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Propofol-induced electroencephalographic, electrocardiographic and spirometric changes in goats

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ABSTRACT

The effects of Propofol-induced electroencephalographic, electrocardiographic and spirometric changes were studied at a lower dose rate (0.4 mg/kg body mass, intravenously) and at higher dose rate (0.5 mg/kg body mass, intravenously) in four apparently healthy goats 10 to 14 months old, weighing 9 to 12 kg. Electroencephalographic results showed that anesthesia was induced with a change of distorted β wave patterns to α waves within one minute. The α wave patterns continued for 5 to 6 minutes at the lower dose (0.4 mg/kg body mass) while they persisted for 12 to 13 minutes at the higher dose (0.5 mg/kg body mass). At the lower dose, recovery was predictable after 5 minutes on reversal of the EEG pattern from α to β waves, whereas at the higher dose α wave patterns continued for 15 minutes. The occurrence of the righting reflex was noticed after the disappearance of α waves. The heart rate increased with both the dose rates within the first 5 minutes and decreased after 10 and 15 minutes of induction. Inverted T waves were found in two goats at the lower dose while at the higher dose it was found to be inverted in three of the four goats. One of the goats inducted with the higher dose showed tachycardia, with ectopic beats from the 5th to 7th minute post induction. On average, apnea was noticed for the first 30 seconds at the lower dose and for 42 seconds at the higher dose. One of the animals receiving the higher dose showed apnea for 314 seconds. This goat was given artificial respiration after 106 seconds and then again after 296 seconds to resuscitate it. The animal showed severe respiratory distress with abdominal respiration during the first few seconds. The tidal volume did not return to normal until 15 minutes after induction. This indicates that Propofol has a respiratory depressant activity in goats and positive pressure ventilation must be provided. It does not induce analgesia and should be accompanied by analgesics .

Key words: propofol, anesthesia, goat, electroencephalography, electrocardiography, respiration

Introduction

The hospitalization of animals following anesthesia is costly and often inconvenient for owners, hence "day case" anesthesia and surgery is becoming increasingly common

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(PESHIN and HALL, 2008). An anesthetic should pass the test of minimal interference in normal physiological processes and produce sufficient analgesia with muscular relaxation. Propofol (2,6-di-isopropylphenol, Diprivan) is widely used in the clinical setting as an induction agent and to maintain short periods of unconsciousness. Rapid recovery and reduced side effects make it the drug of choice, especially for ambulatory surgical interventions. In goats, Propofol has been reported to induce sufficient muscle relaxation and surgical anesthesia (through eye signs) while the heart rate varies over time from 81 to 91 beats/minute and the respiration rate from 9 to 15 breaths/minute (CARROLL et al., 1998). Propofol has a more significant blunting effect on EEG responses to noxious stimulation compared to halothane (ORTH et al., 2005). Propofol depresses the central chemoreflex loop but has no significant effect on the peripheral chemoreflex loop (NIEUWENHUIJS et al., 2001). The quick response elicited to Propofol anesthesia in goats has been reported earlier (ORTH et al., 2005). The potential of Propofol as an anesthetic agent to provide satisfactory anesthesia with short recovery profiles in animals not being subjected to major surgery needs to be investigated. Electroencephalography is of sufficient reliability to assess brain activity in the different physiological states of an animal. The use of electroencephalography for the evaluation of anesthetics was proposed long ago (GIBBS et al., 1937). The observation of vital functions such as cardiovascular and respiratory functions is mandatory in evaluating a drug's suitability as an anaesthetic. Based on these observations, it was proposed to study the electroencephalographic, electrocardiographic and spirometric responses to Propofol induction in goats at two defined dosage levels.

Materials and methods

The present study was conducted during the months of June and July at latitude 28° 53' 24"N, longitude 77° 34' 27" at an altitude of 243.84 meters above MSL. During the course of the experiment the ambient temperature was maintained around 22 °C. Four goats between 10 and 14 months old, weighing 9 to 12 kg were selected and kept in the departmental animal shed, with access to grazing, supplemented with concentrated feed twice in a day and free access to water.

Feed was withheld 12 hours before the experimental trial, while access to water was curtailed 2 hours before the start of experiment. The animals were trained to the experimental conditions until stable electroencephalographic (EEG), electrocardiographic (ECG) and spirometric tracings were obtained. The training period varied between 15 to 20 days for each individual animal. For recording the EEG, each animal was fitted with a set of bipolar (RO-LO) lead systems in the occipital region, while the earth lead was applied to the skin surface above the nasal bone. The site of placement of bipolar electrodes was 1 to 2 cm caudo-medial from the base of the horn. Before the application

of electrodes, the sites were shaved, cleaned with ethanol and dried. Leads (silver disc electrodes) were applied to the scalp using EEG paste (Bentonite paste). A single channel student physiograph (Biodevices, Ambala Cantt, India) was used for EEG recording. Calibration of the physiograph was done by keeping the amplifier sensitivity at 50 μV and calibration at 100 μV equal to 44 mm (maximum deflection achieved). The paper speed was adjusted to 100 mm/sec. The ECG was recorded on an ECG machine (Cardiart 108T/ MK-VII, BPL Limited) calibrated at 10 mm per mV and using a paper speed of 25 mm/ sec, as described earlier (MOHAN et al., 2005) while respiratory volumes and frequency were recorded on a spirometer (Biodevices, Ambala Cantt, India) attached to an isotonic movement transducer on the single channel student physiograph (Biodevices, Ambala Cantt, India) calibrated at 250 mL equal to 29 mm, maintaining the paper speed at 2.5 mm/sec and the amplifier sensitivity at 5 μV.

The goats were weighed and Glycopyrrolate at a dose rate of 2 mg stat was injected as a pre-anaesthetic. Propofol was administered at dose rates of 0.4 and 0.5 mg/kg body mass intravenously, as a single bolus, after 5 minutes. The EEG, ECG and spirometric recordings, in that order, were obtained before and immediately after the Glycopyrrolate and Propofol injections were given. Subsequent recordings were obtained every 5 minutes until the subjects exhibited a righting reflex. The animals were observed for behavioral activities for a further period of at least 30 minutes after the experiment was over. Two such recordings were obtained on each animal,15 days apart, for replicate records. Statistical comparisons were performed by ANOVA (SNEDECOR and COCHRAN, 1994). A difference of $P \leq 0.05$ was considered significant. The data is presented as mean ± SE.

Results

The EEG attributes at different periods of the experiment are presented in Table 1 and Figs. 1 and 2. No significant differences were observed between the pre-experimental (PE) values of both dose trials. The pre-experimental EEG pattern during low and high dose trials was denoted by desynchronized high β wave activity with a frequency of 21.50 ± 2.12 Hz and low amplitude of 9.13 ± 1.59 μV. No significant difference was observed between the pre-anaesthetic (PA) wave patterns of both dose trials with respect to frequency and amplitude. The overall pre-anaesthetic EEG pattern indicated desynchronized β waves with a significant ($P \leq 0.05$) decrease in the frequency to 17.50 ± 1.90 Hz and non-significant higher amplitude of 13.36 ± 4.35 μV, as compared to the PE condition.

At the low dose level of Propofol, the EEG pattern at 1 min of Propofol induction changed from a β wave pattern to a slow α wave pattern showing decreased frequency to 10.50 ± 0.5 Hz and significantly ($P \leq 0.05$) high amplitude of 17.10 ± 2.94 μV, as compared to the waves for the PE and PA conditions. The low frequency and high amplitude waves

were associated with spindle burst. At 5 min, the slow α wave pattern intensified with significant (P≤0.05) increase in frequency to 13.50 ± 0.95 Hz and amplitude decreased to 12.78 ± 1.73 μV with the presence of spindle burst, as compared to the wave pattern at 1 minute. The EEG pattern at 10 minutes revealed that the frequency of waves increased significantly (P≤0.05) to 19.00 ± 1.29 Hz and amplitude decreased further to 6.50 ± 0.70 μV as compared to the wave patterns of 1 and 5 min. At 15 min, the frequency of waves further increased significantly (P≤0.05) to 26.00 ± 1.73 Hz compared to the wave patterns of 1 and 5 min showing fast β activity with decreased amplitude of 8.48 ± 1.80 μV. As depicted in Fig. 1, the spindle bursts at 10 and 15 min recordings disappeared from the β wave pattern.

Table 1. Electroencephalographic attributes of goats at two dose rates of Propofol induction

Parameter \ Time interval		Pre-experimental	Pre-anesthetic	Minutes after propofol induction			
				1	5	10	15 (n = 3)
Frequency (per second)	Low dose	21.50^{cd} ± 2.50	18.50^{c} ± 1.70	10.50^{a} ± 0.5	13.50^{b} ± 0.95	19.00^{c} ± 1.29	26.00^{cd} ±1.73
	High dose	21.50^{c} ± 2.06	16.50^{bc} ± 2.21	14.00^{ab} ± 1.41	8.25^{a} ± 1.31	9.50^{a} ± 0.95	12.00^{ac} ±0.00
Overall Mean ± SE		21.50^{a} ± 2.12	17.50^{b} ± 1.90				
Amplitudes (μV)	Low dose	8.77^{a} ± 2.12	11.70^{b} ± 2.50	17.10^{b} ± 2.94	$12.78^{b}{}_{x}$ ± 1.73	$6.5^{a}{}_{x}$ ± 0.70	8.48^{a} ± 1.80
	High dose	9.49^{a} ± 1.51	15.02^{b} ± 6.00	10.06^{a} ± 1.79	$20.31^{b}{}_{y}$ ± 0.85	$14.25^{b}{}_{y}$ ± 2.16	10.15^{a} ± 1.57
Overall Mean ± SE		9.13 ± 1.59	13.36 ± 4.35				

*Means with different superscripts differed significantly (P≤0.05) in a row while means with different subscripts differed significantly (P≤0.05) in a column within a parameter

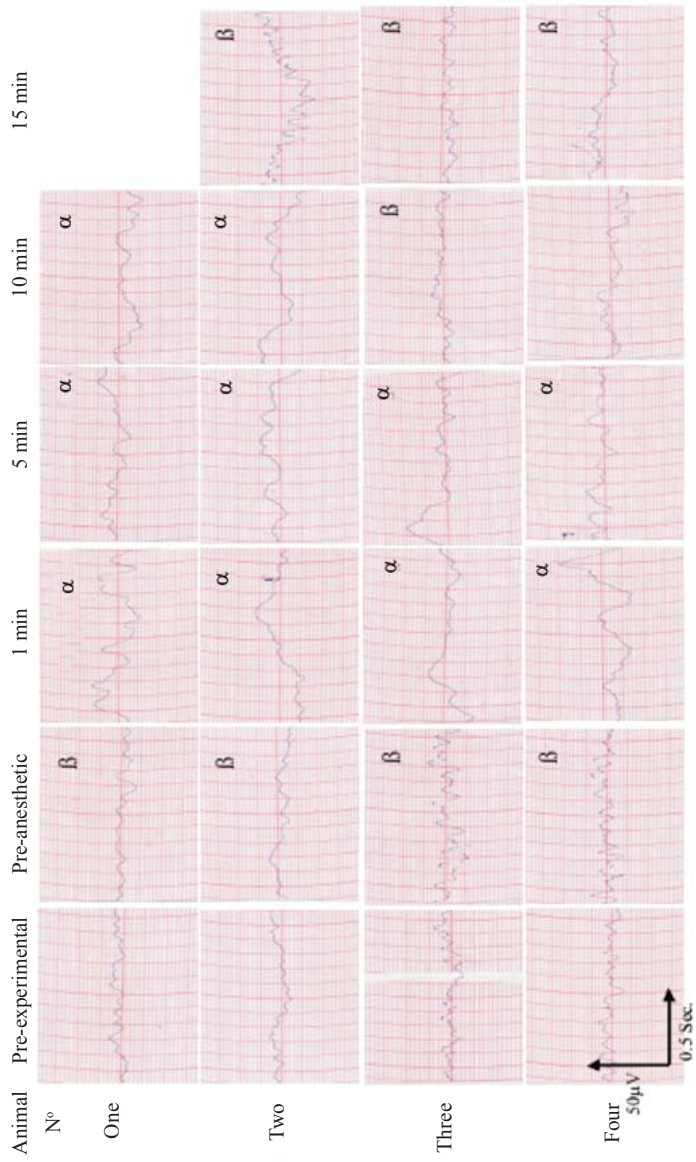

Fig. 1. Electroencephalographic tracings of four goats at various time intervals after induction of propofol anesthetic at lower dose

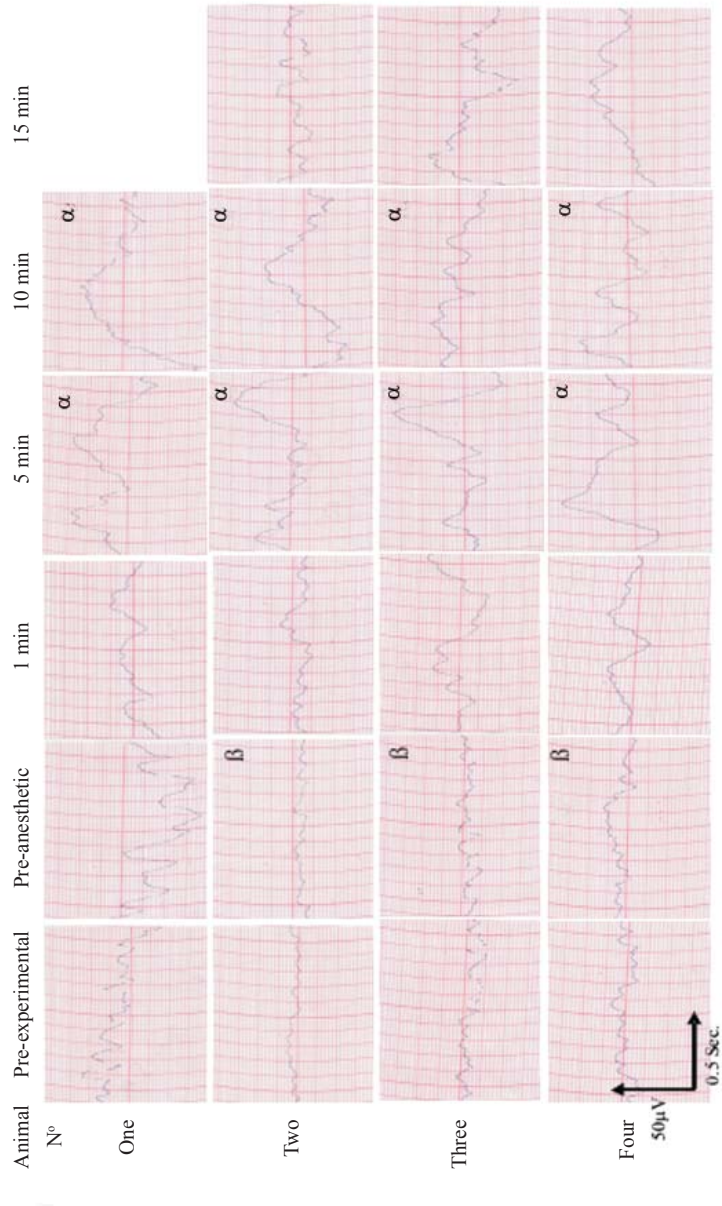

Fig. 2. Electroencephalographic tracings of four goats at various time intervals after induction of propofol anesthetic at higher dose

Table 2. Electrocardiographic attributes of goats at two dose rates of Propofol induction

Parameter \ Time interval		Pre-experimental	Pre-anesthetic	1 minute	5 minutes	10 minutes	15 minutes
Heart rate (per minute)	Low dose	79.81^{a} ± 5.50	117.14^{b} ± 7.21	130.15^{b} ± 12.27	113.40^{b} ± 2.76	99.73^{ab} ± 6.28	NA$^{\$}$
	High dose	87.66^{a} ± 9.74	124.49^{bd} ± 2.42	167.2^{bcd} ± 30.51	135.42^{ad} ± 24.79	113.47^{ad} ± 10.30	113.45^{ac} ± 3.73
P Wave amplitude (mV)	Low dose	0.055 ± 0.003	0.057 ± 0.011	0.070 ± 0.014	0.071 ± 0.017	0.064 ± 0.014	NA$^{\$}$
	High dose	0.036 ± 0.016	0.048 ± 0.007	0.061 ± 0.011	0.065 ± 0.010	0.07 ± 0.006	0.052 ± 0.002
T Wave amplitude (mV)	Low dose	0.06 ± 0.097	0.06 ± 0.136	0.13 ± 0.060	0.135 ± 0.056	0.15 ± 0.072	NA$^{\$}$
	High dose	0.12 ± 0.081	0.16 ± 0.048	0.15 ± 0.066	0.29 ± 0.171	0.19 ± 0.086	0.22 ± 0.029
RR Interval (seconds)	Low dose	0.76^{c} ± 0.050	0.51^{ab} ± 0.028	0.47^{a} ± 0.037	0.53^{ab} ± 0.012	0.60^{b} ± 0.040	NA$^{\$}$
	High dose	0.70^{b} ± 0.064	0.48^{a} ± 0.009	0.39^{ac} ± 0.059	0.48^{ab} ± 0.074	0.54^{ab} ± 0.049	0.53^{bc} ± 0.017
PR Interval (seconds)	Low dose	0.08 ± 0.006	0.07 ± 0.004	0.07^{a} ± 0.002	0.08^{b} ± 0.0008	0.07 ± 0.0008	NA$^{\$}$
	High dose	0.08 ± 0.004	0.08 ± 0.002	0.06 ± 0.010	0.07 ± 0.008	0.08 ± 0.010	0.09 ± 0.004
ST Segment (seconds)	Low dose	0.18 ± 0.010	0.15^{a} ± 0.014	0.16 ± 0.028	0.19^{b} ± 0.005	0.20^{b} ± 0.012	NA$^{\$}$
	High dose	0.17 ± 0.014	0.15 ± 0.008	0.12 ± 0.029	0.14 ± 0.041	0.17 ± 0.020	0.16 ± 0.016
QRS Interval (seconds)	Low dose	0.04 ± 0.001	0.04 ± 0.001	0.04 ± 0.001	0.04 ± 0.002	0.04 ± 0.002	NA$^{\$}$
	High dose	0.04 ± 0.001	0.04 ± 0.002	0.04 ± 0.002	0.04 ± 0.002	0.04 ± 0.002	0.04 ± 0.005
QT Interval (seconds)	Low dose	0.32^{a} ± 0.005	0.29^{b} ± 0.013	0.28 ± 0.020	0.31 ± 0.007	0.33^{a} ± 0.004	NA$^{\$}$
	High dose	0.30 ± 0.011	0.27^{a} ± 0.002	0.25 ± 0.027	0.27 ± 0.030	0.29 ± 0.017	0.30^{b} ± 0.007
R Wave amplitude (mV)	Low dose	-0.13 ± 0.115	-0.16 ± 0.141	-0.15 ± 0.097	-0.15 ± 0.121	-0.16 ± 0.126	NA$^{\$}$
	High dose	-0.13 ± 0.093	-0.12 ± 0.124	-0.11 ± 0.107	-0.38 ± 0.310	-0.11 ± 0.079	-0.08 ± 0.099

$^{\$}$ -The records for this interval could not be obtained as animal rose. *Means with different superscripts differed significantly (P≤0.05) in a row. At 15 min, the low and high dose had n = 2 and n = 3, respectively.

Table 3. Respiratory attributes of goats at two dose rates of Propofol induction

Parameter \ Time interval		Pre-experimental	Pre-anesthetic	1 minute	5 minutes	10 minutes
Rate (per minute)	Low dose	20.25 ± 2.56	18.00_{x} ± 1.22	16.5_{x} ± 1.94	16.5 ± 1.93	17.25 ± 1.43
	High dose	26.25 ± 1.88	26.25_{y} ± 2.25	25.50_{y} ± 1.50	19.50 ± 2.87	22.00 ± 2.29
Tidal volume (mL)	Low dose	37.36_{x} ± 3.85	40.30_{x} ± 5.07	50.08 ± 12.99	50.45_{x} ± 9.36	41.37_{x} ± 6.02
	High dose	21.06^{a}_{y} ± 2.44	12.29^{b}_{y} ± 2.14	27.37^{a} ± 8.26	13.50^{b}_{y} ± 2.24	18.74^{b}_{y} ± 2.36

*Means with different superscripts differed significantly (P≤0.05) in a row while means with different subscripts differed significantly (P≤0.05) in a column within a parameter.

At the higher dose of Propofol induction, at 1 min, the EEG pattern changed from desynchronized β waves (PE and PA condition) to a low β wave pattern of decreased frequency of 14.00 ± 1.41 Hz and amplitude of 10.06 ± 1.79 μV and was associated with low spindle burst and clear appearance of sensorimotor rhythm (SMR). At 5 min, the intensity of spindle burst increased with significant (P≤0.05) decrease in frequency to 8.25 ± 1.31 Hz and increase in amplitude to 20.31 ± 0.85 μV as compared to 1 min wave pattern indicating the appearance of slow α wave pattern. The EEG pattern at 10 min showed decreased intensity of spindle burst with slight increase in frequency to 9.50 ± 0.95 Hz and decrease in amplitude to 14.25 ± 2.16 μV as compared to 5 min. At 15 min, the frequency of waves further increased to12.00 ± 0.00 Hz and amplitude decreased to 10.15 ± 1.57 μV with decreased intensity of spindle burst as depicted in fig. 2. The righting reflex was observed as an α wave pattern formed at both the dose rates. Ear scratching and ataxia was observed at both the dose rates initially, for a few steps. but thereafter the goats assumed normal gait.

The ECG attributes at different periods of the low and high dose trials are presented in Table 2. No significant difference in the heart rate was observed between the PE values of both dose trials. With the injection of Glycopyrrolate (PA), the average heart rate of the goats in both dose trials significantly (P≤0.05) increased. At 1 min post induction of Propofol, the heart rate increased further, with more extent in the higher dose trial. The difference between the two groups was non-significant and was probably due to one goat, showing severe tachycardia at the higher dose, thereby increasing the standard error within the group. At five minutes post induction, the heart rate decreased and the decrease was more pronounced in the low dose trial than in the high dose trial, indicating a faster

recovery. At 10 minutes post- induction, the heart rate further decreased. The heart rate was not significantly different between two dose trials during any of the time periods.

The RR interval decreased with the injection of Glycopyrrolate and also with induction of Propofol at 1, 5 and 10 minutes at the lower dose and 1 minute at the higher dose. The RR interval showed significant differences ($P \leq 0.05$) at various time intervals. The PR interval only showed a significant difference ($P \leq 0.05$) between 1 and 5 minutes post-induction at the lower dose, whereas at all other intervals the differences were non-significant. At the higher dose rate, no significant differences could be observed at any of the time intervals. The QT interval decreased significantly ($P \leq 0.05$) with the injection of Glycopyrrolate but did not showed any significant difference post induction of Propofol at lower dose. However, at the higher dose rate, the QT interval increased significantly ($P \leq 0.05$) at 15 minutes post induction of Propofol, compared to post Glycopyrrolate injection. The QRS interval did not show any significant difference at either dose rate and all time intervals. The ST segment decreased with Glycopyrrolate injection whereas it increased with induction of Propofol. The changes were significant ($P \leq 0.05$) only between post Glycopyrrolate, 5 minutes and 10 minutes post induction at the lower dose. At the higher dose rate, the changes observed were non-significant at all the time intervals. The P and T wave amplitudes were affected non-significantly by Glycopyrrolate or Propofol induction at either of the dose rates throughout the course of experiment. T waves were found to be inverted in two of the four goats at the lower dose, while they were inverted in three of the four goats at the higher dose. The R wave amplitude did not show any significant changes throughout the course of study. R waves were observed to be inverted for both the dose rates and at all the time intervals.

The respiratory attributes of the goats for both the dose rates are presented in Table 3. No significant difference was observed in respiratory frequency and tidal volume between PE and PA conditions at the lower dose. However, at the higher dose rate, the tidal volume decreased significantly ($P \leq 0.05$). The respiratory rate decreased steadily until 5 minutes post induction of Propofol at the low dose rate, while at the high dose rate the decrease was not as steady. The volume at the low dose rate increased for 5 minutes, while at the high dose rate the volume did not increase steadily and showed an initial decline after Glycopyrrolate induction. Apnea was observed in all the goats on Propofol induction, and these periods were ignored while calculating respiratory frequency and tidal volume. The period of apnea ranged from 65 seconds to 314 seconds. At 1 minute post induction there was an increase in the respiratory volume to PE value but thereafter it decreased again until 10 minutes for both the dose rates. The erratic response of respiratory volumes to Propofol induction indicated that the higher dose rate was more stressful to the goats.

Discussion

The desynchronized β wave pattern at the pre-experimental (PE) period was observed during both the dose trials, indicating the goats' active, busy or anxious state. Glycopyrrolate injection during both the trials decreased the frequency to the range of 16-18 Hz, which was closer to the wave pattern of sensorimotor rhythm (SMR). The beginning of SMR has been shown to be associated with physical stillness and bodily presence.

The low dose of Propofol after one minute induced low frequency and high amplitude α waves associated with spindle burst, indicating a non-arousal relaxed state or the induction of light sleep. It confirms findings that a quick response is elicited in goats (CARROLL et al., 1998). At 5 minutes, the α waves changed to a β wave pattern with spindle burst, which designate the clear appearance of SMR. This EEG pattern may be associated with light sleep, physical stillness and body presence. The disappearance of spindle burst with distorted β waves of increased frequency and low amplitude suggested the recovery of animal to an anxious or conscious state at 15 minutes post-induction. A quick recovery after 15 minutes of induction was observed. A similar report of rapid onset, distribution (1.8-8.3 minutes) and metabolic elimination (30-64 minutes) has been observed in humans (RONAN et al., 1995).

The high dose of Propofol after one minute reduced both frequency and amplitude and was associated with low spindle burst, indicating the clear appearance of the slow β waves of SMR. This EEG pattern may be associated with light sleep, physical stillness and body presence one minute after high dose induction. At 5 minutes, the β wave pattern with high spindle burst indicated a non-arousal relaxed state. At 10 minutes, the low amplitude β wave pattern with low spindle burst indicated a relaxed state, whereas, the disappearance of spindle burst at 15 minutes, with further increase in frequency and low amplitude, suggested a relaxed, alert state of consciousness. This indicated a slower recovery at the higher dose rate as compared to the low dose rate.

At none of the time intervals or dose rates did the animals show EEG frequencies slowing to the extent of exhibiting anaesthesia. This indicated that, at these two dose rates, surgical anaesthesia cannot be induced in goats. This may have been due to the fact that there was constant noxious stimulation, due to the electrocardiographic electrodes and mouth and nose coverage, with covers for spirometric recordings. It has been suggested that with noxious stimulation, the electroencephalographic response of the animal changes (ORTH et al., 2005). The quick metabolism of Propofol facilitated earlier recovery at the lower dose as compared to the higher dose. The increase in wave amplitude was concomitant with a decrease in frequency on recovery. An increase in the frequency pattern can be used as an indicator of imminent recovery from anaesthesia by a clinician, as the righting reflex was

observed soon after. The exhibition of ataxia suggests depression of the nervous system while ear scratching suggests involvement of the middle or inner ear.

The various electrocardiographic parameters recorded at the pre-experimental interval were found to be within normal range (MOHAN et al., 2005). With the injection of Glycopyrrolate and Propofol there was immediate and significant ($P \leq 0.05$) increase in the heart rate, with a decrease in the RR interval indicating that both the drugs had positive chronotropic effects. Propofol has been reported to cause haemodynamic instabilities, primarily hypotension and bradycardia (MYLES et al., 1997). In the present study, a decreased ST segment and QT interval, no change in the QRS complex interval and no significant change in the PR interval indicate shortening of the systolic phase of the cardiac cycle. No change in P and T wave amplitude indicates that neither the atrial depolarization nor the ventricular repolarization was affected by the induction of Glycopyrrolate or Propofol. This is contrary to earlier reports, in which Propofol inhibited calcium influx into myocytes, resulting in decreased cardiac contractility and decreased arterial pressure (CHANG and DAVIS, 1993; HEBBAR et al., 1996; YAMAKAGE et al., 1995). It has also been reported that the heart rate is less likely to increase with Propofol (BENSON, 1997). As the heart rate was not significantly different between the two groups at any of the time intervals, it can be safely said that with an increase in the dose rate, the heart rate is not much affected. The induction of anaesthesia using Propofol can lead to marked reductions in mean arterial pressure and heart rate (LISCHKE et al., 1993) at 1.5 mg/kg in humans with coronary heart disease. Our results are in contrast to earlier reports, in which bradycardia has been observed. This may have been due to the fact that we did not support the subjects with artificial respiration, while earlier researchers have usually provided artificial respiration when Propofol has been given.

Propofol is a potent respiratory depressant and apnea is common upon induction, unless the drug is given slowly, especially if it is given by itself (BENSON, 1997). Minute ventilation, tidal volume, mean inspiratory flow rate and functional residual capacity are all decreased during the use of Propofol (MIRENDA and BROYLES, 1995). In humans, the end-expiratory volume was found to be decreased upon the induction of anaesthesia with both thiopentone and Propofol, with more extent in the latter, though not significantly different from each other (RUTHERFORD et al., 1994). Our observations are consistent with these findings. Respiratory activity was affected by Propofol induction. Rapid recovery is its main advantage (GIUSEPPE et al., 2000) whereas the high incidence of apnea and blood pressure reduction are the major disadvantages. This indicates that respiratory support is essential when using Propofol as an induction agent in goats.

Thus, Propofol at these two doses induces apnea and tachycardia in goats. Propofol at the dose rate of 0.4 mg/kg in goats has been found insufficient to induce analgesia for short periods of painful manipulation. However, at the dose rate of 0.5 mg/kg it could be used,

along with pre-anaesthetics, maintenance of respiratory function and close monitoring of cardiac functions in goats. It could be used as an induction agent and to maintain unconsciousness for short interventions, such as bronchoscopy, but with caution. With Propofol as the sole anesthetic agent, apnea occurs at doses required to prevent movement in response to painful manipulation.

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SAŽETAK

Istraživane su elektroencefalografske, elektrokardiografske i spirometrijske promjene uzrokovane propofolom u četiri zdrave koze u dobi od 10 do 14 mjeseci, mase od 9 do 12 kg. Propofol im je bio primijenjen intravenski u malim (0,4 mg/kg tjelesne mase) i većim (0,5 mg/kg tjelesne mase) dozama. Rezultati elektroencefalografije pokazali su da se pri izazvanoj anesteziji obrazac β vala promijenio u α valove u tijeku jedne minute. Obrasci α vala nastavili su se tijekom 5 do 6 minuta kod primjene male doze (0,4 mg/kg tjelesne mase) dok su kod primjene veće doze (0,5 mg/kg tjelesne mase) trajali 12 do 13 minuta. Kod primjene manje doze oporavak se mogao očekivati nakon pet minuta s povratkom EEG obrasca s α na β val, dok je kod većih doza α val trajao do 15 minuta. Pojava refleksa dizanja bila je zapažena nakon nestanka α valova. Učestalost srčanih otkucaja povećala se kod primjene obiju doza tijekom prvih pet minuta, a smanjila se nakon 10 i 15 minuta. Negativan T val bio je ustanovljen u dvije koze kod primjene manje doze, dok je kod primjene veće doze on bio ustanovljen u tri koze. Jedna koza koja je dobila veću dozu pokazivala je tahikardiju s ektopičnim otkucajima od pete do sedme minute nakon indukcije. Apneja se prosječno javljala tijekom prvih 30 sekundi kod primjene manje doze, a tijekom 42 sekunde kod primjene veće doze. U jedne koze apneja je pri primjeni veće doze bila zabilježena tijekom 314 sekundi. Toj je kozi za buđenje dano umjetno disanje nakon 106 sekundi te ponovljeno nakon 296 sekundi. Životinje su pokazivale težak dišni poremećaj s trbušnim disanjem u tijeku prvih nekoliko sekundi. Vrijednosti su se vratile na normalu nakon 15 minuta. Rezultati pokazuju da propofol smanjuje dišnu aktivnost u koza te je nužno primijeniti ventilaciju s pozitivnim tlakom. On ne dovodi do gubitka osjeta boli te treba primijeniti analgetike.

Ključne riječi: propofol, anestezija, koza, elektroencefalografija, elektrokardiografija, disanje