The effect of combined treatment of propylene glycol and glycerol on the metabolic status of dams and survival of fetuses in prolific ewes.

Tamir Alon, Alexander Rosov, Uzi Moallem

Department of Ruminant Science, Institute of Animal Sciences, Volcani Institute

Pregnancy toxemia (PT) is the most frequent metabolic disorder of ewes in late pregnancy when they carry more than 1 fetus. It has been estimated that the frequency of PT in Afec-Assaf ewes carrying 1 or 2 fetuses is only 0.5%, whereas in similar ewes carrying ≥ 3 fetuses, it is as high as 19%. About 60% of fetal growth takes place in the last trimester of gestation when approximately 33 to 36% of the ewe's circulating glucose is directed to the fetoplacental unit. The use of propylene glycol (**PG**) and glycerol (**GLY**) in livestock has been common since the 1950s. From our previous studies, it appears that PG is a more anti-ketogenic agent, whereas GLY is a pro-glucogenic agent. Moreover, there is no reliable information about the doses required to prevent or treat PT in ewes, and about whether mixing these two materials is more beneficial. Therefore, the objectives of the first study in this project were to determine the effect of various doses and combinations of PG and GLY in increasing glucose and reducing BHB concomitantly in late-pregnant ewes. In this experiment, ewes were drenched with 1) Control **(CTL,** n = 6**)** – 110 mL water, 2) **MIX1:1 -** (n = 6) –106 mL PG +108 mL Koforin, and 3) **MIX3:7** (n = 6) – 63.4 mL PG +150.6 mL Koforin. The plasma glucose concentrations were 17.8% and 20.9%, respectively, higher in the MIX1:1 and MIX3:7 ewes than in the CTL ewes ($P < 0.01$). The plasma BHB concentrations in the MIX1:1 and MIX3:7 ewes were 42% and 47%, respectively, lower

than in the CTL ewes ($P < 0.03$). The NEFA concentration in the MIX1:1 and MIX3:7 ewes was 60% and 57%, respectively, lower than in the CTL ewes ($P = 0.008$). In conclusion, MIX1:1 and MIX3:7 were the most effective approaches to increasing glucose and reducing the BHB and NEFA concentrations concomitantly in the plasma of late-pregnant ewes. These mixed treatments can be recommended as an effective treatment for ewes with PT. In the second study, we monitored 24 ewes from 80 to 138 days in pregnancy every 10 days, and then daily until lambing, by ultrasound scanning for maternal heart rate (**HR**) and Doppler ultrasound for litter vitality. Blood samples were taken from dams on the days of scanning. Lambings were categorized as having a low male ratio (**LMR**; <50% males) or a high male ratio (**LMR**; >50% males). The male ratio strongly affected PLL, where the general survival rate (for all lambings) was reduced from 90% in LMR lambings to 85% in HMR lambings. The odds ratio for PLL in HMR vs. LMR litters was 1.82. Birth body weight and the survival rate of females were higher in LMR than in HMR lambings, with no differences for male lambs in both parameters. Dams' HR during the last trimester was 9.4% higher in LMR than in HMR pregnancies, with no differences in fetuses' HR. The plasma glucose and insulin concentrations were not significantly different between groups, but plasma β-hydroxybutyrate and nonesterified fatty acid concentrations were, respectively, 31% and 20% lower in HMR vs. LMR ewes. In conclusion, male fetuses negatively affect pregnancy outcomes and influence dams' metabolic and physiological state in sheep.

We presented the results of this project at several local and international conferences and published two papers in international journals.