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## **EFFECTS OF CONVENTIONAL WHITE NEEDLE ACUPUNCTURE AND AQUAPUNCTURE ON MASTITIS AND MILK PRODUCTION IN DAIRY CATTLE**

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### **ABSTRACT**

**Eighteen Holstein-Friesian x Sahiwal crossbred lactating cows, 3-8 years old, previously diagnosed with mastitis were used to evaluate the effect of acupuncture on mastitis and milk production. The animals were distributed randomly into one control (non-treated) and two acupuncture treatment groups, conventional white needle acupuncture (CWNA) group and aquapuncture group, with six animals per group. For the acupuncture groups, two acupoints, Bai-Hui and Nyukon were stimulated daily for three consecutive days and repeated after a week for two weeks. The CWNA group was stimulated by thrusting and twirling of filiform needles for one minute at five minute intervals for 20-30 min daily. For the Aquapuncture group, 1 ml of 1% chilli pepper decoction was injected into each acupoint using a hypodermic needle. The observation period lasted for three months. Improvement against mastitis was observed in the Aquapuncture group but not in the CWNA and Control groups. The average daily milk production presented as percentage change in milk production showed that the Control group had the steepest decline while CWNA group had the least decline. The above results suggest that aquapuncture has the potential to decrease incidence of mastitis while both CWNA and aquapuncture have the potential to increase milk production.**

Keywords: acupuncture, aquapuncture, cattle, mastitis, milk production

### **INTRODUCTION**

Mastitis is among the most common and most expensive disorders in dairy cattle. It is caused by many types of injury, including infectious groups of microbial organisms and their toxins, physical trauma or chemical irritants. The white blood cell and blood proteins present in response to the inflammation would be remarkably high to obliterate the irritant and restore the damaged tissue. Further inflammation would result in a nonfunctional milk-producing tissue in the mammary gland which can result in considerable economic loss, associated with reduced or loss of milk production and changes in quality and composition of milk (Schroeder, 2010; Jones

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*et al.*, 2009).

Acupuncture has been extensively used to treat some disorders of dairy cattle including mastitis (Oda *et al.*, 1994). Acupuncture is a traditional Chinese medicine widely used at the present. It has been broadly used for more than 4,000 years for analgesia and therapy in humans. The process involves the stimulation of predetermined points on the body thoroughly connected with the central nervous system resulting in a specific physiological effect (Schoen, 1984).

There are different methods of stimulating acupuncture points – traditional and modern. Traditional methods include conventional white needle acupuncture (CWNA), aquapuncture, moxibustion, cupping, pneumopuncture, embedding, fire needling, hemoacupuncture and auriculoacupuncture. Modern methods include electroacupuncture, laser acupuncture, magnetic acupuncture and ultrasound acupuncture. CWNA is the most common method of stimulating acupuncture points. It is performed by insertion of filiform needle or a smooth shaft needle and moderate twirling with 120-180 twists per minute. The appropriate size and shape of the needle depend on what species will the CWNA be applied (Chuan, 1995; FAO, 1990; Acorda, 1999).

Aquapuncture is known to be the most common technique of acupoint stimulation by injection. It is performed by injecting the solution into the acupuncture points by using an appropriate size needle and sterile syringe. Aquapuncture utilizes different solutions including homeopathic remedies, antibiotics, vitamins, hormones, sterile saline, herbal extracts and the patient's own blood. Often, this method is used as a therapeutic regimen in horses such as ptyalism, rheumatic pain of limbs, shoulder and elbow lameness, sprains on hip joint and pedal osteoma. This method has been reported to reduce ruminal indigestion in cattle (FAO, 1990) and postweaning diarrhea in piglets (Acorda, 2000; Alonte, 1997).

Acupuncture has been successfully used in the past to treat several disorders, including mastitis, in dairy cattle. However, most of the procedures utilized expensive equipments such as laser and electrostimulator and a variety of acupuncture points or acupoints. In this study, the simplest and cheapest methods of acupoint stimulation, CWNA and aquapuncture, were used to stimulate two acupoints, Bai-Hui and Nyukon, to investigate their effects on mastitis in dairy cattle, without severely disrupting management procedures. In addition, the stimulation of the two acupoints using the two methods of acupuncture may have the potential to induce higher milk production.

## MATERIALS AND METHODS

Eighteen Holstein-Friesian x Sahiwal crossbreed lactating cows, 3-8 years old, previously diagnosed with mastitis using California Mastitis Test and somatic cell count at a dairy farm in Calauan, Laguna were used in this study. The cows were subjected to the farm's standard protocol including milking, feeding, vaccination and deworming. Based on medical history and clinical examination, all eighteen cows did not exhibit any other disorders besides mastitis. The dairy cows were given unlimited access to napier grass and fresh water. Mineral premix and

powdered Vitamin ADE were added to the feed. Spent grains were also given every other week and during the last quarter of the experiment, fish meal and soya were added to their diet. Every other week, all dairy cows were examined for the presence of mastitis through California Mastitis Test. Cows that presented clinical mastitis were given Ceftiofur and Cloxacillin while cows with subclinical mastitis were given Ceftiofur only. The cows were milked twice a day, 5:30 AM and 5:00 PM, and daily milk production for each cow was recorded. After milking, the teats of the dairy cows were washed with warm water and the cows were immediately given feeds.

The 18 animals were distributed randomly into three groups with six animals per groups: a) Control; b) Conventional white needle acupuncture (CWNA); and c) Aquapuncture. For the Control group, the lactating cows with mastitis did not receive any acupuncture treatment but were handled following the standard management procedures of the farm.

For the CWNA group, 2.5-cm filiform needles were inserted perpendicularly at a depth of 1-2 cm each into two acupuncture points: a) Bai-Hui, located between the spinous processes of last lumbar and first sacral vertebrae; and b) Nyukon, located at the lymph node dorsal to the posterior mammary gland. The acupuncture sites were disinfected using 70% isopropyl alcohol before and after needle insertion. The stimulation consisted of moderate thrusting and twirling of the needles for one minute at five-minute intervals for 20-30 min daily. The procedure was conducted daily for three consecutive days and repeated after a week for two weeks.

For the Aquapuncture group, 1 ml of 1% chilli pepper decoction was injected into the two acupuncture points, Bai-Hui and Nyukon. The decoction was prepared by boiling 100 ml of distilled water and one chilli pepper for five minutes. After boiling, the decoction was strained and distilled water was added to bring the decoction to 100 ml. The decoction was injected into the acupuncture point using a 23-gauge hypodermic needle and sterile syringe after proper disinfection. The procedure was conducted for 3 consecutive days and repeated after a week for two weeks.

The observation period lasted for three months. Milk production and occurrence of mastitis were determined during the three-month observation period. The mean and standard deviation of the average monthly milk production, average daily milk production and effect on mastitis were computed for each group and compared. Significant difference for milk production was determined using analysis of variance and for the mastitis, Kruskal-wallis equality of population rank test was used.

## RESULTS

No mortality or abnormal disorders (excluding mastitis) were observed in all animals in all treatment groups during the whole duration of the study. Physical restraint was sufficient to enable performance of both CWNA and aquapuncture in all animals during the course of the study.

Table 1 shows the occurrence of mastitis as determined by California

Table 1. California Mastitis Test (mean±S.D.) results of acupuncture-treated and non-treated dairy cows.

Treatment	Pre-acupuncture	Month 1	Month 2	Month 3
Control	2.0±1.1	3.7±1.0	4.0±0.0	2.7±4.6
CWNA	1.5±1.3	1.8±1.1	2.0±1.5	2.5±3.4
Aquapuncture	3.5±2.4	2.2±2.1	3.7±3.0	2.3±2.1

0= negative, 1= trace, 1=2, 2=3, 3=4

CWNA: Conventional white needle acupuncture.

Mastitis Test in non-treated dairy cows and in cows treated with CWNA or Aquapuncture. There was an improvement against mastitis observed in the Aquapuncture group during the first month and third month of the observation period compared to the pre-acupuncture mastitis status. In contrast, there was an increase in mastitis for the Control and CWNA groups compared to their pre-acupuncture mastitis status. For the 2<sup>nd</sup> month, there was a general increase in mastitis cases in the three groups especially for the Control group. Furthermore, the Aquapuncture group presented an increase of mastitis compared to the CWNA group. For the 3<sup>rd</sup> month, a slight decrease of mastitis was observed in the Control group. However, this was still higher than the pre-acupuncture mastitis status. In addition, there was no improvement observed for the CWNA group.

The average daily milk production for Control, CWNA and Aquapuncture groups decreased compared to the pre-acupuncture values (Table 2). Treated groups showed a lower milk production compared to the Control group. Comparison of the two acupuncture groups showed that Aquapuncture group had higher milk production compared to the CWNA group. No significant differences were observed in the average milk production of cows for Control, CWNA and Aquapuncture groups.

Table 2. Milk production (kg/day, mean±S.D.) of acupuncture-treated and non-treated dairy cows.

Treatment	Pre-acupuncture	Month 1	Month 2	Month 3
Control	11.1±7.8	9.2±7.1	7.8±6.6	6.5±8.4
CWNA	7.5±7.6	6.9±6.7	6.1±3.6	5.0±5.3
Aquapuncture	8.9±9.5	8.0±6.3	7.1±6.2	5.8±4.5

CWNA: Conventional white needle acupuncture.

Figure shows the percentage change in milk production with the pre-acupuncture status for milk production pegged at 100%. Dairy cows treated with CWNA had the lowest reduction in milk production compared to the Control and

Aquapuncture groups. Cattle treated with CWNA had the highest milk production during the three months of observation.

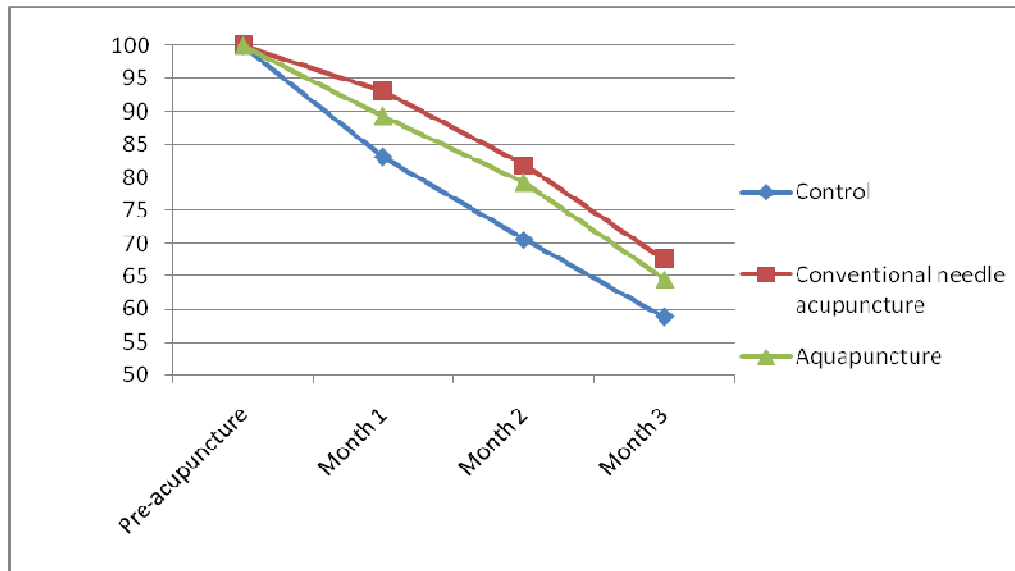


Figure. Percentage change in milk production (kg/day) of acupuncture-treated and non-treated dairy cows.

## DISCUSSION

Mastitis is almost always a problem in every dairy farm. It is one of the most common causes of reduced or lowered milk yield. In mastitis, the mammary gland is inflamed and this can be caused by microbial organisms or even chemical, physical or mechanical trauma. Mastitis causes decrease in milk production of almost 70%. Mastitis is treated by flushing antibiotics and prevented by constant washing of lukewarm water after each milking. However, there are methods to further alleviate subclinical or clinical mastitis and this is through acupuncture.

The CWNA group showed a relatively slight increase in mastitis compared to a drastic increase seen in the Control group during the first month. This could be attributed to the weather, since the experiment was conducted starting at the end of summer and lasted until the rainy season. According to Beyene *et al.* (2005), mastitis cases are high during wet season since the condition favors the proliferation of the pathogens. During rainy season, it is recommended that teat dipping be done. The increase in mastitis may also be due to milking hygiene. It is important that every after milking, each teat should be washed with warm water and dried with clean cloth. Another factor which might have contributed to the high incidence of mastitis was the physical status of some cows. Some cows had pendulous udder which often came in contact with the ground and this condition may have favored contact between the udder and the microorganisms.

Acupuncture has been recommended for the treatment of mastitis. However, the apparent ineffectivity of CWNA for treatment of mastitis may be attributed to insufficient stimulation of the acupuncture points. During the first 10 min of the experimentation period, there was difficulty in stimulating the acupuncture points because of the frequent movement of the animals. According to Acorda *et al.* (1999), it is vital to know the best time and frequency of stimulating correct and appropriate acupoints. It is recommended that acupoints specifically affecting the mammary gland should be used to have better result.

FAO (1990) and Chuan (1995) recommend treatment of mastitis by bleeding acupoint 41 (Di-ming, on the superficial cranial epigastric or subcutaneous abdominal vein) and stimulation of acupoint 42 (Yang-ming, in the depression lateral to the base of each teat). Oda *et al.* (1994) utilized 10 acupuncture points for treatment of mastitis in Holstein cows, including: a) Youmei (Japanese) or Yangming (Chinese), four points in the depression lateral to the base of each teat; b) Nyutoko (Japanese), four points at the base of each teat; c) Nyuki (Japanese) or Di-ming (Chinese), one point at the base of the mammary vein in front of the anterior mammary gland; and d) Nyukon (Japanese), one point at the lymph node dorsal to the posterior mammary gland. They found significant reduction in somatic cell count scores of treated cows. The present study, on the other hand, utilized only two acupuncture points so as not to cause extensive disruption to the management of the farm. Stimulation of the acupoints in the study of Oda *et al.* (1994) used low level laser which did not elicit any reactions from the animals. The present study, however, utilized conventional acupuncture needles and hypodermic needles for acupuncture which elicited some reactions in the animals. The use of limited acupuncture points in this study may have led to the minimal effect of acupuncture for mastitis in the present study.

The Aquapuncture group presented an improvement in mastitis during the first month. This may be partly attributed to the chili pepper decoction. *Capsicum frutescens* is rich in Vitamins A and C. According to Yang *et al.* (2011), vitamin A is essential in sustaining the healthy tissues surrounding the mammary gland and increases its resistance against pathogens. Also, chili contains oils such as capsaicin, pectin, oleoresin and resin that are counterirritant. These essential oils produce a much higher stimulus in the area leading to a decrease in inflammation of the teats due to vasodilation (Acorda *et al.*, 1999). In addition, capsaicin which is a phytochemical contains anti-microbial property that can destroy *S. aureus* and *Klebsiella sp.*

The peak of milk production is 45-60 days after calving and it decreases 5-10% each month. Total milk production in dairy cows can be affected by many intrinsic factors. One of these is the difference in the number of days milked for each cow. This could have contributed to the difference in milk production among the three groups. Another factor could be the genetic differences among the breeds and the degree of mastitis of each dairy cows, suggesting that the overall condition of a cow can affect its production of milk.

CWNA and Aquapuncture using the acupoints Bai-Hui and Nyukon did not increase the production of milk. In spite of the decrease from the pre-treatment to the observation period, the result observed in the treated groups presented a lesser decrease on milk production compared to the control group. This may be due to the

stimulation of acupoints Bai-Hui and Nyukon by conventional white needle acupuncture and aquapuncture.

Acupoint Bai-Hui has been proven to treat reproductive disorders and local diseases like fever (Yang *et al.*, 2011). It can also increase the reproductive performance of the cow using aquapuncture. On the other hand, acupoint Nyukon has been used to treat teat ulcer and lessen the incidence of subclinical mastitis using low level laser acupuncture (Acorda *et al.*, 2000).

The higher amount of milk production observed in the Aquapuncture group compared to the CWNA group may be attributed to chili pepper decoction. The solution is rich in Vitamins A and C. Yang *et al.* (2011) reported that Vitamin A helps increase in milk yield by maintaining the health of the mammary gland for a better milk yield. Acorda *et al.* (1999) also observed improvement in milk production among dairy cows subjected to aquapuncture using vitamins ADE.

The above results suggest that Aquapuncture has the potential to decrease the incidence of mastitis while both CWNA and Aquapuncture have the potential to increase milk production. It is recommended that further studies with longer duration of acupuncture, *i.e.* at least three months, be conducted to see if long-term acupuncture therapy will have more pronounced effects on both the occurrence of mastitis and milk production in dairy cattle. Additional acupuncture points may be investigated for possible complementary effects on reduction of occurrence of mastitis and increasing milk production. Other solutions to be used for aquapuncture could also be investigated.

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