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IMPACT OF RUMEN JUICE TRANSFAUNATION ON BEHAVIORAL ACTIVITIES, PERFORMANCE PARAMETERS AND KIDNEY FUNCTION IN FATTENING LAMBS

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ABSTRACT

Rumen juice transfaunation (RT) has been suggested as one of the effective ways to improve the performance and health of the host. This study's objective was to investigate the effect of RT on behavior, performance and kidney function of fattening lambs. Twelve male lambs were divided into three groups at random: controls (CON, n = 4): lambs were given one liter of normal saline, (Ts, n = 4): lambs received 1 liter of sheep ruminal juice and (Tc, n = 4): lambs received 1 liter of cattle ruminal juice, once throughout the study. Each lamb was caged in a single pen with alive weight of 20.7 (±1.95) and the experiment lasted six weeks. The instantaneous scan sampling approach was used to record behavioral observations on days 1, 2, 3, 7, 8, 15, 16, 30, 31 and 45 & 46 after rumen fluid transfauntion; production parameters and kidney function were measured every week. Rumen juice transfaunation resulted in a significant decrease in chewing pen fixtures behavior especially in Ts and feed conversion ratio in both (Ts and Tc) at first and second weeks, however a significant increase in body weight in both (Ts and Tc) at third, fifth and sixth week compared to control lambs. There was no significant effect on the serum creatinine and urea levels. In conclusion, the current results indicate that RT has a beneficial effect on fattening lamb's behavior and performance; therefore it can be used in intensive fattening sheep farms.

Keywords: Rumen juice transfaunation, fattening lambs, behavior, performance

INTRODUCTION

Mammals belonging to the Order Arteriodactyla (even-toed, hooved mammals) Suborder Ruminantia include ruminants. The term "ruminant" derives from the Latin word "ruminare," which means "to chew over gain," therefore the term "cud-chewing." (DePeters and George, 2014). Sheep were the first animals that humans domesticated. Much earlier than that, between 11,000 and 9,000 BC, sheep were domesticated (Amills *et al.*, 2017; Aldridge *et al.*, 2018). Sheep were raised primarily for the production of meat, milk, and fleece. Originally, the majority of sheep breeds originated in the southwest part of Asia (Chessa *et al.*, 2009). It has been

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demonstrated that rumen juice transfusion in the case of ruminants can transmit ruminal microbes from healthy donor animals to recipents to provide health benefits (Falony *et al.,* 2016). Rumen juice transfusion is essential for animal health and feed intake, as well as one of the potential techniques for adjusting the symbiotic microbiota and increasing host efficiency (DePeters and George, 2014), improved gut wall damage in pigs (Cheng *et al.,* 2018) and successfully treated sheep ruminal acidosis (Liu *et al.,* 2019). The rumen's symbiotic microbiome improves digestion by digesting the ingesta and degrading plant components into various volatile fatty acids (VFAs) and ammonia to provide the host with nutrients and energy (Zhou *et al.,* 2018). In addition, Transfaunation is expected to improve rumen function and has been utilised as a biotic treatment for ketosis, anorexia, and a variety of dyspepsia reasons including rumen acidity (Depeters and George, 2014) and also, can help cows recover from abomasum displacement (Rager *et al.,* 2004; Camara *et al.,* 2010), abomasum impaction (Camara *et al.,* 2010) and gangrenous mastitis (RIZZO *et al.,* 2015). It can also treat dysbiosis (anomalies in the structure of the typical microbiota) caused by antibiotic use and it is a useful method to re-establish a dysbiotic community, such as in cases of rumen acidosis (Ji *et al.,* 2018). Directly fed microbial, like probiotics, had a non-significant effect on serum kidney function tests such as creatinine and urea in ruminants (Bakr *et al.,* 2009; Sayed. 2003) however, it was found to have a good effect on changing the organisms in the stomach and intestine, which may affect neuronal function, mood and behaviour as well as decrease depressed behaviour (Sudo, 2006 and Bravo *et al.,* 2011). Ruminal juice transfaunation also increased ruminating duration but had no effect on total water intake (Leo-Penu *et al.,* 2015). In this study, we aimed to compare the effects of RT of sheep and cattle on behavior, performance and kidney function in fattening lambs. We hypothesize that RT may improve the behavior and health of fattening lambs.

MATERIALS AND METHODS

This study was carried out at the Animal and Poultry Behaviour and Management Research Department between January and March 2021, College of Veterinary Medicine, Asyut University, Egypt. The Faculty of Veterinary Medicine, University of Asyut, Egypt's Animal Care and Use Committee approved all activities and handling of animals.

1- Animals and housing

Twelve (12) male lambs (recipient lambs) of the Saidi breed clinically healthy, with a-live weight of 20.7 (±1.95) kg and around 80 days old (weaned at 60 days) were kept in a single barn and each lamb was caged in a single pen (150 cm length, 100 cm width and 120 cm in height) with unrestricted access to drinking water and feed (pellet feed) was supplied two times per day at 08:00 and 20:00. The floor of the pens was bedded with rice straw.

2- Management

In the beginning, all manure materials were removed from floors and walls. Also, all dust materials were removed from windows, floors, ceilings and walls, then finally disinfected by Virkon™ S (Lanxes International Company - England), at a dilution of 10 grams per liter. All equipment (feeders and drinkers) were taken out of the room and soaked in water, then disinfected by Virkon™ S. For 15 days. Lambs were acclimated to their new surroundings before the beginning of the experiment and per os dewormed with Leavafluke (levamisole + oxyclozanide) (Pharma swede, Egypt) at a dose of 2.5 ml of Leavafluke /10 kg body weight. They were given avimec 1% s/c (Arab Veterinary Industrial Company (AVICO), Egypt) at adose 0.5 ml per 20 kg body weight and these doses were repeated after 15 days.

3- Diet and feeding

Each lamb received a concentrate diet (pellet feed 14% (2% of its body weight)

(Alwatania feed Co., Egypt) two times per day, at 8:00 am and 8:00 pm. Hay (Tibn) and clean drinking water were given *ad libitum*.

4- Experimental design

Twelve male lambs were divided into three groups at random: controls (CON, n = 4) that received 1 liter of normal saline, lambs that received 1 liter of ruminal fluid from the sheep (Ts, n = 4) and lambs that received 1 liter of ruminal fluid from cattle (Tc, n = 4) once throughout the experiment.

4-1- Ruminal juice samples from donors

The rumen juice was collected from a slaughterhouse (Durunka, Assiut, Egypt), immediately after slaughtering. There were two types of ruminal juice; the bovine and ovine ruminal fluids were pooled from three healthy bulls and five healthy rams (donors). Samples were filtered using gauze to remove the gross particles to avoid clogging the tube that used for administration of ruminal fluid to the recipient lambs. The fluid was collected in bottles and kept closed at room temperature (approximately 25 ◦C) then, gathered and blended together in a bucket. The pooled ruminal fluid was given to lambs (Ts & Tc) within 1 hour of collection using stomach tube (Huo *et al.*, 2019).

4-2- Rumen liquor samples for analysis

Rumen juice samples from lambs were collected for analysis at six different time points during the experiment: on the day of transfaunation (d1), 2 (d2), 7 (d7), 15 (d15), 30 (d30) and 45 (d45) days of transfauntion. Ruminal fluid was collected with a stomach tube (Huo *et al.*, 2019).

5- Data collection

5-1- Behavioral observations

Lambs were individually identified using an electronic cameras (Model C3W 720P; Hangzhou Hikvision Digital Technology Co., Ltd., Hangzhou, China). The cameras were placed on the surface of room beside the pens to observe the animals' behavior. Each group was continually observed for 12 hours each day (08:00–20:00 h) on days 1, 2, 3, 7, 8, 15, 16, 30, 31 and 45 &46 after rumen fluid transfauntion. Each video was watched by two trained observers to record the lamb behavior using the scanning technique described by (Ekiz *et al.,* 2012; Pascual-Alonso *et al.*, 2017) based on the developed ethogram (Table 1).

5-2- Performance measurement

5-2-1- Live body weight (LBW)

Live body weight of lamb was individually taken at the start of the study and then weekly throughout the experimental period.

5-2-2- Body weight gain (BWG)

Lambs' weekly gains in body weight were estimated by subtracting the previous week's BW from the current week's BW.

5-2-3- Feed intake (FI)

The feed intake for each lamb was calculated every week by subtracting the remaining amount of hay during the end of the week from the total amount of hay during the beginning of the same week as every lamb receive a constant amount of concentrates (pelleted feed) calculated by 2% of its weight.

5-2-4- Feed conversion ratio (FCR)

Feed conversion ratio was estimated weekly using the equation below.

FCR= total feed consumption (hay & concentrates) / body weight gain.

6- Serum samples

Blood samples were collected through jugular venipuncture on days 1, 2, 7, 15, 30, and 45. Ten mL of blood from each animal was collected in test tube without anti-coagulant to separate serum in order to measure the blood's chemical characteristics. The tubes were left at ambient temperature for 30 minutes, followed by refrigeration for 60 to 90 minutes. After that, they were centrifuged at 3000 rpm for 10 minutes, and the separated serum was transferred using a micropipette to another epindoorf's tube. Sera were stored at -20°C until examination with a commercial kit according to the manufacturer's instructions.

6-1- Kidney function test (urea mmol/l & creatinine mg/dl)

Using commercially available assay kits, blood urea nitrogen (Cat. no. UR 21-10) and serum creatinine (Cat. no. 234-000) were determined to assess the health of the kidneys (Schiffgraben, Hannover, Germany) according to the manufacturer's instruction. The previous parameters were measured spectrophotometrically.

6-1-1- Determination of serum creatinine

Under alkaline conditions, creatinine interacts with picric acid to generate a yellow-red complex. The absorbance of the resulting color according to measurement at a wavelength 492nm where, its density was directly related to the concentration of creatinine in the sample (Toora and Rajagopal, 2002).

6-1-2- Determination of blood urea nitrogen

In an alkaline environment, the ammonium ions generated by the Berthelot interaction react to produce the blue dye indophenol which absorbs light between 530 and 560 nm (Afkhami and Norooz-Asl, 2008).

7- Statistical analysis

A randomized block design was used to perform the experiment. The experimental unit was regarded as a pen (n = 4). Repeated measures ANOVA was used for analyzing behavioral patterns and growth performance characteristics while One Way Analysis of Variance was used to analyze all other parameters. PROC MIXED model using SAS 9.4 software (SAS Institute Inc., Cary, NC) was used to analyze the data. The data's normality was examined using the Shapiro-Wilk test. When a significant difference was found, the Tukey-Kramer test was utilized to compare the means; the level of statistical significance was established when the coefficients were at P 0.05. The data were shown as mean SEM.

RESULTS

1- Behavioral patterns

The effects of RT (sheep & cattle) on different behavioral activities (%) of lambs following rumen fluid transfauntion were presented in table (2). Both treatments (Ts and Tc) did not affect the behavioral activities (standing, laying, walking, rumination, pawing, butting, rearing, nosing pen fixtures, grooming, feeding and drinking, respectively) of fattening lambs at different time sets in comparison with CON (P = 0.1306, P = 0.1710, P = 0.6404, P = 0.4808, P = 0.3015, P = 0.5569, P = 0.5656, P = 0.6184, , P = 0.8807, P = 0.2533, and P = 0.2258, respectively), however there was a significant decrease in chewing pen fixtures behavior in Ts treatment (P = 0.0363) in comparison with control and Tc treatments.

2- Performance

2-1- Body weight

The effects of RT (sheep & cattle) on performance parameters (body weight, body weight gain, feed intake & feed conversion ratio) at first, second, third, fourth, fifth and sixth weeks were presented in tables (3). In comparison to the control group, at first, second and fourth week, both treatments (Ts and Tc) had a non-significant effect on the body weight of lambs (P = 0. 1053, P = 0. 0863 and P = 0. 0687, respectively). However, the body weight was increased in both treatments (Ts and Tc) at third, fifth and sixth week in comparison with control group (P = 0. 0357, P = 0. 0395 and P = 0. 0087, respectively), Ts had the highest increase.

2-2- Body weight gain

Compared to the control group, at first, third, fourth, fifth and sixth week, both treatments (Ts and Tc) had a negligible impact on the lambs' body weight gain. (P = 0. 0691, P = 0. 0811, P = 0. 9067, P = 0. 2289 and, P = 0. 1994, respectively). However, the body weight gain was increased in both treatments (Ts and Tc) at second week in comparison to the control group (P = 0. 0396), Ts had the highest increase.

2-3- Feed intake

In comparison to the control group, at second, fifth and sixth week, both treatments (Ts and Tc) had a-non significant effect on the feed intake of lambs (P = 0. 1567, P = 0. 0651 and P = 0. 1824, respectively). However, the feed intake was increased in the Ts treatment at first week (P = 0.0258) and in Tc treatment at third week (P = 0. 0076) as compared to the control group.

2-4- Feed conversion ratio

In comparison to the control treatment, at third, fourth, fifth and sixth week, both treatments (Ts and Tc) had a-non significant effect on the feed conversion ratio of lambs (P = 0. 4036, P = 0. 6191, P = 0. 2287, and P = 0. 4096, respectively). However, the feed conversion ratio was decreased in both treatments (Ts and Tc) at the first and second weeks (P = 0. 0003 and P = 0.0089, respectively), the treatment Ts had the highest decrease in the feed conversion ratio (P = 0. 0089).

3- Biochemical parameters

3-1- Kidney function test:

3-1-1- Urea (mmol/l)

The effects of RT (sheep & cattle) on serum urea (mmol/l) of lambs at days 1, 2, 7, 15, 30 &45 are presented in table (4). Ruminal transfaunation did not affect the level of urea in the serum (P = 0.3903, P = 0.9797, P = 0.8182, P = 0.5863, P = 0.1438 and P = 0.7108, respectively).

3-1-2- Creatinine (mg/dl)

The effects of RT (sheep & cattle) on serum creatinine (mg/dl) at days 1, 2, 7, 15, 30 &45 are presented in table (4). Compared to control treatment, both Ts and Tc treatments had a negligible impact on creatinine levels (P = 0.4471, P = 0.9499, P = 0.4224, P = 0.9941, P = 0.9850 and P = 0.6964, respectively).

Table 1: Behavioral ethogram for sheep.

Behavioral patterns	Definition
1. Lying	Lying without showing any other behavioral activity.
2. Standing	Standing without showing any other behavioral activity.
3. Walking	The lamb moves from one place to another in its pen.
4. Rumination	Chewing the rumen content, that was brought to the mouth.
5. Butting	The lamb lowers its head and butts walls, feeder, eTc.
6.Pawing	Striking ground with forelegs.
7. Rearing	Forelegs on pen, back legs on ground and head raised.
8. Nosing pen fixtures	Nosing or rubbing muzzle on pen fixtures (palings, floor slats, wire or feeder).
9. Chewing pen fixtures	Chewing pen fixtures (palings, floor slats, wire or feeder).
10. Feeding	Head lowered and directly in the feeder or floor where feed is visible.
11. Drinking	Lamb drinking water from the drinker.
12. Grooming	ScraTching or licking himself or another animal.
13. Defecating	Eliminating feces.
14. Urinating	In urination.

Table 2: Effect of Rumen juice transfaunation (RT) (T_s and Tc) on behavioral activities % of lambs on days 1, 2, 3, 7, 8, 15, 16, 30, 31 and 45 &46 after rumen juice transfauntion. All behavior activities measured by percentage (**%**).

Beh. Act.	Control	T_s	Tc	SEM	P-Value
Standing %	9.14	11.92	9.36	0.960	0.1306
Laying %	26.16	17.64	23.51	2.96	0.1710
Walking%	1.66	2.28	2.31	0.537	0.6404
Pawing %	1.34	0.45	1.42	0.458	0.3015
Butting %	1.012	0.54	0.60	0.323	0.5569
Rearing %	0.53	0.40	0.60	0.134	0.5656
Chewing pen fixtures%	$1.86^{a\,b}$	1.21^{b}	1.97^{a}	0.185	0.0363^{*}
Nosing pen fixtures %	0.17	0.40	0.32	0.162	0.6184
Feeding %	22.21	19.55	21.45	1.08	0.2533
Rumination%	30.57	38.18	34.10	4.27	0.4808
Drinking %	1.14	0.60	0.95	0.205	0.2258
Grooming %	3.57	2.85	3.50	1.09	0.8807

^{a,b} Means ± SE with different superscripts in the same row differ significantly ($p < 0.05$)
% Percentage of behavioral activities

Table (3): Effect of cow and sheep ruminal juice transfaunation on performance parameters at first, second, third, fourth, fifth and sixth weeks.

Treatment[1]	Control	T_s	Tc	SEM	P-Value
First week					
Body weight (kg)	20.30	23.616	22.06	0.971	0.1053
Body weight gain (kg)	0.966	1.283	2.212	0.3389	0.0691
Feed intake (kg)	4.546^{b}	5.716^{a}	4.125^{b}	0.34726	0.0258
Feed conversion ratio (kg/kg)	4.70^{a}	4.45^{a}	2.14^{b}	0.289	0.0003
Second week					
Body weight (kg)	21.93	25.35	23.03	0.966	0.0863
Body weight gain (kg)	1.45^{b}	1.73^{a}	0.975^{b}	0.176	0.0396
Feed intake (kg)	4.56	3.93	5.67	0.582	0.1567
Feed conversion ratio (kg/kg)	3.337^{b}	2.403^{b}	5.946^{a}	0.635	0.0089
Third week					
Body weight (kg)	23.25^{b}	26.525^{a}	$23.55^{a\,b}$	0.814	0.0357
Body weight gain (kg)	1.90	1.05	0.512	0.381	0.0811
Feed intake (kg)	3.13^{b}	2.38^{b}	4.78^{a}	0.414	0.0076
Feed conversion ratio (kg/kg)	2.80	2.33	3.83	0.794	0.4036
Fourth week					
Body weight (kg)	24.36	27.33	24.70	0.849	0.0687
Body weight gain (kg)	0.90	0.93	1.15	0.431	0.9067
Feed intake (kg)	6.566^{a}	5.20^{b}	5.15^{b}	0.343	0.0279
Feed conversion ratio (kg/kg)	7.312	5.60	7.17	1.3362	0.6191
Fifth week					
Body weight (kg)	24.90^{b}	28.30^{a}	$25.47^{a\,b}$	0.837	0.0395
Body weight gain (kg)	0.56	0.96	0.77	0.151	0.2289
Feed intake (kg)	5.63	4.16	6.11	0.522	0.0651
Feed conversion ratio (kg/kg)	8.31	5.30	7.88	1.1802	0.2287
Sixth week					
Body weight (kg)	26.90^{b}	29.55^{a}	26.90^{b}	0.5273	0.0087
Body weight gain (kg)	0.866	1.25	1.42	0.205	0.1994
Feed intake (kg)	4.466	5.650	4.150	0.549	0.1824
Feed conversion ratio (kg/kg)	3.976	4.564	3.319	0.622	0.4096

^{a,b} Mean ± SEM with different superscripts in the same row differ significantly ($p < 0.05$). [1](n – 4 per treatment and the data were collected from 4 lambs/ treatment). Control (lambs that received 1 liter of normal saline, Tc (lambs that received 1 liter of ruminal fluid from cow), T_s (lambs that received 1 liter of ruminal fluid from sheep).

Table 4: Effect of cow and sheep ruminal juice transfaunation on kidney function tests as urea (mmol/l) and creatinine (mg/dl) of fattening lambs.

Treatment[1]	Control	T_s	Tc	SEM	P-Value
Urea (mmol/l)					
Day 1	2.97	2.11	2.48	0.424	0.3903
Day 2	2.88	2.76	2.80	0.422	0.9797
Day 7	3.08	2.75	3.11	0.438	0.8182
Day 15	3.26	2.61	3.23	0.487	0.5863
Day 30	2.49	3.23	2.31	0.312	0.1438
Day 45	2.56	2.45	2.86	0.354	0.7108
Creatinine (mg/dl)					
Day 1	2.50	2.05	2.72	0.366	0.4471
Day 2	2.06	1.89	1.90	0.425	0.9499
Day 7	1.67	2.15	1.71	0.272	0.4224
Day 15	2.02	2.05	2.04	0.240	0.9941
Day 30	2.25	2.36	2.35	0.510	0.9850
Day 45	2.39	2.78	2.58	0.323	0.6964

Mean± SEM in the same row not differ significantly ($p > 0.05$). [1](n – 4 per treatment and the data were collected from 4 lambs/ treatment). Control (lambs that received 1 liter of normal saline, Tc (lambs that received 1 liter of ruminal fluid from cow), T_s (lambs that received 1 liter of ruminal fluid from sheep).

DISCUSSION

Ruminal juice transfaunation (RT) had a positive effect on modifying the bacteria in the stomach and intestine, which can affect neuronal function, mood, and behavior, as well as lowered cortisol levels and depressive behavior (Sudo *et al.*, 2004; Sudo 2006 and Bravo *et al.*, 2011). Also, RT had a slight increase in rumination time but had no effect on cumulative water intake behaviour (Leo-Penu *et al.*, 2015). In the current study, compared to the control group, both Ts and $TRNNS_c$ had a non-significant ($P > 0.05$) effect on fattening lambs behaviors, however, the Ts lambs had the lowest percentage of chewing pen fixtures behavior in comparison with control and Tc lambs. These results agreed with the report made by Nowak *et al.* (2008) who found that, animal wellbeing may be evaluated using behavioral measurements, and abnormal behaviour is thought to be the primary sign of stress and discomfort in animals. Lambs have been observed mouthing bars, chewing chains or slats, biting and chewing pen fittings, and repeatedly butting, these are all considered abnormal behaviours. The decrease in chewing pen fixtures may be due to the effect of sheep ruminal juice transfauntion on decreasing the level of serum cortisol. In addition, Karaağaç *et al.* (2005) and Arney (2009) reported that rumination time and behavior are crucial indicators of an animal's comfort and welfare. Moreover, Bravo *et al.* (2011) demonstrated that, ruminal juice transfaunation as Probiotic was discovered to influence animal emotional behaviour. Furthermore, Sudo *et al.* (2004), Sudo (2006) and Messaoudi *et al.* (2011) found that, although there is bidirectional contact between the brain and gastrointestinal tract via the brain-gut axis, exposure to probiotic bacteria can reduce stress and depression-related behaviours. In the same time, Yong (2011) and Emily (2012) reported that, direct fed microbials may alter brain activity in areas responsible for processing emotions including anxiety, mood and aggressiveness. Combining the administration of *B. longum* R0175 with *L. helveticus* R0052 decreased the anxiolytic-like action in rats (Messaoudi *et al.*, 2011). Similarly, Naglaa and Ghada (2014) recorded that the temperament score of anxious ewes was significantly affected by the probiotic (ActisafR) supplementation after one month of administration. The score was (4.3) before the treatment and decreased to (2.6) afterward, demonstrating a significant difference between the two records. These results agreed with those reported by Jenkins (2014), who observed better temperament of rumen-zyme treated animals, and with that documented an experiment by the Ministry for Primary Industries (2013), which found that probiotic supplemented cattle were easier to manage than the control ones. Furthermore, Sudo *et al.* (2004) and Sudo (2006) demonstrated that although there is a significant connection and interaction between gut microorganisms and the brain, changing the bacteria in the stomach and intestine can alter neuronal function, mood, and behaviour.

These study results showed that, compared to control lambs, both Ts and Tc lambs indicated a rise in body weight at third, fifth and sixth week following ruminal juice transfaunation and also, showed an increase in body weight gain with both treatments (Ts and Tc) at second week in comparison with control treatment. These findings agreed with Manichanh *et al.* (2010); Willing *et al.* (2011); Hamilton *et al.* (2013); and Liou *et al.* (2013) who reported that, in small animals, microbial transfaunation improved performance and altered the symbiotic microbiome. However, these results disagreed with Yin *et al.* (2021) who reported that, in fattening lambs, rumen juice transplantation reduced average daily live weight growth and apparent digestion of ether extract in 3-month-old fattening lambs in comparison to controls. Furthermore, these findings were similar to Musa *et al.* (2009) who reported that, direct fed microbial increase food availability, nutrient synthesis, and microbial ecology, and helps farm animals gain weight more quickly (Oyetayo and Oyetayo, 2005). Moreover, Haddad and Goussous (2005) found that adding a yeast culture (YC; Diamond V® YC) to the meals of Awassi lambs resulted in higher weight gain (266 g/day) than the control group (212 g/day). Similar findings were made by Jang *et al.* (2009), who discovered that supplementing lambs with probiotics tended to improve weight gain. According to Erasmus *et al.* (1992), greater weight growth in lambs fed probiotic-containing meals might be attributed to increased microbial protein synthesis, resulting in additional amino acid supply at the post-ruminal stage. Similar to this, Abas *et al.* (2007) showed that Kivircik male yearling lambs treated with direct feed microbial culture (Cylactin ® LBC ME 10) gained more body weight than the control group. Also, Anandan *et al.* (1999) discovered that Cheghu crossbred young kids who consumed probiotics (curds) orally at 15 ml/day gained significantly more weight than the control group (4.37 versus 3.15 kg and 44.6 versus 32.1 g/day), indicating that curds as probiotics may be supplemented for the enhancement of kids growth performance.

In addition, Robinson (2002) found that probiotics boosted weight gain in small ruminants and increased feed conversion ratio, which is consistent with our findings. Moreover, Russell and Wilson (1996) reported that, increased weight gain in ruminants may be caused by increased cellulolytic activity, which improves fiber decomposition and results in reduced ammonia production, increasing the protein's absorption ability at the post-ruminal stage (Chaucheyras-Durand *et al.*, 2008). The most generally accepted markers for assessing chronic kidney disease (CKD) and renal health are serum urea and creatinine. Chronic kidney disease (CKD) is defined as a gradual loss of renal function (Venktapathy *et al.*, 2014). It is a disorder in which the kidneys lose normal function, particularly excretory and regulatory functions, as a result of infections, autoimmune diseases, cancer, or exposure to toxic substances (Abdulla *et al.*, 2012).

Serum measurement of renal function indicators such as urea and creatinine is commonly employed (Gowda *et al.,* 2010). The kidneys produce blood urea (BU) (Kamal, 2014), a primary nitrogenous end product of protein and amino acid catabolism (Gowda *et al.,* 2010), and creatinine (Kamal, 2014), the decomposition product of creatine phosphate in muscle (Gowda *et al.,* 2010). Serum urea is an indirect and inaccurate marker of renal function that assesses the quantity of urea nitrogen in blood and is directly connected to kidney excretory performance. Creatinine tests are used to identify decreased renal function and to determine the quantity of creatinine phosphate in the blood.

Our results reflected that both sheep and cow ruminal juice transfaunation did not affect the urea and creatinine concentration in the serum of fattening lambs at different time sets (d 1, 2, 7, 15, 30 & 45). The same findings were reported by Leo-Penu *et al.* (2015), who recorded that, urea and creatinine concentrations demonstrated no differences on day 1, day 4, day 9 and day 45 after rumen juice transfaunation compared with control in bulls. Furthermore, these findings agreed with Antunovic *et al.* (2005), who showed that the level of creatinine and urea did not change in lambs that fed the feed mixture containing 0.1% of the probiotic preparation (PIONEER PDFM®). In addition, Goats fed probiotic-supplemented diets showed no difference in creatinine levels (Belewu *et al.,* 2008). Similarly, Antunovicc *et al.* (2006) reported identical results for growing lambs, moreover Galip (2006) also discovered no differences in the blood creatinine levels of rams receiving probiotic supplements. In contrast, these study results disagreed with Antunovic *et al.* (2005) who reported that, weaned lambs (60 days old) supplemented with 0.1% probiotics (PDFM®) had statistically lower concentration of blood urea (BU). Antunovic *et al.* (2006) similarly found decreased levels of urea in the blood serum of lambs on probiotic diets compared to control diets. Low blood urea nitrogen (BUN) levels in lambs fed a probiotic-enriched diet may be related to enhanced nitrogen (N) utilization in the rumen (Bruno *et al.,* 2009).

CONCLUSION

In the current study, ruminal transfaunation do not show a significant effect on behavioral activities and kidney function in fattening lambs. But, it showed a decrease in chewing pen fixtures behavior and improvement in feed efficiency of fattening lambs. The latter finding, together with the current results, suggests that RT requires more research, maybe focusing on its effect on the physiological and microbial status of the recipient animals.

CONFLICTS OF INTERESTS

The authors have reported no conflicts of interest.

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تأثير نقل عصارة الكرش على السلوك؛ الأداء ووظيفة الكلى فى حملان التسمين

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لقد تم اقتراح نقل عصارة الكرش (RT) كواحدة من الطرق الواعدة لتحسين صحة الحيوان وأدائه. الهدف من هذه الدراسة هو معرفة تأثير نقل عصارة الكرش(RT) على السلوك والأداء ووظيفة الكلى فى حملان التسمين. لقد تم تخصيص اثني عشر ذكرًا من حملان التسمين وتوزيعهم بشكل عشوائي فى ثلاثة مجموعات: مجموعة ضابطة (CON،وعددها اربعة حملان): تلقت فيها الحملان لترًا واحدًا من محلول الملح العادي ، (Ts ، وعددها اربعة حملان): تلقت فيها الحملان لترًا واحدًا من عصارة كرش الأغنام و (Tc، وعددها ايضا اربعة حملان): تلقت فيها الحملان ١ لتر من عصارة كرش الماشية جرعة واحدة وذلك فى اليوم الاول من التجربة . تم وضع كل خروف في حظيرة واحدة (طولها ١٥٠ سم وعرضها ١٠٠ سم وارتفاعها ١٢٠ سم) بوزن حي ٢٠,٧ كجم واستمرت التجربة لمدة ستة أسابيع. تم تسجيل السلوك بواسطة تقنية المسح اللحظي لكل معاملة. تم قياس معايير الاداء ووظائف الكلى اسبوعيا. لقد أظهرت نقل عصارة الكرش انخفاضًا معنويًا في سلوك المضغ فى شبكة الحظيرة خاصة في المجموعة التى تلقت عصارة كرش الاغنام وانخفاض معنويا ايضا فى نسبة تحويل العلف في كلا من المجموعتين (Ts و Tc) في الأسبوع الأول والأسبوع الثاني (P = 0. 0003 و P = 0.0089 ، على التوالي) ، ولكن اظهرت زيادة معنوية في وزن الجسم في كل من المجموعة (Ts و Tc) في الأسبوع الثالث والخامس والسادس (P = 0. 0357 ،P = 0. 0395 و P = 0. 0087 ، على التوالي) مقارنة بحملان المجموعة التى تلقت محلول الملح. لم يكن هناك اى تأثير معنوي على مستوى اليوريا والكرياتينين في الدم (P> 0.05). في الختام ، تشير نتائج هذه الدراسة إلى أن نقل عصارة الكرش لها تأثير جيد على سلوك وأداء حملان التسمين ، وبالتالي يمكن استخدامها في مزارع الأغنام المكثفة ، ولكن لا تزال هناك حاجة لمزيد من الابحاث حول هذا الصدد.