*Indian Journal of Animal Sciences* **82** (3): 290–291, March 2012

# Fentanyl and buprenorphine as premedicants to ketamine anaesthesia in Large White Yorkshire pigs

SUMEET GARG[1], RAJU SHARDA[2], S K TIWARI[3] and KASHI NATH[4]

*Indira Gandhi Krishi Vishwavidyalaya, Anjora, Durg, Chhattisgarh 491 001 India*

Received: 16 November 2010; Accepted: 28 April 2011

**Key words**: Buprenorphine, Fentanyl, Ketamine, Pig anaesthesia

The knowledge of appropriate analgesia and anaesthesia in pigs however is limited (Malavasi *et al.* 2005). Body conformation and anatomy make manual restraint difficult, necessitating use of slings or chemical restraint agents.

Fentanyl is 4–acylanilino –piperidine compound, and is 250 times as potent as morphine. It is very short acting having peak effect lasting less than 30 min when used in anaesthetic doses. Fentanyl is widely used in veterinary medicine to produce complete surgical anaesthesia in dogs (Marsboon *et al*. 1964). Ketamine hydrochloride is a congener of phencyclidine known for analgesic properties (White *et al.* 1982). Buprenorphine is a partial mu-opoid agonist-antagonist derived from thebaine. Its analgesic action may last as long as 8 to 12 h. Reports regarding use of anaesthetic combination of ketamine with fentanyl and buprenorphine in swines are limited. Therefore, the research work was planned to evaluate the clinico-physiological effects of the anaesthetic combination in pigs. Buprenorphine was combined with ketamine to potentiate the analgesic effects and reduce the time of onset of analgesia

Clinically healthy large white Yorkshire pigs (15) of either sex weighing 35–65 kg body weight were used. They were fasted for 12 h and drinking water was withheld for 6 h before the administration of anaesthesia. The animals were divided randomly into 3 groups of 5 animals each. The animals of group 1 received atropine sulphate 0.04 mg/kg body weight followed by ketamine hydrochloride 15 mg/kg body weight by slow intravenous injection through ear vein. In treatment group 2, after premedication with atropine intramuscular injection of buprenorphine 25µg/kg and 10 min later ketamine hydrochloride 15 mg /kg body weight intravenously were given. In group 3, premedication with atropine sulphate was followed by intramuscular injection of fentanyl 10µg/kg body weight and 10 min later by ketamine hydrochloride given 15 mg /kg body weight intravenously.

*Clinical observations:* The onset of sedation was noted as the time taken from the administration of anaesthesia till the pig became calm and quite and elicited diminished response to external stimuli. The surgical stage of analgesia was assessed by the absence of pedal and pin prick reflex. The duration of anesthesia was recorded as the time taken from the onset of sedation and analgesia till the return of pedal reflex and pin prick reflex after surgical anaesthesia. Muscle relaxation was assessed by observing the tone of jaw muscles, flaccidity of tongue and relaxation of anal sphincter. Complete recovery was recorded as the time taken from the onset of sedation/analgesia till the animal made its first movement like raising of head and attainment of sternal posture. Complications such as lacrimation, salivation, vomition during and after anaesthetic procedure were recorded. Presence or absence of corneal, conjunctival, palpebral, pedal reflexes and relaxation of anal sphincter were also monitored.

*Physiological observations:* Rectal temperature, heart and respiratory rate were recorded before and 10 min after premedication and 10, 20, 30, 40, 60, 90, 120 and 180 min after anaesthesia. The data was analyzed using analysis of variance (ANOVA) to compare the means among the groups using standard procedure outlined by Snedecor and Cochran (1994) and ANOVA Single factor programme of MS Excel in the computer in data analysis.

*Clinical observations*

The onset of anaesthesia differed nonsignificantly ($P<0.01$) between 3 groups. The onset of induction of anaesthesia in animals of group 2 was 1.48±0.10 min, in animals of group 1 1.60±0.19 min and in group 3,1.60±0.13 min. Duration of anaesthesia was significantly ($P<0.01$) longer in group 3, followed by group 2 as compared animals of group 1. Similar duration (20 to 30 min) of satisfactory

Present address: [1, 4] Teaching Associate (dr kashinath @gmail.com); [2]Associate Professor (dr_rajusharda@gmail.com); [3]Professor and Head (tiwari_sk62@yahoo.in), Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry.

anaesthesia was reported in pigs with fentanyl/ innovar vet and ketamine by Thurmon and Tranquilli (1986). Recovery time from anaesthesia was significantly (P<0.01) higher in animals of group 2 (66.4±1.81 min) and group 3 (65.4±1.59 min) as compared to group 1 (32.6±1.98 min). The recovery was smooth, free from excitement and uncomplicated in groups 2 and 3.

In group 1, degree of analgesia was very poor whereas in group 2 it was very good which simulates with the observations made in pigs with fentanyl anaesthesia by Bauer *et al.* (2007). The extent of muscle relaxation in animals of group 2 was excellent and for longer duration. The tongue became flaccid and protruded out with relaxed anal sphincter in animals of group 2. To its contrary, the extent of flaccidity of tongue and relaxation of muscles was less in animals of group 1.

Corneal, conjunctival and palpebral reflexes were present in animals of the group 1 group 3 when combined with fentanyl. The animals anaesthetized with ketamine showed muscular tremors and stiffness in the limbs initially which became relaxed within 2 to 3 min as animals were anaesthetized.

*Physiological parameters*

A non significant (102.56±0.07 to 104.52±0.1°F) increase in rectal temperature following ketamine administration up to 60 min was seen in animals of group 1, which then gradually approached the base values by180 min. However, in groups 2 and 3 the rectal temperature marginally decreased after buprenorpnine-ketamine, and fentanyl-ketamine administration up to 40 and 30 min, respectively, and then increased to near normal values by 120 min. Similar increase in rectal temperature was recorded by Sharma *et al.* (2005) following ketamine anaesthesia in dogs. However, Fritz *et al.* (2005) found hypothermia following fentanyl anaesthesia in pigs.

The mean value of heart rate (90.00±3.34 min) to (132.80±2.24 min) increased significantly (P<0.01) up to 20 min after anaesthesia in animals of group 1, and gradually decreased to return towards pre administration level by 180 min. However, in animals of group 2 and 3 there was nonsignificant increase in heart rate after premedication followed by increase up to 20 min post anaesthesia. Tachycardia may be attributed to vagolytic action of atropine along with chronotropic effect of ketamine..

The respiratory rate (38.00±2.28 min) to (58.00±1.41 min) increased significantly (P<0.01) from 10 min after premedication up to 20 min in animals of group 1 which gradually decreased to return to base values by 180 min. To its contrary a significant (P < 0.01) decrease in respiratory rate (35.60±1.71 min) to (22.80±1.28 min) in group 2 (buprenorphine-ketamine) and (37.80±0.80 min) to (21.60±0.51 min) in group 3 (fentanyl- ketamine) was seen from 10 min after anaesthesia up to 30 min post anaesthesia which gradually increased to return to base levels by end of study. Lumb and Jones (1996) also found respiratory depression in canines after fentanyl anaesthesia. Decrease in respiratory rate in dogs following administration of ketamine has earlier been reported by Tiwari *et al.* (1997).

It is concluded that extent of anaesthesia, muscle relaxation and analgesia increased when fentanyl or buprenorphine are used as premedicants to Ketamine hydrochloride which is suitable to perform surgery in pigs.

## SUMMARY

Clinico-physiological response to fentanyl and buprenorphine as premedicants to ketamine anesthesia was studied in white Yorkshire pigs. The duration of anaesthesia and time taken for complete recovery from anaesthesia was more in animals when fentanyl and buprenorphine was used along with ketamine. The changes observed in various clinicophysiological parameters were transient in nature and returned to normal values in short time. The anaesthetic combination appears to be safe for pig anaesthesia.

## REFERENCES

Bauer A, Baschnegger H, Renz V, Brandl U, Brenner P, Thein E, Reichart B, Schmoeckel M and Christ F. 2007. Comparison of propofol and isoflurane anaesthesia in orthotopic pig-to baboon cardiac xenotransplatation. *Xenotransplantation* **14**(3): 249–54.

Fritz H G, Holzmayr M, Walter B, Moeritz K U, Lupp A and Bauer R. 2005. The effect of mild hypothermia on plasma fentanyl concentration and biotransformation in juvenile pigs. *Anesthesia and Analgesia* **100**: 996–1002.

Lumb W V and Jones E W. 1996 Preanesthetics and Anesthetic Adjuncts. *Veterinary Anesthesia.* 3rd edn. 183–209.

Malavasi L M, Augustsson H, Jensen Waern M and Nyman G. 2005. The effect of transdermal delivery on fentanyl on activity in growing pigs. *Acta Veterinaria Scandinavica* **46**(3): 149–57.

Marsboon R, Verstraete A, Thienpont D and Mattheeus D. 1964. Small Animal Anaesthesia.Oxford: Pergemon. *British Veterinary Journal* **120**: 466.

Thurmon J C, Nelson D R and Christie G J. 1972. Ketamine anaesthesia in swine. *Journal of American Veterinary Medical Association* **160**: 1325.

Tiwari S K, Kumar A and Sharma B. 1997. Medetomidine as a preanaesthetic to ketamine anaesthesia and its reversal by Atipamizole in dogs. *Indian Veterinary Journal* **74**: 961–64.

Sharma Y K, Pandey S S, Pandey S K and Sharma P K. 2005. Clinico physiological effects of epidural buprenorphine in combination with bupivacaine, xylazine or Ketamine in dogs. *Indian Journal of Veterinary Surgery* **26**(1): 43–44.

Snedecor G W and Cocharan W G. 1994. *Statistical Methods* 8th edn. Pp 254–68. East West Press, New Delhi.

White P F, Way W L and Trevor A J. 1982. Ketamine – Its pharmacology and therapeutic uses. *Anesthesiology* **56:** 119–24.