hypogalactia [5].

This study was undertaken to determine the therapeutic effect of bee venom by administering of whole bee venom to acupuncture points in sows with hypogalactic syndrome postpartum.

Materials and Methods

A total of 42 cases of sows with hypogalactia syndrome postpartum were treated over the period of seven months in 1998. Sows with hypogalactia syndrome postpartum were selected for the study from local rearing farms. Clinical symptoms were recorded and animals were allocated to one of two treatment groups.

Sows with hypogalactia syndrome postpartum were randomly assigned to control and treatment groups. Both acupoints of Yang-ming (ST-18, 1.5 cm lateral to the base of the last 2 pairs of teats) and Jiao-chao (GV-1, at the indentation between the base of tail and the anus) were chosen for the bee sting (Fig. 1). In the treated group, 22 sows were bee-acupunctured on both acupoints once a day for 3 consecutive days. In the control group, 20 sows were intramuscularly injected with a standard dosage of penicillin G (Green-Cross Vet Pharm Co., 400,000 IU/head) once a day for 3 consecutive days.

Whole honeybees used for apitherapy in this study were raised at the farm of the Agricultural College of Chungbuk National University. Bees of about 15 days old after

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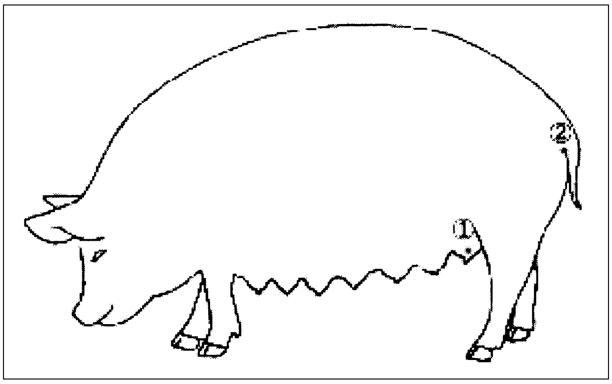

Fig. 1. Two local acupoints for bee acupuncture in sows with hypogalactia syndrome postpartum. ① Yang-ming (ST-18, 1.5 cm lateral to the base of the last 2 pairs of teats), ② Jiao-chao (GV-1, at the indentation between the base of the tail and the anus).

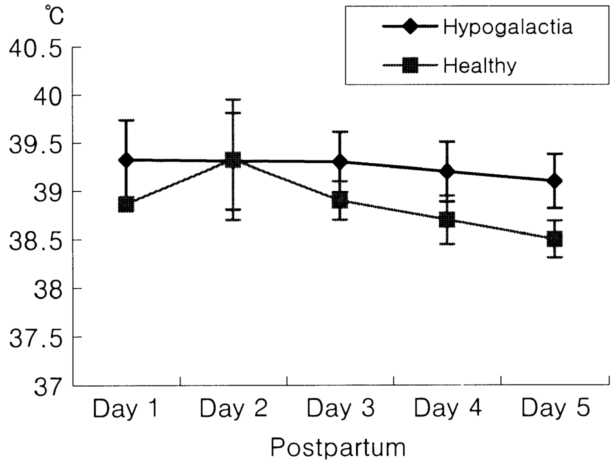

Fig. 2. Changes of rectal temperature in healthy and hypogalactic sows postpartum.

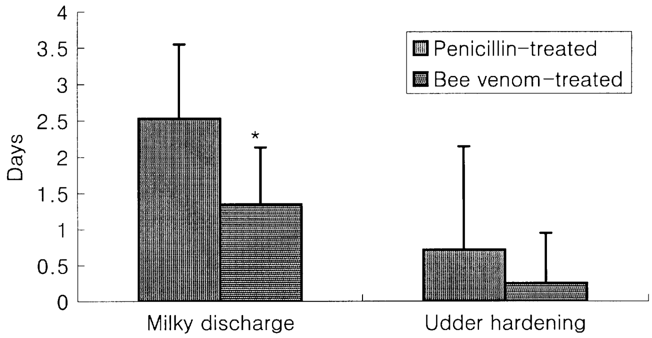

Fig. 3. Changes of milky discharge and udder hardening in sows with hypogalactia syndrome by penicillin- and bee venom-treatment. *p<0.05.

metamorphosis were used, since they are known to have about 0.1 mg of bee venom in their poison sacs, a strong bee sting, and are easy to acupuncture.

Clinical findings of rectal temperature, milky discharge and udder hardening were observed during and after the treatments. Bacteria of the mammary gland in healthy and hypogalactic sows were detected using an auto microorganism analyzer (bioMerieux Vitek, WSVTK-RO5.04, USA).

All results are expressed as mean ± SD, and were analyzed using one-way analysis of variance (ANOVA). The significance of differences was tested using the paired Student's *t*-test. The criterion for significance was $p<0.05$.

Results

The criteria for hypogalactia syndrome postpartum in sows are swelling and hardening of one or several udder glands with insufficient milk production. Rectal temperature and udder changes were also observed during the experimental period. Veterinarians performed a careful examination of affected animals with a rectal temperature exceeding 39.3°C within 48 hours of farrowing. The rectal temperature of the affected sows was slightly higher than that of healthy sows postpartum (Fig. 2). The period of milky discharge was significantly shorter for bee venom treated animals than for those receiving drug treatment (Fig. 3, $p<0.05$).

Among the several bacteria identified, *Escherichia coli*, *Strptococcus spp*. and *Staphylococcus spp*. were predominantly isolated (Table 1). The bacteria were isolated as pure and as mixed cultures from the mammary glands.

Post-treatment, 85.0% of the drug-treated control sows and 90.9% of bee venom-treated sows recovered from hypogalactia syndrome postpartum (Table 2). Moreover, the bee acupunctured sows did not show any side effects, such as infection, bleeding or intoxication.

Discussion

Hypogalactic syndrome postpartum occurs more or less in all sow herds. Sows with hypogalactic syndrome are a source of economic loss to the swine industry. Affected sows show swelling and hardening of one or several udder glands, and insufficient milk production. In healthy sows, milk ejection usually starts within <30 seconds after the initiation of nursing behavior and is of short duration (<30 seconds). The primary clinical signs of periparturient hypogalactia syndrome (PHS) concern the sow's inability to produce sufficient milk [10,13] to meet the nutritional requirements of the piglets. The PHS is observed almost exclusively within the first 3 days postpartum, with more than 50% of the affected sows showing clinical signs of insufficient milk production within 24 hours postpartum [10]. PHS is only rarely observed more than 72 hours postpartum [10,16].

Table 1. List of bacteria isolated from the mammary glands of healthy and hypogalactic sows postpartum

Bacteria	Healthy sows (%)	Hypogalatic sows (%)
Escherichia coli	11(28.9)	12(28.6)
Streptococcus spp.	7(18.4)	11(26.2)
Staphylococcus spp.	9(23.7)	8(19.0)
Corynebacterium spp.	5(13.2)	4(9.5)
Proteus	3(7.9)	2(v4.8)
Others	3(7.9)	5(11.9)
Total	38(100)	42(100)

Table 2. Therapeutic effects of penicillin and bee venom in sows with hypogalactia syndrome

Groups	Incidence (head)	Recovery (head)	Cure rates (%)
Penicillin-treated	20	17	85.0
Bee venom-treated	22	20	90.9

There is good evidence that milk production in sows is decreased by several causes [21]. This multiplicity of etiologies is reflected in the names that have been associated with this disease complex: coliform mastitis, PHS, agalactia toxemia, puerperal mastitis, dysgalactia, mastitis-metritis-agalactia (MMA) syndrome, and puerperal toxemia [1,16,19,21,23]. While most sows show decreased milk production, only infrequently is there true agalactia. Likewise, metritis is rarely part of the syndrome. PHS more accurately describes the problem [21].

Our results and those of Hermanson et al [10] show an increase in rectal temperature of 1.0-1.5℃ in affected animals. However, the rectal temperature of clinically normal sows is increased during the first 1-2 days following parturition. When examined at 1 day prior to parturition, rectal temperature was found to be both unchanged [6] and increased [8,18].

The mammary glands of PHS animals may vary in appearance from normal or firm and locally warm to the touch to grossly swollen with a blotched appearance [11]. Milk samples collected from affected sows were serous or creamy and contained fibrin and blood. These clinical signs are very similar to those reported by Penny [16], Bertschinger and Pohlenz [1], and Ross et al [20].

De Passille and Rushen [4] demonstrated that in some cases the clinical presentation may be different, with only the piglets affected. In this case, the sow is clinically normal, yet the piglets do not grow at the expected rate due to excessive teat fighting or neonatal diarrheas. The majority of sows with hypogalactia were anorectic, constipated, or depressed as mentioned by Hermanson *et al*. [10] and Bertschinger and Pohlenz [1].

Lactation insufficiency in the sow is an extremely complex syndrome, and over 30 different etiologies have been associated the problem. Gram-positive bacteria were identified in a high percentage of affected sows and were the most important cause of sows with agalactia [17,20]. Oren and Shai [15] were reported that an affected sow, attributed to bacteria of the genera *Escherichia coli*, *Staphylococcus spp*. and *Sterptococcus spp*. treated with bee venom melittin, showed complete lysis of both Gram-positive and Gram-negative bacteria, as revealed by transmission electron microscopy.

Honeybee venom contains at least 18 active substances. Mellitin, the most prevalent, is one of most potent anti-inflammatory agents known (100 times more potent than hydrocortisol). Adolapin is another strong anti-inflammatory substance, and inhibit cyclooxidase. Apamin inhibits complement C3 activity, and blocks calcium-dependent potassium channels, thus enhancing nerve transmission. Other substances, such as Compound X, hyaluronidase, phospholipase A2, histamine, and mast cell degeneration protein, are also involved in the inflammatory response of the venom, in during a softening of tissue and the facilitation of fluid flow. The mode of action of the bee venom, melittin, is considered to be via pore formation in the bacterial membrane, thus influencing the permeability of translocation, but details have not yet been clarified [14].

In summary, the advantages of apitherapy were, that patients did not have to be restrained for a long period, and that client acceptance was high, as the owners were accustomed to seeing their animals receive routine injections. Bee venom has antibacterial activity and is effective in controlling of hypogalactia in sows.

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References

1. **Bertschinger, H. U. and Pohlenz, J.** Coliform mastitis. In: Diseases of Swine, 5th ed. A.D. Leman, R.D. Glock, W.L. Mengeling, R.H.C. Penney, E. Scholl, and B. Straw. Ames: Iwoa State Univ. Press. 1980.
2. **Broadman, J.** Bee venom: The natural curative for arthritis and rheumatism. G.P. Putnams Sons, New York, 1962.
3. **Chen, G. S.** Acupuncture treatment of breast fibrocystic disease (abstract). Am. J. Acupunct. 1982, **10**, 272.
4. **De Pasille, A.-M.B. and Rushen J.** Using early suckling behavior and weight gain to identify piglets at risk. Can. J. Anim. Sci. 1989, **69**, 535-544.
5. **Fava, A., Bongiovanni, A. and Frassodati, P.** Acupuncture treatment of hypogalactia. Am. J. Acupunct. 1982, **10**, 333-339.

6. **Furniss, S. J.** Measurement of rectal temperature to predict Mastitis, metritis and agalactia (MMA) in sows after farrowing. Prev. Vet. Med. 1987, **5**, 133-139.
7. **Gao, D. K., Su, J. M., Liu, C. A., Wang, Z. Y. and Qin, P.** Efficacy of acupuncturing the jianjing point 393 cases of acute mastitis. J. Tradit. Chin. Med. 1986, **6**, 19-20.
8. **Goransson, L.** The effect of dietary crude fibre content on the frequency of postpartum agalactia in the sow. Zentralbl Veterinarmed A. 1989, **36**, 474-479.
9. **Guo, C. J. and Zhang, W. H.** Effect of acupuncture treatment in 500 patients of mammary gland hyperplasia. J. Tradit. Chin. Med. 1988, **8**, 157-160.
10. **Hermansson, I., Einarsson, S., Larsson, K. and Backstrom, L.** On the agalactia post partum in the sow: A clinical study. Nord. Vet. Med. 1978, **30**, 465-473.
11. **Jones, J. E. T.** Reflections on post-parturient diseases associated with lactational failure in sows. Vet. Res. 1971, **89**, 72-77.
12. **Liang, Z. P.** Thirty-two cases of acute mastitis treated with acupuncture, moxibustion and cupping. J. Tradit. Chin. Med. 1988, **8**, 15-18.
13. **Martin, C. E. and Elmore, R. G.** Agalactia in current therapy in theriogenology. Ed. D.A. Morrow. Philadelphia: W.B. Saunders. 1980, 1083-1086.
14. **Matsuzaki, K.** Molecular action mechanisms and membrane recognition of membrane-acting antimicrobial peptides. Yakugaku Zassh. 1997, **117**, 253-264.
15. **Oren, Z. and Shai, Y.** Selective lysis of bacteria but not mammalian cells by diasteromers of melittin: structure-function study. Biochemistry. 1997, **36**, 1826-1835.
16. **Penny, R. H. C.** The agalactia complex in the sow: A review. Aust. Vet. J. 1970, **46**, 153-159.
17. **Pejsak, A., Tarasuik, K. and Jochle, W.** Immunoprophylaxis against MMA and/or CM in sows with a vaccine against urinary tract infections (Urovac). Proc. 11th Int. Congr. Pig Vet. Soc., Lausanne. 1990, 307.
18. **Persson, A., Pedersen, A. E., Goransson, L. and Kuhl, W.** A long term study of the health status and performance of sows on different feed allowances during late pregnancy. 1. Clinical observations, with special reference to agalactia post partum. Acta. Vet. Scand. 1989, **30**, 9-17.
19. **Ross, R. F.** Agalactia syndrome of sows. In: Current Veterinary Therapy, Food Animal Practice. Ed. J.L. Howard, Philadelphia: W.B. Saunders, 1981, 962-965.
20. **Ross, R. F., Orning, A. P., Woods, R. D., Zimmermann B. J., Cox, D. F. and Harris, D. L.** Bacteriologic study of sow agalactia. Am. J. Vet. Res. 1981, **42**, 949-955.
21. **Smith, B. B., Martineau, G., Bisaillon, A.** Mammary glands and lactation problem. In: Diseases of Swine, 7th ed. Ed. A.D. Leman, B.E. Straw, W.L. Mengeling, S. D'Allaire, D.J. Taylor. Ames: Iowa State Univ Press. 1992, 48-57.
22. **Smith, B. B.** Pathogenesis and therapeutic management of lactation failure in the periparturient sow. Comp. Cont. Ed. Prac. Vet. 1985, **7**, S523-S534.
23. **Thurman, J. C. and Simon, J.** A field study of twelve sows affected with the MMA syndrome. Vet. Med. Small Anim. Clin. 1970, **65**, 263-272.
24. **Xiong, X. N.** Moxibustion of point Tanzhong and massage of point Tianzong in 47 cases of acute mastitis. J. Tradit. Chin. Med. 1982, **2**, 109-110.
25. **Zumla, A. and Lulat, A.** Honey: a remedy rediscovered. J. Roy. Soc. Med. 1989, **82**, 384-385.