Evaluation of Atropine as an Anticholinergic in Buffalo Calves (*Bubalus bubalis*)

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ABSTRACT: Twelve experimental trials were undertaken on clinically healthy male buffalo calves. Atropine was administered @ 0.04 mg/kg, IM. Atropine produced ataxia in all the animals. Muzzle, mouth and nostrils became dry at 37.5±4.924 minute and again became wet at 246.3±28.00 minute of its administration. No analgesia was observed. Heart rate, pulse pressure and mean arterial pressure increased significantly without any significant variations in central venous pressure.

Key words: Atropine, Anticholinergics, Buffalo.

INTRODUCTION - Preanaesthetic drugs are administered to minimize pain, remove apprehension, and facilitate handling of animal and to minimize undesirable sympathetic and parasympathetic reflex activity. Atropine blocks cardiac vagus and thus inhibits cardiac inhibitory effect of α₂-adrenocepter agonists. The study was planned with the objective to evaluate the efficacy and safety of atropine and as an anticholinergic in buffalo calves.

MATERIAL AND METHODS - Twelve experimental trials were undertaken on clinically healthy male buffalo calves of 6 to 18 months of age and weighing 70 to 105 kg. Atropine was administered @ 0.04 mg/kg, IM. Each animal was weighed a day before the experiment and had free access to feed and water. Following protocol of experiment was followed:

| Groups (n=number of animals) | Drugs used | Parameters investigated |
|------------------------------|------------|-------------------------|
| I (n=6)                     | Atropine   | Behavioural changes, rectal temperature, heart rate, respiration rate, haemoglobin (Hb), packed cell volume (PCV), erythrocyte sedimentation rate (ESR), blood/plasma glucose, cholesterol, urea nitrogen, creatinine, total proteins, albumin, calcium, inorganic phosphorus, magnesium, sodium, potassium, chloride, serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALKP) and bilirubin |
| II (n=6)                    | Atropine   | Systolic pressure, diastolic pressure, pulse pressure, mean arterial pressure (MAP), central venous pressure (CVP) and electrocardiogram |
The parameters were investigated at various time intervals after administration of drug as shown in different tables. The statistical analysis of data was done by one-way-analysis of variance and Duncan’s multiple range test (Duncan, 1955).

**RESULTS AND CONCLUSIONS** - All the animals became ataxic at 18±3.33 minute of atropine administration. All the animals remained standing throughout the experiment except one which went to sternal recumbency by 121 minute but was active with head held up. Five buffalo calves urinated while defaecation was noticed in one calf only. There was no cutaneous analgesia. Muzzle, mouth and nostril became dry at 37.5±4.924 minute and again become wet at 246.3±28.00 minute. Animals recovered from the effect of atropine by 180±29.290 minute of atropine administration with heart rate near normal. The effects of atropine administration on rectal temperature and respiration rate are shown in table 1.

| Parameters (Units) | Before administration of drug | At its peak effect | At recovery from effect of drug | 24 hours after administration of drug |
|--------------------|--------------------------------|--------------------|---------------------------------|-------------------------------------|
| Rectal Temperature (°C) | 37.76±0.409 | 37.90±0.365 | 37.88±0.328 | 37.85±0.395 |
| Respiration rate (per minute) | 21±5 | 23±5 | 18±4 | 14±2 |

Means with different superscript vary significantly (p<0.05).

No significant variation was found in any of the parameter.
The effect of atropine administration on Hb, ESR and PCV are shown in table 2.

| Parameters (Units) | Before administration | At its peak effect | At recovery from effect of drug | 24 hours after administration of drug |
|--------------------|-----------------------|--------------------|---------------------------------|-------------------------------------|
| Haemoglobin (g/dl) | 10.8±0.403 | 10.00±0.465 | 10.1±0.490 | 10.50±0.428 |
| Erythrocyte sedimentation rate (mm per hour) | 44±11.845 | 46±9.103 | 47±10.229 | 45±10.104 |
| Packed cell Volume (%) | 31±3.774 | 30±3.280 | 31±2.986 | 30±2.863 |

Means with different superscript vary significantly (p<0.05).
There was no significant change in any of the haematological parameter. The effects of atropine administration on blood glucose, total plasma proteins, BUN, plasma creatinine, plasma cholesterol, albumin, calcium, phosphorus, magnesium, sodium, potassium, chloride, bilirubin, SGOT, SGPT and alkaline phosphatase are shown in Table 3.

Table 3. Effects of IM administration of atropine on blood biochemical parameters in buffalo calves. Table showing arithmetic mean of values obtained before and at various intervals after its administration. Mean values are presented here with (±) their respective standard errors (n=6).

| Parameters (Units) | Before administration | At its peak effect | At recovery from effect of drug | 24 hours after administration of drug |
|--------------------|-----------------------|--------------------|---------------------------------|--------------------------------------|
| Blood glucose (mg/dl) | 62.51±6.329 | 65.70±6.102 | 61.73±7.180 | 50.63±4.246 |
| Cholesterol (mg/dl) | 50.75±5.756 | 48.36±4.582 | 44.46±3.959 | 48.10±5.730 |
| BUN (mg/dl) | 24.52±3.334 | 24.74±3.847 | 25.33±4.272 | 25.31±3.698 |
| Creatinine (mg/dl) | 2.25±0.207 | 2.36±0.151 | 2.34±0.102 | 2.31±0.116 |
| Total proteins (g/dl) | 6.25±0.135 | 6.00±0.117 | 5.81±0.386 | 5.76±0.541 |
| Albumin (g/dl) | 3.48±0.057 | 3.54±0.086 | 3.46±0.083 | 3.47±0.110 |
| Calcium (mg/dl) | 4.33±0.766 | 4.26±0.845 | 3.88±0.880 | 5.00±1.33 |
| Phosphorus (mg/dl) | 5.80±0.889 | 5.20±0.549 | 5.42±0.624 | 6.01±0.583 |
| Magnesium (mg/dl) | 2.46±0.080 | 2.46±0.033 | 2.45±0.054 | 2.49±0.068 |
| Sodium (mmol/l) | 114.75±9.839 | 120.26±9.979 | 115.95±9.063 | 120.06±8.972 |
| Potassium (mmol/l) | 3.93±0.337 | 3.71±0.276 | 3.88±0.162 | 3.48±0.190 |
| Chloride (mmol/l) | 102.80±0.775 | 102.14±2.38 | 105.69±3.00 | 100.89±2.15 |
| Bilirubin (mg/dl) | 0.32±0.128 | 0.37±0.102 | 0.35±0.115 | 0.32±0.102 |
| SGOT (U/l) | 39.07±3.221 | 36.76±4.176 | 44.90±3.896 | 42.24±2.350 |
| SGPT (U/l) | 25.11±3.677 | 23.43±1.983 | 22.15±1.370 | 21.72±1.963 |
| ALKP (U/l) | 85.50±9.01 | 87.50±8.02 | 84.33±6.92 | 80.6±7.718 |

Means with different superscript vary significantly (p<0.05).

There was no significant change in any of the parameters. However, the blood glucose was on lower side at 24 hour after drug administration (50.60±4.246 mg/dl) as compared to base value (62.90±6.329 mg/dl).

The effect of atropine on heart rate, pulse pressure, mean arterial pressure and central venous pressure are shown in Table 4.

There was a significant increase in heart rate (52±2 beats per minute) after 5 minute of atropine administration as compared to base value (43±1 beats per minute). The heart rate increased gradually and remained higher than the base value throughout the entire period of observation. Kumar (1977) observed similar findings in goats. Pablo et al. (1995) also found a significant increase in heart rate by atropine administration in goats. Atropine blocks transmission of vagal impulses to the heart, thus causes tachycardia.

Mean arterial pressure increased significantly (156.00±2.129 mm Hg) at 10 minute and
(155.66±1.584 mm Hg) at 30 minute after atropine administration as compared to base value (147.00±1.843 mm Hg). There was no significant variation in pulse pressure after atropine administration except at 10 minute (9.00±1.125 mm Hg) and at 15 minute (6.83±0.833 mm Hg) where the value increased significantly as compared to base value (3.33±0.666 mm Hg). The CVP increased significantly to 7.17±1.134 cm water at 5 minute of atropine administration from base value of 4.25±0.406 cm water which decreased significantly to 1.98±0.110 cm water at 15 minute post atropine administration. These fluctuations were of no clinical significance. However, Kumar (1977) found that mean arterial blood pressure was not significantly affected after atropine administration in goats. No variation in time and voltage function of ECG was seen after atropine administration. Primary T-wave changes can be related to variation in cardiac contractibility and myocardial oxygenation that usually occurs in such circumstances as animals were not on a ventilator.

From the present study, it was concluded that atropine induced tachycardia and antisialagogic activity in buffalo calves.

Table 4. The effect of IM administration of atropine on heart rate, systolic pressure, diastolic pressure, pulse pressure, mean arterial pressure and central venous pressure. Table showing arithmetic mean of values obtained before and at various intervals after its administration. Mean values are presented here with (±) their representative standard errors (n=6).

| Parameters                  | Base          | 5 min | 10 min | 15 min | 30 min | 45 min | 60 min |
|-----------------------------|---------------|-------|--------|--------|--------|--------|--------|
| (Units)                     | (beats per minute) | 43d±1 | 52c±2 | 54c±1 | 54c±2 | 64b±3 | 83a±2 | 89a±3 |
| Systolic pressure           | (mm Hg)       | 151.00b±2.236 | 151.33b±3.955 | 162.00a±2.250 | 152.33b±2.027 | 158.00±2.476 | 155.00ab±1.125 | 153.00b±1.527 |
| Diastolic pressure          | (mm Hg)       | 144.66d±1.605 | 146.33±3.955 | 153.00b±2.250 | 146.00c±2.027 | 153.66a±1.584 | 151.66abc±0.614 | 147.33bcd±1.429 |
| Pulse pressure              | (mm Hg)       | 3.33c±0.666 | 5.00b±0.683 | 9.00a±1.125 | 6.83ab±0.833 | 5.66bc±0.614 | 3.33c±0.666 | 4.33bc±1.085 |
| Mean arterial pressure      | (mm Hg)       | 147.00b±1.843 | 148.33b±3.402 | 156.00a±2.129 | 148.33b±2.155 | 155.66a±1.584 | 152.66ab±0.843 | 148.33b±1.085 |
| Central venous pressure     | (cm water)    | 4.25b±7.17a | 4.85b±4.85b | 1.98c±5.03b | 1.98c±5.03b | 3.18bc±1.843 | 3.23bc±1.085 | 3.23bc±1.085 |

Means with different superscript vary significantly (p<0.05).

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