COMPARISON BETWEEN ACUPUNCTURE ANALGESIA AND XYLAZINE-KETAMINE ANESTHESIA FOR EXPLORATORY LAPAROTOMY IN SHEEP

JESSIE A. ACORDA*, JOHN P. FRAGATA AND CONRADO A. VALDEZ
Department of Veterinary Clinical Sciences, College of Veterinary Medicine
University of the Philippines Los Banos, College, 4031 Laguna

ABSTRACT

The effectivity of conventional acupuncture analgesia using needles inserted at Acupoints 26 and 31 was compared to anesthesia induced by xylazine-ketamine for right flank exploratory laparotomy in ten sheep. Acupuncture stimulation produced surgical analgesia comparable to that induced by xylazine-ketamine combination in five out of six sheep. Respiratory and hearts rates were stable, and white blood cell and differential white blood counts were higher in sheep under acupuncture analgesia, compared to the xylazine-ketamine group. The results show that acupuncture analgesia can be used as an alternative to xylazine-ketamine anesthesia in the performance of abdominal surgeries.

Keywords: *aeupuncture, analgesia, ketamine, laparatomy, pain, sheep, surgery, white blood cells, xylazine.*

INTRODUCTION

The use of conventional anesthetics and analgesics such as ketamine and xylaxine has been widely accepted in the performance of variuss surgical procedures in sheep. However, considering the cost, side effects and complications of using anesthetics and analgesics, acupuncture analgesia can provide an alternative due to its distinct advantages such as no side effects, sueprior post-operative recovery and minimal cost (Chuan, 1995).

Acupuncture analgesia has proven its effectivity for many surgical procedures in domestic animals such as dogs, pigs, cattle and horses (Klide and Kung, 1977; Lin, 1984; Yung *et al.*, 1984. However, limited studies have been conducted on the use of acupunture analgesia in sheep (Bossut *et al.* (1986; Orilla (1980).

This study was conducted to compare the effects of acupuncture analgesia and xylazine-ketamine induced anesthesia on pain responses, phyiological responses (heart rate and respiratory rate) and blood cellular responses (total white blood cell

{WBC} count, absolute and relative differential WBC counts) before, during and after right flank exploratory laparotomy in sheep.

MATERIALS AND METHODS

Materials

Ten one to eight-year old female Philippine sheep were randomly selected from 38 sheep of University of the Philippines College of Veterinary Medicine Experimental Animal Farm were used in the study. The sheep were subjected to standard management procedures. The sheep was fasted 18 hours before the scheduled surgery.

Xylazine 20% (Rompun) was used as a sedative and preanesthetic drug. Ketamine 100 mg/ml (Ketaset) was used to induce and maintain anesthesia. Straight round sharp filiform needles, 0.65 cm. in diameter and 7 cm long were used for acupuncture. The acupuncture needles were sterilized before being used.

Methods

Two acupuncture points were used in the study, Acupoints 26 and 31. The acupuncture points were selected based on their degree of analgesic effect as demonstrated in a preliminary study. Acupoint 26 (Tian-Ping) is located on the dorsal midline between the spinous processes of the thirteenth thoracic vertebrae and the first lumbar vertebrae (Figure). Acupoint 31 (Bai-Hui) is located on the dorsal midline between the spinous processes of the sixth lumbar vertebrae and the first sacral vertebrae.

The ten sheep were divided randomly into two groups. Four sheep composed the xylazine-ketamine (control) group and six sheep the acupuncture (treatment) group. All sheep were subjected to right flank exploratory laparotomy.

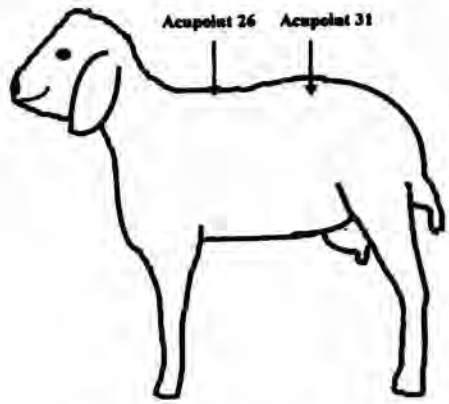

Figure 1. Acupoints used for a acupuncture analgesia in sheep.

For the control group, anaesthesia was induced via administration of xylazine (0.15 mg/kg body weight) intramuscularly followed by the administration of ketamine (11 mg/kg body weight) intramuscularly five minutes after xylazine administration.

For the treatment group, acupuncture analgesia was induced via insertion of acupuncture needles on Acupoints 26 and 31. The acupoint areas were disinfected using 1% iodine solution and 70% isopropyl alcohol prior to acupuncture needle insertion. The needles were inserted perpendicularly for about two to three cm deep depending on the size of the animal. The needles were stimulated via continuous rotation and thrusting for a duration of one minute and repeated every five minutes. Stimulation was continued for the whole duration of the surgery.

The surgical area in the right flank was clipped prior to induction of acupuncture analgesia or xylazine-ketamine anesthesia. After induction of anesthesia for the control grup, each sheep was placed in left lateral recumbency and prepared for final asepsis and draping. For the treatment group, each sheep was restrained at left lateral recumbency on the surgical table. Acupuncture needle insertion then followed after which final aseptic preparation of the surgical area and draping was made.

After reaching the desired level of anesthesia, an 8-10 cm vertical skin incision was made in the paralumbar fossa midway between the last rib and the tuber coxae and about 2-3 cm ventral to the transverse processes of the lumbar vertebrae. The skin incision was continued deeply, cutting through the fibers of the external abdominal oblique muscles and internal abdominal oblique muscles and exposing the transverse abdominal muscles. An incision through the transverse abdominal muscle and peritoneum was made and extended with scissors allowing entry into the abdominal cavity.

After opening the abdominal cavity, the cecum and a substantial length of the intestines were exposed and exteriorized. The rumen, abomasum, right kidney and pelvic organs were palpated. Exploratory laparotomy lasted for approximately 15 min before the incision was closed.

Closure of the laparatomy was achieved by three layers of suture. First, the peritoneum and the transverse abdominal muscles were closed together with a 3-0 chromic cat-gut using simple continuous suture pattern. The internal and external abdominal oblique muscles were closed with a second continuous layer using a 3-0 chromic cat-gut. The skin incision was closed with a simple interrupted suture pattern using a 3-0 silk and disinfected. Prophylactic antibiotic (250,000 units of procaine penicilin and 250 mg Dihydrostreptomycin per 10 kg body weight), was administered intramuscularly to each sheep once a day for three days.

Pain response to the surgery was graded as follows: 1) Good, if there was no pain response to surgery; 2) Fair, if responses were noticed but the operation can be accomplished smoothly; and 3) Poor, if intensive pain responses and struggling was present and the operation can no be carried out; in such case surgery was discontinued.

For both groups, blood samples were collected ten minutes prior to induction of analgesia or anesthesia and ten minutes after surgery. Total WBC and relative and absolute differential WBC counts were determined using standard procedures. Heart

and respiratory rates were monitored every ten minutes prior to xylazine administration or acupuncture stimulation. Monitoring lasted until last ten minutes after recovery from anesthesia and until ten minutes after surgery, for control and treatment groups, respectively.

The pain response to surgery of the control and treatment group was compared and the differences in the mean values of the blood cellular and physiological responses for both groups were analyzed statistically.

RESULTS

All sheep responded to pain stimuli induced by pin prick and pinch probe applied on the surgical site prior to xylazine-ketamine administration or acupuncture stimulation and after the sheep were restrained with ropes in the treatment group. The sheep would kick towards the offending stimuli, grind their teeth, raise and shake their head violently and struggle hard.

All sheep subjected to right flank exploratory laparatomy in the control group were graded as good on their pain responses (Table 1). The animals stayed asleep during the course of surgery up to 10-25 minutes after surgery. For the treatment group, five out of six sheep operated under acupuncture analgesia were graded as good and one was graded as fair. For those animals grade as good, the analgesia produced can be described as comparable to xylazine-ketamine anesthesia. There were no pain responses observed, no struggle, no unnecessary movement that interfered with the performance of the surgical procedure. The five sheep stayed calm and did not respond to noise stimuli.

For one sheep graded as fair, there was minimal movement such as raising of head, movement of hindlimbs, and raising of body when there is excessive tissue manipulation such as during stretching of the flank muscles and clamping of the viscera. This was observed during the early part of the surgery. The needle inserted as Acupoint 31 was then withdrawn and reinserted allowing surgery to be accomplished smoothly with no observable indication of pain during suturing of the flank muscles, subcutaneus tissue and skin.

Table 1. Pain responses of sheep (no. of animals) subjected to right flank exploratory laparotomy under either xylazine-ketamine anesthesia or acupuncture analgesia.

Group*	Pain Response		
	Good	Fair	Poor
Control	4	0	0
Treatment	5	1	0

Control: Xylazine-ketamine group; Treatment: Acupuncture group.

All sheep in the treatment group stayed awake throughout the course of surgery. After the surgery, the animals readily rose up and were allowed to walk by themselves towards their pen.

Table 2 shows the mean WBC counts of the sheep in the two groups ten minutes before anesthesia or analgesia and ten minutes after recovery. In the control group, there was a significant decrease in the total WBC count after recovery ($p<0.05$). In the treatment group, the WBC count increased significantly after recovery ($p<0.05$).

Table 3 shows the mean relative differential WBC counts of the sheep in the two groups. In the control group, the eosinophil count was lower while the lymphocyte and neutrophil counts were higher after recovery than before surgery but the differences were not significant ($p>0.05$). In the treatment group, the monocytes, eosinophils and neutrophils increased significantly after recovery ($p<0.05$). Table 4 shows the mean absolute differential counts of the sheep. All components of WBC in the control group decreased after recovery, but the differences were not significant ($p>0.05$). In the treatment group, segmented neutrophils increased significantly after recovery ($p<0.05$) (Table 5). There was a decrease in the heart rate during surgery in the control group as compared to that before surgery ($p<0.05$) (Table 6). In the treatment group, there were no changes in the respiratory and heart rates before, during and after surgery.

DISCUSSION

In small ruminants such as sheep and goats, provision of suitable restraint procedures can include physical restraint, chemical restraint or acupuncture analgesia.

Xylazine-ketamine combination is oen of the most common drug combinations used in inducing anesthesia both in small and large animal species. The dose range used in the study has been reported to produce the best sedation, analgesia, and muscle relaxation without side effects (Kurdele et al., 1988). It also provided sufficient muscle relaxation and post-operatively no adverse effects was observed. Sheep are the most sensitive domestic animals to the effect of xylazine, producing deep sedation and

Table 2. Total WBC counts (/αl) of sheep before and after right flank exploratory laparotomy under either xylazine-ketamine anesthesia or acupuncture analgesia.

	Time of Collection			
	Before		After	
Group*	mean	SD	mean	SD
Control	11846.9[a]	2379.4	10118.8[b]	3739.3
Treatment	11893.8[a]	1742.5	15364.6[b]	2999.6

Control: Xylazine-ketamine group, Treatment: Acupuncture group.
†Values with different superscripts in the same row are different ($p<0.05$).

Table3. Relative differential WBC counts (%) of sheep before and after surgery under either xylazine-ketamine anesthesia or acupuncture analgesia.

	Relative Differential WBC Count†			
	Before		After	
Group*	mean	SD	mean	SD
CONTROL				
Lymphocyte	45.2[a]	3.6	51.2[a]	6.8
Eosinophil	11.5[a]	0.6	1.0[a]	0.8
Band Neutrophil	0.8[a]	0.5	1.0[a]	0.8
Segmented neutrophil	52.5[a]	4.0	46.8[a]	7.3
TREATMENT				
Lymphocyte	58.8[a]	10.1	52.0[a]	5.8
Eosinophil	0.7[a]	0.8	0.8[b]	0.8
Band Neutrophil	1.7[a]	0.5	1.5[a]	0.8
Segmented neutrophil	38.3[a]	10.6	45.3[a]	4.5

Control: Xylazine-ketamine group, Treatment: Acupuncture group.
†Values with different superscripts in the same row are different ($p<0.05$).

Table4. Absolute differential WBC counts (/αl) of sheep before and after surgery under either xylazine-ketamine anesthesia or acupuncture analgesia.

	Absolute Differential WBC Count†			
	Before		After	
Group*	mean	SD	mean	SD
CONTROL				
Lymphocyte	5408.6[a]	1494.2	5090.6[a]	1793.3
Eosinophil	81.6[a]	59.8	187.4[a]	103.9
Band Neutrophil	85.7[a]	69.1	86.9[a]	62.7
Segmented neutrophil	4823.4[a]	2364.0	6163.9[a]	952.8
TREATMENT				
Lymphocyte	6985.8[a]	1168.4	8035.7[a]	1869.7
Eosinophil	76.4[a]	92.5	120.7[a]	109.1
Band Neutrophil	195.5[a]	53.4	217.8[a]	126.0
Segmented neutrophil	463.18[a]	1306.9	693.72[b]	1263.7

Control: Xylazine-ketamine group, Treatment: Acupuncture group.
†Values with different superscripts in the same row are different ($p<0.05$).

Table4. Relative differential WBC counts (%) of sheep before and after surgery under either xylazine-ketamine anesthesia or acupuncture analgesia.

	Absolute Differential WBC Count†			
	Before		After	
Group*	mean	SD	mean	SD
CONTROL				
Lymphocyte	5408.6[a]	1494.2	5090.6[a]	1793.3
Eosinophil	81.6[a]	59.8	187.4[a]	103.9
Band Neutrophil	85.7[a]	69.1	86.9[a]	62.7
Segmented neutrophil	4823.4[a]	2364.0	6163.9[a]	952.8
TREATMENT				
Lymphocyte	58.8[a]	10.1	52.0[a]	5.8
Eosinophil	0.7[a]	0.8	0.8[b]	0.8
Band Neutrophil	1.7[a]	0.5	1.5[a]	0.8
Segmented neutrophil	38.3[a]	10.6	45.3[a]	4.5

Control: Xylazine-ketamine group, Treatment: Acupuncture group.
†Values with different superscripts in the same row are different ($p<0.05$).

Table 5. Respiratory rates (breaths/min) of sheep before, during and after surgery under either xylazine-ketamine anesthesia or acupuncture analgesia.

	Respiratory Rates†					
	Before		During		After	
Group*	mean	SD	mean	SD	mean	SD
Control	72.7[a]	44.4	57.3[a]	33.7	58.8[a]	29.8
Treatment	45.0[a]	9.6	57.0[a]	10.6	50.2[a]	12.6

Control: Xylazine-ketamine group; Treatment: Acupuncture group.
†Values with different superscripts in the same row are different ($p<0.05$).

Table 6. Heart rates (beast/min) of sheep before, during and after surgery under either xylazine-ketamine anesthesia or acupuncture analgesia.

	Heart Rates†					
	Before		During		After	
Group*	mean	SD	mean	SD	mean	SD
Control	105.0[a]	10.0	582.0[b]	13.0	78.5[b]	1.9
Treatment	99.5[a]	11.2	100.5[a]	22.6	102.8[a]	23.8

Control: Xylazine-ketamine group; Treatment: Acupuncture group.
†Values with different superscripts in the same row are different ($p<0.05$).

analgesia (Booth and McDonald, 19820. Xylazine-ketamine combination provides good degree of muscle relaxation, analgesia and anesthesia in ruminants (Gray and Wayne, 1986).

Several studies have demonstrated the analgesia-inducing effect of acupuncture in many surgical procedures in other domestic animals. The present study proves that acupuncture analgesia using two points, Tian-ping (Acupoint 26) and Bai-hui (Acupoing 31), can produce sufficient analgesia in the performance of right flank exploratory laparotomy in sheep. Acupoints 26 and 31 are two of the many sets of acupoints which can be used for acupuncture analgesia in the performance of abdominal surgery in ruminants (Chuan, 1995).

In the present study, acupuncture analgesia was comparable with xylazine-ketamine anesthesia in several aspects. Firstly, the sheep appear to be drowsy that rough movement in the surgery area, presence of other sheep and production of noise did not elicit any distractive response from the sheep. Such finding is in agreement with Whie et al. (1985) on the use of electroacupuncture analgesia for laparotomies in two dairy cows. Cockrill (1975) observed that rumenotomy in a four year old bull under acupuncture analgesia alone allowed partial evacuation of rumen contents, regurgitation, chewing and reswallowing.

Secondly, acupuncture provides enough analgesia to the flank skin muscles as depicted by no painful response during incision, tissue clamping, stretching and suturing. In cows, the acupuncture analgesia effect was described to be similar in many respects to paralumbar nerve block (White *et al.*, 1985). O'Boyle and Vajda (1975), observed excellent analgesia in several cases of dogs subjected to various abdominal surgeries under acupuncture analgesia alone.

Thirdly, acupuncture provides sufficient analgesia in the abdominal viscera. Tissue clamping, invasive palpation of the abdominal organs, exposure of the intestines with subsequent stretching and replacement did not elicit any painful response.

In comparison with xylazine-ketamine anesthesia, acupuncture analgesia provides additional advantage because it allows surgery in an awake sheep; thus, producing superior post-operative recovery. The sheep could rise up and walk right after the surgery (Chuan, 1995). Such aspects is of considerable advantage because it decreases the length of time the animal stays recumbent with concurrent hypoxemia (Gray and Wayne, 1986). In addition, aninimals operated under acupuncture analgesia are assured of no adverse and toxic effects of general and local anesthetics.

A decrease in the respiratory rates and heart rates of sheep under xylazine-ketamine anesthesia was observed in the present study. However, these values were within normal ranges. Denghani *et al.* (1991) and Coulson *et al.* (1989) also reported decrease in heart rates and respiration rates with this combination. Because of this action, xylazine-ketamine combination is contradicted in animals with compromised heart function.

Compared to xylazine-ketamine anesthesia, animals operated under acupuncture analgesia had stable respiratory rates and heart rates. This is in agreement with several studies using acupuncture in different animals (Dill *et al.*, 1988; Janssens *et al.*, 1979;

Lakshmipathi and Ramakrishna, 1988; O'Boyle and Vajda, 1975; Wright and McGrath, 1981). The absence of changes in the respiratory and heart rates of sheep during and after acupuncture stimulation makes acupuncture analgesia an excellent alternative to anesthetic risk patients (Celo and Luzuriaga, 1980; O'Boyle and Vajda, 1975).

Although there was reductions in the total WBC and differential WBC counts in sheep under xylazine-ketamine anesthesia, in agreement with previous studies (Komar, 1988; Moore *et al.*, 1988), the values obtained were within normal ranges. Induced stress to the sheep might play an important role in the decrease in the WBC of sheep after xylazine-ketamine anesthesia and exploratory laparotomy. It has been reported that stress is one of the culprit of decrease in WBC count (Coles, 1980). There is, however, no explanation on how xylazine-ketamine anesthesia exerts a direct affect on these changes in the WBC pictures of sheep and even in other animals.

The WBC, lymphocyte and neutrophil counts observed in sheep under acupuncture analgesia were above normal levels. In humans, other studies reported an increase (Kita et al., 1979; Lin *et al.*, 1980), decrease (Craciume*tal.*, 1973) and a decrease followed by an increase (Omura, 1979) in the leucocyte count after acupuncture stimulation. Leuocytosis indicates introduction of foreign substances to the body or disease invasion. It requires proper stimulation and presence of stimulating agents such as antigen and chemotactic factors which generally indicates bacterial or viral disease and tissue damage (Tizard, 1992; Schalm, 1982). Whether acupuncture has a direct effect on leucocytosis can not be explained in this study. The relationship between acupuncture analgesia and its role as a possible immunostimulant has to be investigated further.

The above results show that acupuncture analgesia can be used as an alternative method in the performance of abdominal surgeries in sheep, in place of xylazine-ketamine anesthesia, with less side effects, minimal cost and superior post-operative recovery.

ACKNOWLEDGMI

This study is part of the Research Project entitled "Application of Acupuncture Analgesia and Therapy in Sheep" which was funded by the Office of Director of Research, University of the Philippines Los Banos

REFERENCES

Booth , H.N., and L.E. McDonald. 1982. *Veterinary Pharmacology and Therapeutics*, 3rd ed. Iowa: Iowa State University Press. Pp. 241-318.

Bossut, D.B.F., M.W. Stromberg, and P.V. Malven. 1986. Electroacupuncture-indicated analgesia in sheep; measurement of cutaneous pain threshold and plasma concentration of pro-lactin and beta-endorphin immunorectivity. *American Journal of Veterinary Research* 47:669-76.

Celo, E.M., and H.M. de Luzuriaga. 1980. A study on the possible application of acupuncture analgesia in abdominal surgery in dogs. *Philippine Journal of Veterinary Medicine* 19: 98-121.

Chuan Y. 1995. *Traditional Chinese Veterinary Acupuncture and Moxibustion.* Beijing: China Agricultrual Press.

Cockrill, W.R. 1975. Veterinary medicine in China: A blend of art and science. *Modern Veterinary Practice.* 56: 325-330.

Coles, E.H. 1980. *Veterinary Clinical Pathology,* 3rd ed. Philadelphia: WB Saunders Co. pp. 15-69.

Coulson, N.M., A.S. Januszkiwics, K.T. Dodd, and G.R. Riffle. 1989. The cardiorespiratory effects of diazepam-ketamine and xylazine-ketamine anesthetic combination in sheep. *Laboratory Animal Science* 39: 591-597.

Cracium, T.c, C.Toma, and V. Turdenau. 1973. Neurohumoral modification after acupuncture. *American Journal of Acupuncture* 1:67-70.

Denghani, S., A. Behbodikhah, and N. Korsand. 1991. Journal of Veterinary Anesthesia. *Proceedings of the 4th International Congress of Veterinary Anesthesia,* Utretch, Netherlands, 25-31 August, 1991. Pp. 123-128.

Dill, S.G., R. Gleed, N.S. Mathews, H.N. Erb, and T.K. Miller. 1988. Cardiovascular effects of acupuncture stimulation at point governing vessels 26 in halothane-anesthetized ponies. *American Journal of Veterinary Research* 49:1708-1712.

Gray, P., and M.N. Wayne. 1986. Anesthesia in goats and sheep: Part II. General Anethesia. *The Compendium on Continuing Education for the Practicing Veterinarian* 8: S127-S133.

Janssens, L.A. A., S. Altman, and P.A. M. Rogers. 1979. Respiratory and cardiac arrests under general anesthesia: Treatment by acupuncture of the nasal philtrum. *Veterinary Record* 122: 355-358.

Kita, I., K. Kitazawa, T. Iwasa, and H. Makie. 1979. Clinical and hematological findings during electroacupunctural analgesia (EAA) in the dog: Observations in the course of EAA by gradual induction, and rapid induction with thiamylal sodium premedication. *Japanese Journal of Veterinary Anesthesia* 10:57-65.

Klide, A.M. and S.H. Kung. 1977. *Veterinary Acupuncture.* Philadelphia: University of Pennsylvania Press.

Komar, E. 1988. Effects of general anesthesia with ketamine or etomidate on some biochemical values in sheep. Medecyna Wuterynariya 44: 600-603.

Kurdele, A., M.K. Borku, and M. Gurkon. 1988. Some clinical observations on sheep given xylazin hydrochloride (rompun) and ketamine hydrochloride (ketalar). *Lalahan Hayvancilic Aratiuma Enstitusu Dergisi* 28: 42-50.

Laksmipathi, G.V. and O. Ramakrishna. 1988. A study of the effects of acupuncture analgesia in buffaloe calves. *American Journal of Acupuncture* 16: 165-188.

Lin, J.H. 1984. Veterinary Acupuncture in Taiwan. *Proceedings of the 10th Annual International Conference on Veterinary Acupuncture,* Austin, Texas, USA. Pp. 193-205.

Lin., H.J., A.M. Philip, and P.A.M. Rogers. 1980. Acupuncture effects on the body's defense system. A veterinary review. *The Veterinary Bulletin* 5:633-639.

Moore, T.C., C.H. Spruck, and L.E. Leduc. 1988. Depression of lymphocyte traffic in sheep by anesthesia and associated changes in eferent lymph PGE 2 and antibody levels. *Immunology* 63:139-143.

O'Boyle, M.A., and G.K. Vajda. 1975. Acupuncture anesthesia for abdominal surgeries. *Modern Veterinary Practice* 56: 705-707.

Omura, Y. 1979. Simple non invasive methods of evaluation brain circulation and the hypotensive and serum lipid lowering effects of acupuncture. *Cardiovascular Research* 4:449-457.

Orilla, W.E.C. 1992. Observations of pain reactions in selected goats and sheep using electrically induced analgesia. DVM *Thesis.* University of the Philippine Los Banos.

Schalm, O.W., N.C. Jain, and E.S. Caroll. 1982. *Veterinary Hematology.* 3rd ed. Philadelphia: Lea and Febiger, pp. 471-530.

Tizard, I. 1992. *Veterinary Immunology,* 4th ed. Philadelphia: WB Saunders Co. pp. 17-20.

White, S.S., J.R. Bolton, and D.M. Fraser. 1985. Use of electroacupuncture as an analgesic for laparotomies in two dairy cows. *Australian Veterinary Journal* 62:52-54.

Wright, M., and C.J. McGrath. 1981. Physiologic and analgesic effects of acupuncture in the dog. *Journal of the American Veterinary Medical Association.* 178:507.

Yung, C.R., W.W. Chan W.W., J.H. Lin. 1984. Electroacupuncture analgesia for surgery in dogs – 42 cases. *Report presented in the 4th Congress of the Federation of Asian Veterinary Associations,* Taipei. Taiwan, pp. 65-71.