Lactation Performance of Primiparous Holstein Dairy Cows in Early Postpartum Period an affected by feeding Dry glycerol

V. Piri Hoseinabadi¹, F. Kafizadeh¹, H. Karami shabankareh¹

Abstract:
Effects of feeding a dry glycerin product (minimal 65% of food grade glycerol, dry powder) to 20 primiparous Holstein dairy cows (10 control and 10 glycerin supplemented) on milk yield and composition were investigated. Dry glycerin was fed at 250 g/d (corresponding to 162.5 g of glycerol/d) as a top dressing to the common lactating total mixed ration. Study was carried out from parturition to 21 d postpartum. Individual milk was sampled from 3 consecutive milkings weekly and was analyzed for its components. Average milk yield and milk compositions were not affected by dry glycerin supplementation.

Introduction:
As early as the 1950s, glycerol was used to treat ketosis in dairy cows via drenching orally, feeding with concentrates, or both, with a relatively large dose (Johnson, 1951, 1954). Glycerol is an important structural component of triglycerides and phospholipids and it’s glucogenic property of glycerol is well established (Cori and Shine, 1935).
Glycerol can be converted to glucose by the liver (Krebs et al., 1966) and kidneys (Krebs and Lund, 1966) and provides energy for cellular metabolism. In more recent studies (DeFrain et al., 2004; Ogborn, 2006; Chung et al., 2007), glycerol was fed as an energy supplement to holstein dairy cows. Glycerin administered by feeding (DeFrain et al., 2004; Ogborn, 2006; Chung et al., 2007) appeared to be less glucogenic than glycerol that was orally drenched or provided via an esophageal pump (Goff and Horst, 2001;). Oral drenching and esophageal pumping, however, presented tremendous stress to dairy cows, especially in the early postpartum period. Improved overall energy status or energy availability by supplementing glucogenic substrates is beneficial, although it does not always translate into production performance. Not much data are available on the effect of feeding glycerol to primiparous Holstein dairy cows.

The objective of this experiment was to determine the effect of feeding, dry glycerol on milk production and milk composition of primiparous Holstein cows during the first 3 wk of lactation.

Materials and Methods:
Experimental Design and Care of Animals
The results presented here are from a preliminary experiment to study the effect of feeding dry glycerol on milk production and it’s constituents. Twenty primiparous Holstein dairy cows were used in this experiment. Animals were randomly divided in two groups, glycerol supplemented and control. Cows were moved from their maternity pen into a naturally free-stall barn after calving. Cows were milked three times per day at 8-h intervals from parturition to 21 Days after parturition. cows received a common total mixed ration once daily after the morning milking, which was either supplemented (glycerin treatment) with 250 g/d or not supplemented (control treatment) of a dry glycerin product containing a minimum of 65% food grade glycerol (providing 162.5 g of pure glycerol/d) as a top dressing.
The TMR was formulated based on NRC (2001) guidelines for milking Holstein dairy cows weighing 500 kg and producing 30 kg of milk/d with 3.7% of milk fat. The TMR containing 40% forage (corn silage and alfalfa hay) and 60% concentrate (corn, barley, wheat bran, soybean meal, with trace minerals and vitamins mixture) with 56.7% dry mater, 1.64 Mcal/kg net energy for lactation and 15.79% crude protein.

Table 1. Effect of glycerol supplementation on milk yield and milk components

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Glycerol</th>
<th>SEM</th>
<th>Treatment</th>
<th>Week</th>
<th>Treatment×time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows number</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk yield, kg/d</td>
<td>24.05</td>
<td>25.16</td>
<td>0.5</td>
<td>0.4</td>
<td>&lt;0.0001</td>
<td>0.86</td>
</tr>
<tr>
<td>4% FCM¹, kg/d</td>
<td>23.6</td>
<td>23.49</td>
<td>0.51</td>
<td>0.94</td>
<td>&lt;0.0001</td>
<td>0.34</td>
</tr>
<tr>
<td>Fat yield, kg/d</td>
<td>0.93</td>
<td>0.89</td>
<td>0.02</td>
<td>0.56</td>
<td>0.0002</td>
<td>0.25</td>
</tr>
<tr>
<td>Protein yield, kg/d</td>
<td>0.8</td>
<td>0.84</td>
<td>0.02</td>
<td>0.57</td>
<td>&lt;0.0001</td>
<td>0.86</td>
</tr>
<tr>
<td>Lactose yield, kg/d</td>
<td>1.27</td>
<td>1.34</td>
<td>0.02</td>
<td>0.33</td>
<td>&lt;0.0001</td>
<td>0.14</td>
</tr>
</tbody>
</table>

¹) 4% FCM = (0.4 × milk yield) + [15 × (% fat ÷ 100) × milk yield].

Dry glycerin (Phoderush, Phode´ S.A., Albi Terssac, France; NEL =2.6 Mcal/kg of DM) contained 33% ash, <2% glycerin fatty acid esters, <2% water, negligible amounts of salt and methanol, and flavoring substances other than glycerol and was stabilized on a dry mineral carrier.

Dry glycerin fed in the current study was used as a glucogenic supplement to provide additional glucogenic substrates to dairy cows in the early postpartum period; therefore, no adjustment in energy concentration was made. Dry glycerin was fed as a top dressing and hand mixed with TMR. This study was performed at a private dairy farm housing approximately 3000 Holstein Friesian lactating cows located in the Kermanshah province; Iran during the period between Oct. 2010 and Nov. 2010. Cows were housed in free-stall barns provided with shade.

Measurements and Collection of Samples:
Milk from individual cows was sampled once per week from 3 consecutive milking for the first 3 wk of lactation. Milk samples were preserved with potassium dichromate. Milk samples were analyzed for fat, true protein and lactose using infrared spectrophotometry (Fossomatic 4000 Milko-Scan, Foss Electric, Hillerød, Denmark).

Statistical Analysis:
The experiment was conducted as a completely randomized design. Before statistical analysis, daily measurements for milk production were condensed to weekly averages. Data were analyzed as repeated measures using PROC GLM (SAS Institute, 1999).

Result and Discussion:
The milk yield, 4% fat corrected milk and milk components are reported in Table 1. Yield of milk components and 4% FCM was not affected by dry glycerin which is in agreement with recent (DeFrain et al., 2004; Ogborn, 2006; Chung et al., 2007) studies in which glycerol 3 was also fed to early postpartum multipar Holstein dairy cows. There was not a treatment×time response for milk production. Increased production of biofuels has increased the coproduction of glycerol and has led
to a corresponding decline in price projections (Yazdania and Gonzalez, 2007). These dynamics may favor the use of glycerol in rations fed to livestock.

Chung et al (2007) found milk yield tended to increase 3 wk after cessation of feeding, but difference was not statistically significant. In contrast, Bodarski et al (2005) reported milk production of cows fed supplemented glycerol at 300 and 500 ml/day was increased by 14.6 and 12.5 %, respectively, during 10 weeks of lactation. Milk fat content in the present study decreased due to feeding glycerol, although the difference was not statistically significant. Similar result were observed by Ogborn (2006) and Chung et al (2007). However, DeFrain et al (2004) reported a trend toward lower milk fat content of cows fed glycerol versus control cows when used higher levels of glycerol (860 g/day/head).

Results from this study clearly indicate that glycerol is a valuable feed ingredient for lactating dairy cows.

Reference:


ISSN 2072-3875