Oxytocin Administration and Its Effect on Milk Yield and Composition of Karadi Ewes

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ABSTRACT

This paper described the effect of various doses of oxytocin (0, 1, 5 and 10 IU), injected intramuscularly, on milk yield and milk composition in Karadi ewes. Twelve Karadi ewes were injected intravenously with 1 IU synthetic oxytocin and hand-milked to empty their udders. After 12 h, the procedure was repeated using the different doses of oxytocin in 1 mL sterile saline solution intramuscularly. As the dose of oxytocin injected to ewes increased, a significantly (P<0.05) more milk was obtained compared to control. However, the maximum increase in milk yield (62.5%) was attained by ewes injected with 10 IU oxytocin. Treatment had no effect on the composition of milk. It is concluded that 10 IU of oxytocin, injected intramuscularly, is adequate to obtain maximum milk withdrawal.

Keywords: Oxytocin; milk yield; composition; Karadi

INTRODUCTION

The Karadi, comprises about 18-20% of the Iraq's sheep population, is native to the northeastern mountains, villages and dry farming plains of the Kurdistan region of Iraq (Alkass and Juma, 2005). Milk production of the ewe is an important component of maternal environment and contributes to early lamb growth (Morgan et al., 2000). Additionally, sheep milk is widely used in the Mediterranean, Balkan and Middle east regions for making dairy products.

Several methods of estimating ewe milk production such as weigh-suckle-weigh, hand milking, hand milking after oxytocin injection and machine milking have been reported (Benson et al. 1999; Cardellion and Benson, 2002; Band et al. 2006; Baker et al., 2009). Previously, the first two methods have been employed in Karadi ewes, however, the milk yield based on hand milking represent only about 45% of the potential of the ewe (Baker et al., 2009).

Therefore, the aim of this work was to investigate the effect of injecting different doses (0, 1, 5, 10 IU) of oxytocin on milk yield and composition of Karadi ewes.

MATERIALS AND METHODS

This experiment was conducted at Animal Farm, School of Animal Production, Faculty of Agriculture and Forestry, University of Duhok, where twelve Karadi ewes aged 3-5 years were allocated to four treatment groups (0, 1, 5, 10 IU oxytocin). After being separated from their lambs, the ewes were injected intravenously with 1 IU synthetic oxytocin (KOBORO B.V; 10 IU/mL) and milked immediately by hand milking. After the first milking, the ewes were returned to their paddock, while their lambs were kept in separate pen, out of sight from their mothers. After 12h the procedure was repeated using 0, 1, 5, and 10 IU oxytocin in 1 ml sterile saline solution intramuscularly. The milk output at the second milking was recorded using a graduated cylinder and samples collected for determination milk constituents. The milking procedure was carried out every second day for 8 days. On each day, the dose of oxytocin allocated to each ewe varied according to a double Latin Square experimental design. On the same test-day, milk samples were immediately analyzed by EKO MILK TOTAL (Eon Trading LLC, U.S.A.) to determine the fat, protein, lactose, solid not fat and total solid.

Least square analysis of variance was used for statistical analysis of the milk output and composition (SAS, 2002). The module included effects due to animals, days and treatments, and effects were assumed to be significant at P=0.05. The effects of the different oxytocin doses were tested by Duncan multiple test (1955).

RESULTS

The overall mean of total milk yield, fat, protein, solid non fat, lactose and total solids were 229.10 ml, 5.06, 5.42, 10.76, 4.48 and 15.81%, respectively. It appears from the results presented in Table 1 that as the dose of oxytocin injected to ewes increased, a significantly (P<0.05) higher milk was obtained compared to control. However, the maximum increase in milk yield (62.5%) was attained by ewes injected with 10 IU oxytocin. The treatments did not affect the composition of the milk except fat was increased numerically in ewes injected with 10 IU oxytocin.
In the present study, milk production increased when ewes were injected with oxytocin. These results are in agreement with Bencini et al. (1992), and Bencini, (1995) who reported that ewes injected with oxytocin released significantly more milk than control ewes. Also, an increase in milk production was found when exogenous oxytocin was injected in dairy cattle (Ballou et al., 1993; Knight, 1994) and buffalo (Akhtar et al., 2012). Similarly, when milk yield was determined using either weight suckling weight (WSW) and oxytocin + hand milking (O+HM) methods, Unal et al. (2007) demonstrated that ewes injected with oxytocin+HM yielded significantly higher milk than those WSW.

Although, it seems from the results that milk yield was increased with the different doses of oxytocin, yet the higher dose (10 IU) is required to achieve the highest yield of milk. Also, Doney et al. (1979) reported that when injected intravenously, the dose must be greater than the physiological level. However, in contrast to this, Bencini (1995) indicated that a higher intramuscular dose was not required to achieve the effect, and 1 IU even when injected intramuscularly, is adequate to obtain milk withdrawal.

Oxytocin influences milk production by reducing intra-alveolar pressure, reducing the presence of the feedback inhibitor of lactation from around the alveoli, and re-establishing normal mammary blood flow. Moreover, the presence of a proper milk ejection reflex during milking is a crucial factor for obtaining alveolar milk that is rich in total solids. Oxytocin affects milk production due to better milk transfer within the mammary gland and direct stimulatory effect on mammary metabolism (Lollivier et al., 2002). In addition to the beneficial effect of oxytocin on milk production and milk quality due to better milk transfer within the mammary gland, oxytocin could also have a direct stimulatory effect on mammary metabolism (Lollivier et al., 2002).

There is no effect of oxytocin administration on all milk composition. Also Bencini (1995) reported that oxytocin did not affect the composition of the milk, except the highest dose of 10 IU, which significantly (P<0.05) increased fat concentration, and noted that it was important to determine the minimum amount of oxytocin needed for milk ejection while avoiding changes in milk composition that may comprise the results of subsequent experiments.

In conclusion, the oxytocin technique using a dose of 10 IU injected intramuscularly is suitable to induce milk ejection and measure the potential milk production of Karadi sheep.

## REFERENCES


Duncan DB, 1955. Multiple range and Multiple test Biometric, 11:16.


Lollivier V, JG Flamant, MO Bousquet and PG Marnet, 2002. Oxytocin and milk removal: two important

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**Table 1: Yield and composition (%) of the milk (mean ± SE) obtained with different intramuscular oxytocin doses**

<table>
<thead>
<tr>
<th>Traits</th>
<th>Overall mean</th>
<th>0</th>
<th>1</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield (ml)</td>
<td>229.10±18.244</td>
<td>171.0±21.87</td>
<td>225.75±33.26</td>
<td>241.58±40.50</td>
<td>278.08±43.85</td>
</tr>
<tr>
<td>Milk composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>5.06±0.27a</td>
<td>5.01±0.58a</td>
<td>4.41±0.48a</td>
<td>5.31±0.54a</td>
<td>5.47±0.60a</td>
</tr>
<tr>
<td>Solid non fats</td>
<td>10.76±0.18a</td>
<td>10.90±0.42a</td>
<td>10.56±0.47a</td>
<td>11.02±0.22a</td>
<td>10.53±0.31a</td>
</tr>
<tr>
<td>Protein</td>
<td>5.42±0.15a</td>
<td>5.55±0.36a</td>
<td>5.24±0.39a</td>
<td>5.66±0.18a</td>
<td>5.23±0.26a</td>
</tr>
<tr>
<td>Lactose</td>
<td>4.48±0.01a</td>
<td>4.49±0.03a</td>
<td>4.48±0.03a</td>
<td>4.50±0.02a</td>
<td>4.45±0.02a</td>
</tr>
<tr>
<td>Total solid</td>
<td>15.81±0.37a</td>
<td>15.92±0.83a</td>
<td>14.93±0.86a</td>
<td>16.33±0.54a</td>
<td>16.0±0.77a</td>
</tr>
</tbody>
</table>

Within rows, values followed by the same letter are not significantly different at P=0.05