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APPLICATION OF NON-CONVENTIONAL ACUPUNCTURE IN SHEEP, CATTLE, AND WATER BUFFALOES

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ABSTRACT

Acupuncture is an alternative approach for the treatment of various diseases and disorders in animals. Although it is less expensive and has less side effects compared to conventional drugs and other chemicals, its potential for use in animals in the Philippines has not been thoroughly investigated. In this series, different methods of acupuncture were used in cattle, water buffaloes, and sheep, namely: pneumoacupuncture (injection of air), hypodermic needle acupuncture (stimulation using disposable hypodermic needles), and aquapuncture (injection of distilled water, 5% lactated Ringer's solution, vitamin ADE solution, 2% lidocaine solution, and capsicum decoction). Results show that non-conventional acupuncture methods can: a) produce analgesia sufficient for performance of surgical procedures; b) increase reproductive performance; c) be used for treatment of reproductive disorders; and d) increase white blood cell counts in ruminants.

Key words: acupuncture, analgesia, aquapuncture, blood cell counts, cattle, pneumoacupuncture, reproduction, sheep, water buffaloes

INTRODUCTION

Acupuncture has been used in animals in the diagnosis of diseases, production of analgesia for surgical procedures and treatment of various diseases and disorders. Presently, the most popular methods of acupuncture stimulation in animals are conventional needle acupuncture, moxibustion, electroacupuncture and

laser puncture. Although conventional needle acupuncture is easy to apply in humans, it is not very commonly used in animals because of the need for restraint, especially in large animals, and the need to manipulate the needles by thrusting and twirling (FAO, 1990). Electroacupuncture and laser puncture (Chuan, 1995) are both easy to apply because stimulation is done through the use of machines. However, the high cost of these machines limits their use in animals, especially in the rural areas.

Besides the above methods, there are other methods of acupuncture, including hemoacupuncture, fire-needling, pneumoacupuncture, moxibustion, hot packing, cauterization, cupping, massage, aquapuncture, and thread embedding (Chuan, 1995). However, very limited studies have been done using these techniques of stimulation. With the concern for the environment and the high cost of production in the use of drugs and other chemicals, there is a need to investigate other methods of treatment which are cost-effective, environmentally friendly, and can be utilized by animal raisers in rural areas.

PNEUMOACUPUNCTURE, HYPODERMIC NEEDLE ACUPUNCTURE, AND AQUAPUNCTURE IN SHEEP

This study was conducted to compare the effectiveness of conventional needle acupuncture, hypodermic needle acupuncture, pneumoacupuncture, and aquapuncture in producing analgesia and to determine the effect of the different methods on the blood cell counts of sheep. For aquapuncture, a further investigation using different solutions, triple distilled water, dextrose 5% in lactated Ringer's solution, vitamin ADE injectable solution, 2% lidocaine solution, and 1.6-2.0% chili (*Capsicum frutescens*) decoction was conducted.

Materials and Methods

Sixteen (16) male and female healthy Philippine sheep, 1-8 years old were used in the study. The sheep were subjected to the same feeding, watering, and husbandry management procedures. Using randomized complete block design, the 16 sheep were assigned into four blocks with four sheep per block: a) block 1 - male sheep; b) block 2 - female sheep 1-2 years old; c) block 3 - female sheep 2-3 years old; and d) block 4 - female sheep more than 3 years old. Each block was subjected to four different treatment procedures - conventional needle acupuncture, hypodermic needle acupuncture, pneumoacupuncture, and aquapuncture.

Acupuncture points used were Yao-Pang three points (BAO5). These acupoints are located between the tips of the transverse processes of the last thoracic and first lumbar (T13-L1), second lumbar and 3rd lumbar (L2-L3), and third lumbar and fourth lumbar (L3-L4) vertebrae. Stimulation of the acupuncture points for each animal was performed once a day for three consecutive days while the animals were in lateral recumbency.

For conventional needle acupuncture, 7-cm, 0.7-cm in diameter conventional acupuncture needles were used. The acupuncture needle was inserted perpendicularly into the acupoint at a depth of 1-2 cm. Stimulation was done by gentle thrusting and twirling of the needles for 1 min, right after insertion and at 5-min intervals. Thrusting was done by inward-outward movement of the inserted needle while simultaneously twirling the needle in alternating clockwise and counterclockwise fashion at 120-160 rotations per min.

For hypodermic needle acupuncture, 1 1/2-in, gauge 21 disposable hypodermic needles were used. The needle was inserted perpendicularly into the acupoint at a depth of 1-2 cm. Stimulation was done by gentle thrusting of the needles for 1 min, right after insertion and at 5-min intervals.

For pneumoacupuncture, 10 mL of air was injected into the acupoint at a depth of 1-2 cm while 10% chili pepper decoction was injected once for aquapuncture. In both pneumoacupuncture and aquapuncture, 1 1/2-in, gauge 21 disposable hypodermic needles were used to inject air or solution, respectively, and the needles were withdrawn immediately after injection.

For the aquapuncture investigation, twenty-four (24) 1 to 8 year-old healthy Philippine-raised sheep of both sexes were used. Solutions used were triple distilled water, dextrose 5% in lactated Ringer's solution, vitamin ADE injectable solution, 2% lidocaine, and 1.6-2.0% chili (*Capsicum frutescens*) decoction (prepared by mixing the chopped chili (approximately 10 grams) with 600 mL water and boiling it for thirty (30) minutes). The 24 sheep were randomly distributed into six (6) groups, five (5) treatment groups and a control group consisting of four sheep, 2 males and 2 females each in every group. For the five treatment groups, each sheep was injected with different solutions which included triple distilled water, dextrose 5% in lactated Ringer's solution, vitamin ADE, 2% lidocaine, and 1.6-2.0% *Capsicum* decoction, respectively.

The animal's response to pain stimuli was evaluated through the pinch probe method 10 min before stimulation and at 10-min intervals until 50 min after initial stimulation. The pinch probe method involved pinching a fold of skin using an Allis tissue forceps. The areas which were pricked or pinched included the right and left flanks and the gluteal region of the animal, areas which were found to develop analgesia after conventional needle acupuncture stimulation, based on a preliminary study.

The analgesic effect was rated as: a) good, if there is no response to pain stimulus; b) intermediate, if there is reaction to pain stimulus but animal tolerates pain; and c) poor, if there is vigorous reaction to pain stimulus. The analgesic effect at days 1, 2, and 3 for the different acupuncture methods were observed and recorded.

Blood samples were collected three (3) times from the jugular vein for each animal, at time 0, 20, and 50 min respectively and the red blood cell count, white blood cell count, and packed cell volume were determined using standard procedures. All injection sites were clipped, cleaned, and disinfected with 70% isopropyl alcohol.

Results

No adverse reactions attributed to acupuncture stimulation using conventional needle acupuncture, hypodermic needle acupuncture, and pneumoacupuncture were observed in all animals for the duration of the experiment. During aquapuncture, shivering was observed in all sheep right after injection up to 10-15 min after injection of *Capsicum* solution. However, all sheep remained healthy throughout the duration of the study.

Application of pinch probe stimulus 10 min before insertion of needle for all methods showed that no analgesia can be observed in all sheep prior to acupuncture stimulation for days 1-3. Upon application of pinch probe, the sheep would kick towards the offending stimulus, grind their teeth, raise and shake their head violently and struggle hard to break from the restraint being applied.

The period of induction of analgesia ranged from 10-40 min after stimulation, with an average of 20-30 min for all four methods. At day 1, aquapuncture produced good analgesia in three animals, while both conventional needle acupuncture and hypodermic needle acupuncture produced analgesia in two animals each. Only intermediate analgesia was observed in animals subjected to pneumoacupuncture. No analgesia was observed in two animals each for conventional needle acupuncture, hypodermic needle acupuncture, and pneumoacupuncture. At day 2, two animals showed good anesthesia for conventional needle acupuncture and one animal each had good anesthesia for pneumoacupuncture and aquapuncture. In addition, one sheep and two sheep showed intermediate analgesia for hypodermic needle acupuncture and aquapuncture, respectively. At day 3, no analgesia was observed in all sheep for all acupuncture methods.

Ten min after withdrawal of acupuncture needle during conventional needle acupuncture, one animal still had good analgesia at day 2. Fifty min after injection of air for pneumoacupuncture, one sheep still had intermediate analgesia at day 1. For aquapuncture, good analgesia was observed in one sheep 50 min after injection of solution at day 1 and day 3. No residual analgesic effect was observed in hypodermic needle acupuncture during the treatment period and for the other three methods during day 3.

For the aquapuncture study, the mean temperature of the sheep in the control and *Capsicum* decoction aquapuncture group decreased while that of vitamin ADE aquapuncture group increased slightly 0- to 60-minute observations. However, the differences were not significant ($p > 0.05$). In all treatment groups, there were no significant differences in the heart rate from 0- to 60-minute observations ($p > 0.50$). For all treatment groups there were no significant differences in the packed cell volume values before, during, and after aquapuncture treatment ($p > 0.05$). For all treatment groups, no significant differences were observed before, during, and after aquapuncture treatment ($p > 0.05$).

AQUAPUNCTURE IN CATTLE

The objective of the study was to determine the effect of vitamin ADE aquapuncture on the reproductive performance of dairy cattle, particularly on the percentage of cows with complete uterine involution at 30 days postpartum, calving to first estrus interval, number of services (artificial insemination) per conception, and conception rate.

Materials and Methods

Twenty-four post-parturient dairy cattle of various breeds, 3-14 years old with 1-8 parities, were used in the study. The cows were subjected to the same management procedures. Regular rectal palpation was done at 45 days after artificial insemination, as pregnancy diagnosis, and at 30 days after calving to check if the uterus has involuted. Gross uterine involution was considered complete when the previously gravid uterine horn and the non-gravid one were equal in size upon rectal palpation and the site of the bifurcation of the horns is distinct upon rectal palpation.

Cows were artificially inseminated with frozen thawed bull semen in the afternoon when they come into heat in the morning, and the following morning when they come into heat in the afternoon. However, AI is done immediately when the cow was observed to be in standing heat.

Commercially available injectable vitamin ADE (Vitacen™) was administered using 1 1/2 inch. 19-20 gauge hypodermic needle. The acupoints used were: a) Acupoint #31 (Bai-hui) which is located at the dorsal midline between the spinous processes of L6 and S1, and b) Acupoint #52 (Hou hai), which is located between the anus and the ventral tail base.

The 24 animals were allocated in three groups using RCBD. The Control was given vitamin ADE injections at the gluteal muscle once within three days after calving. The single injection acupuncture group (SIA) was given vitamin ADE at the Acupoints 31 and 52, once within three days after calving. The multiple injection acupuncture group (MIA) was given vitamin ADE once a day for three days after calving. Injections of vitamin ADE in all groups were repeated two months after calving and every three months thereafter for one year.

The period of occurrence of heat of each cow, number of inseminations received, number of pregnant animals, and the stage of uterine involutions during rectal palpation at 30 days post partum were determined, and the percentage of cows with complete uterine involution at 30 days postpartum, mean calving to first estrus interval, number of services per conception and conception rate were calculated.

Results

The percentage of cows with complete uterine involution was 100% for the three groups. There were no significant differences between the three groups in

the mean calving to first estrus interval excluding slaughtered cows, although the values are 76, 60, and 41 days for the control, SIA, and MIA respectively. The mean calving to the first estrus intervals including slaughtered cows were 70.86, 59.27, and 36.9 days for the control, SIA, and MIA respectively. Results for the number of services per conception showed significant differences in values of 2.25, 2.0 and 2.0 for the control, SIA, and MIA respectively ($P>0.05$). This implies that the control required more services per conception than SIA or MIA.

SIA had the highest first services conception rate of 57.14%, while control and MIA had 20% each. The control and MIA achieved their highest conception rate of 50% and 66.67%, respectively, during the second insemination. In the third insemination, the conception rate for SIA was 50% and that of control and MIA were 0%. All got a 100% conception rate on the fourth and beyond inseminations.

The overall conception rate when problem breeders were included was 80% for control, while all experimental animals got pregnant for MIA and SIA. The overall conception rate when problem breeders were included had favorable results. The MIA had the highest at 83.84%, followed by SIA at 70%, and control at 57.14%.

HYPODERMIC NEEDLE ACUPUNCTURE IN WATER BUFFALOES

This study was conducted to determine the effect of hypodermic needle acupuncture on the reproductive activity of postpartum anestrus water buffaloes, particularly, on the development of ovarian follicles and corpus luteum, appearance of heat, and conception rate.

Materials and Methods

Eight (8) postpartum anestrus female water buffaloes (*Bubalus bubalis*) 6-11 years old, that showed no signs of heat (as determined through routine visual examination and rectal palpation) for at least three consecutive months were used in the study. All animals were subjected to standard management procedures. Commercially available 21-gauge 1 1/2 inch hypodermic needles were used to stimulate the acupoints.

Two acupuncture points were utilized in this study: a) Acupoint 31 (Hundred meetings) located on the center of the dorsal midline between the spinous processes of the sixth lumbar and first sacral vertebra; and b) Acupoint 52 (Caudal sea) located in the depression between the anus and the ventral tail base. The eight animals were divided into the control and treatment groups using a completely randomized design (CRD). The treatment group received simultaneous acupuncture therapy at acupoints 31 and 52 for five minutes a day for five consecutive days at a depth of 1 1/2 inches, while the control group received no treatment. Stimulation of the acupoints was done slowly by thrusting the needle and gently pulling out part of the needle, and then thrusting it in again, gently, to the same

depth once every 10 seconds for 5 minutes. Acupoints 31 and 52 were disinfected with 70% alcohol prior to the introduction of acupuncture needles.

Both groups were initially palpated rectally for the presence or absence of ovarian structures such as ovarian follicles and corpus luteum to establish anestrus in the animals. Rectal palpations were conducted on both groups one day after therapy, and repeated every five to seven days thereafter for 90 days. The presence of ovarian follicles and corpus luteum was noted. Visual examinations for signs of estrus such as loss of appetite, bellowing, swelling of the vulva, mucus vaginal discharges, mounting and standing to be mounted, restlessness, and frequent urination were conducted daily until 90 days for both groups. All caracows in both control and treatment groups which showed signs of heat were artificially inseminated and the conception rates or return to heat were determined.

Results

All caracows subjected to acupuncture therapy came into estrus twice; with two caracows each coming to two complete cycles (estrus to corpus luteum formation) and two other animals reaching a cycle once. For the control group, one animal came into full cycle twice, one animal cycled completely once, one animal came into heat once, and one animal did not exhibit signs of heat.

The control group had shorter mean calving to first follicular development interval than the treatment group. However, compared to the control group, the treatment group had shorter intervals for calving to first heat, calving to first corpus luteum development, first follicular development to first heat, and first follicular development to first corpus luteum development.

The interval between acupuncture or start of observation and first heat, first corpus luteum development, second heat, and second corpus luteum development was shorter in the treatment group than in the control group.

For the treatment group, two animals were artificially inseminated. Subsequent pregnancy diagnoses revealed that both animals did not successfully conceive. For the control group, one animal was inseminated, but no conception was observed.

DISCUSSION

The three methods used in this study, namely, hypodermic needle acupuncture, pneumoacupuncture, and aquapuncture were chosen in terms of their availability for use with small-scale farmers. Whereas conventional needles are not readily available locally, hypodermic needles can be purchased in any drug store or veterinary store. Both aquapuncture and pneumoacupuncture make use of locally available materials, solution and air, respectively, besides hypodermic needles. Although many aquapuncture solutions are recommended (Chuan, 1995; FAO, 1990), the aquapuncture solutions used in this study were chosen because of their availability and their potential to produce greater stimulation, e.g., chili decoction.

Conventional needle acupuncture or hand needling which is the original technique used to induce analgesia is now out of favor and has been replaced by other methods, the most common of which is electroacupuncture. In contrast with conventional needle acupuncture, electroacupuncture produces relatively consistent analgesia in sheep (Bossut et al., 1986). The relatively lower percentage of acupuncture analgesia achieved through conventional needle acupuncture in this study could be due to the insufficient stimulation of adequate number of acupoints. The main advantage of electroacupuncture is that the stimulation can be quantified and controlled (FAO, 1990; Klide and Kung, 1977) since continuous stimulation is required to maintain sufficient excitation of the central nervous system (Klide and Kung, 1977).

There are no known studies on the use of pneumoacupuncture and hypodermic needle acupuncture in animals. There are generally three methods of pneumoacupuncture (air injection): a) the traditional wide needle method; b) traditional gas needle method; and c) modern pneumoacupuncture utilizing purified air (Chuan, 1995).

In the present study on sheep, hypodermic needle stimulation produced analgesic effects comparable to that of conventional needle. In water buffaloes, it was able to improve reproductive performance. However, hypodermic needles sometimes caused puncture of vessels and tend to lacerate tissues at the acupoint. The latter effect can be minimized by the use of smaller needles, e.g., gauge 23-25. To minimize injury to tissues, twirling only can be used for stimulation instead of both twirling and jabbing. Although air injection has been used for therapeutic purposes (Chuan, 1995; FAO, 1990), in this study no significant analgesia was produced using this method. Injection of air could not have produced sufficient stimulation to produce analgesia in the sheep.

Significant analgesia was observed in aquapuncture using chili pepper (*Capsicum*) decoction. *Capsicum* (*Capsicum frutescens*) contains an oleoresin which is a counterirritant, the active principle being capsaicin, a vanillylamide of isodecenoic acid. It causes dilatation of cutaneous blood vessels and slight local anesthesia, giving an anodyne (pain killing) effect (Booth and McDonald, 1982).

An idiosyncrasy of acupuncture analgesia is the individual variation in response: up to 40 percent of people and animals respond poorly (Peets and Pomeranz as cited by Janssens et al., 1988). Individual variations of analgesic effect exist in animals of different mental states, species, and sex. Among domestic animals, the ox and sheep respond most favorably to acupuncture analgesia followed by the pig and then the horse. In bovines, cattle respond better than horses of mixed breeding and mares and gelding react better than stallions (Klide and Kung, 1977).

Different methods of acupuncture have been used to treat reproductive disorders in ruminants. Low level laser acupuncture was found to be effective in the treatment of persistent corpus luteum, quiescent ovary, and silent heat in dairy cattle (Oda et al., 1994). Conventional acupuncture was shown to increase conception rate in repeat-breeding Holstein cattle (Sumano et al., 1987). Aquapuncture

using soluble Vitamin B was found to be effective in the treatment of chronic endometritis (Pineda et al., 1987).

Acupuncture stimuli are said to be carried to the hypothalamus via the peripheral sensory nerves and sympathetic trunks. This leads to the activation of the pituitary gland, which in turn releases ACTH, MSH, TSH, and gonadotropins. These hormones may cause release of estrogen, progesterone, oxytocin, prolactin, relaxin, and insulin (Rogers, 1991). Acupuncture is also known to restore the functions of the body (Schoen et al., 1991). Another possible effect of acupuncture is the stimulation of the ovarian function and adjustment of reproductive hormonal imbalance (Shuzhi et al. (1987). In addition, this treatment was shown to decrease plasma progesterone level in cows, leading to manifestation of estrus and fertility in cows with inactive ovaries. Chengmin et al. (1987), noticed that milk progesterone level decreased following laser puncture implying luteolysis and follicular development. In the study of Deen et al. (1987), laser acupuncture was reported to be capable of activating ovarian function; removing persistence of the corpus luteum, ovarian cyst, and ovarian atrophy; promoting oogenesis, oestrus, and ovulation, and treating metritis which causes early abortion of the embryo. In humans, it was shown that the level of luteinizing hormone was elevated following acupuncture (Aso et al., 1979).

The results of the study show that cheaper and more readily available non-conventional methods of acupuncture stimulation, namely hypodermic needle acupuncture and aquapuncture have the potential of replacing more expensive and less readily available conventional acupuncture needles in producing analgesia in sheep and in enhancing reproductive performance of both cattle and water buffaloes. It is recommended that other indigenous plant materials be investigated for possible use as aquapuncture solutions. In addition, other acupoints can be used to evaluate the efficacy of the different methods of stimulation.

REFERENCES

- Aso, T., T. Motohashi, M. Murata, T. Nishimura, K. Kakizaki, and S. Kimura. 1979. The influence of acupuncture stimulation on plasma levels of LH, FSH, progesterone and estradiol in normally ovulating women. In Kao, F., and J. Ka (eds) *Recent Advances in Acupuncture Research*. New York: Institute for Advanced Research in Asian Sciences and Medicine. Pp. 652-653.
- Booth, HN, and LE McDonald. 1982. *Veterinary Pharmacology and Therapeutics*, 3rd ed. Iowa: Iowa State University Press. Pp. 241-318.
- Bossut DBF, MW Stromberg, and PV Malven . 1986. Electroacupuncture-induced analgesia in sheep; measurement of cutaneous pain threshold and plasma concentration of pro-lactin and beta-endorphin immunoreactivity. *American Journal of Veterinary Research* 47: 669-76.
- Chengmin, L., T. Zhiguo, X. Yiqing, and Z. Zhangheng. 1987. Investigation on the laser puncture for treatment of ovarian function and uterus diseases and conception in dairy cattle. *International Conference of Veterinary Acupuncture (Abstracts)*. Beijing: China Academic Publishers. Pp. 70-71.
- Chuan, Y. 1995. *Traditional Chinese Acupuncture and Moxibustion*. Beijing: China Agricultural Press.

- Deen, L., Z. Guiyuan, and R. Zhenbang. 1987. The effect of laser acupuncture on acetic treatment and fetus protection in cows. *International Conference of Veterinary Acupuncture (Abstracts)*. Beijing: China Academic Publishers. P. 74.
- Food and Agricultural Organization. 1990. Handbook of Chinese Veterinary Acupuncture and Moxibustion. Bangkok: FAO Regional Office for Asia and the Pacific.
- Janssens, LAA, PAM Rogers, and AM and Schoen. 1988. Acupuncture analgesia: a review: *Veterinary Recorder* 122: 355-358.
- Klide, AM, and SH Kung . 1977. Veterinary Acupuncture. Philadelphia: University of Pennsylvania Press.
- Oda, Y., JA Acorda, T. Kameya, and H. Yamada. 1994. Effect of low level laser acupuncture on subclinical mastitis and reproductive disorders in dairy cattle. *Laser Therapy* 6: 157-160.
- Pineda, FJZ, JPR Bermudez, and MGR Perez. 1987. Evaluation of acupuncture treatment and antibiotherapy in chronic endometritis of Holstein Friesian cows. Proceedings of the International Conference on Veterinary Acupuncture, Beijing, Pp. 59-60.
- Sumano, H., and F. Vasquez . 1987. Effect of acupuncture on fertility of repeat breeding Holstein cattle. Proceedings of the International Conference on Veterinary Acupuncture. Beijing. P. 67.
- Rogers, PAM. 1991. Acupuncture in cattle and pigs. Proceedings of the Australian Veterinary Acupuncture Association, Sydney. Pp. 1-3.
- Shuzhi L., W. Renhe, L. Guiru, and C. Hongwei. 1987. The influence of laser irradiation on the reproductive hormones of livestock - the influence of laser irradiation on the content of progesterone in the plasma of dairy cows with dysfunctional ovaries. International Conference on Veterinary Acupuncture (Abstracts). Beijing: China Academic Publishers. P. 77.