



The effect of L-Carnitine injections on some semen characteristics of male Afghan goats

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ABSTRACT

The aim of the study is to improve the semen characteristics of Afghan goats. This study was conducted in the animal field of the Department of Animal Production/College of Agriculture/University of Diyala during the period from 10/6/2022 until 10/9/2022, and microscopic examinations of semen were conducted in the physiology laboratory of the Department of Animal Production. It was done in the Al-Amin Medical Laboratory For pathological analyses/Baquba, the experimental animals were randomly divided into four groups and four replicates for each group. The first group was without injection (the comparison) and the other three groups were injected with different concentrations of L-carnitine every three days. My agencies: The second group was injected with 25 mg of L-carnitine/kg body weight. The third group was injected with 50 mg of carnitine/kg body weight, and the fourth group was injected with 75 mg of carnitine/kg body weight. The animals were trained in the process of collecting semen for 10 days before the tests began. At the end of each month, semen was collected and semen tests were performed.

The results of the study showed that injection of L-Carnitine at a concentration of 75 mg led to a significant increase in the volume of ejaculate, the mass matility of sperm, the individual movement of normal sperm, the concentration of sperm, the percentage of live sperm, and the percentage of live, dead, and deformed sperm.

Introduction

Animal husbandry has been an integral part of human civilization and culture since primitive man began to domesticate animals. It is believed that they were domesticated in the mountains of West Asia between 7,000 and 10,000 BC. Goats are distinguished by being raised in all parts of the world, with the exception of very cold regions such as the Arctic. They are used for about 75% of the world's population uses goats to produce milk, meat, wool, and leather [1] and the demand for animal-sourced foods is increasing globally.

Male goats suffer from an increase in the percentage of Abnormal and dead sperm during stress, which leads to a decrease in their fertility as a result of the production of free radicals in the semen. Free radicals are also produced through oxidation processes that take place inside the cells, as free radicals interact with the fatty membranes that make up the cell membranes or with the genetic material. This leads to death or deformation of sperm [2] Many studies have been conducted to improve the characteristics of semen during the summer by adding antioxidants such as vitamin C [3] and vitamin E[4] or adding acids. Amino acids such as arginine and aspartic acid [5] and [6]

Carnitine is a biological compound that plays essential roles in oxidative metabolism in mitochondria and has antioxidant effects that protect mitochondria from oxidative damage and cell death resulting from damage to mitochondria. Carnitine also works on protein synthesis [7] and carnitine also works to protect cellular membranes from Oxidative damage resulting from peroxidation of polyunsaturated fatty acids that constitute one of the components of the cell membrane. It also works to transfer fatty acids to the mitochondria inside the sperm.

Due to the lack of a study showing the effect of carnitine on the characteristics of semen in Afghan goats in Iraq, this study was conducted to demonstrate the effect of carnitine on goat fertility by studying changes in:

1. Characteristics of semen of Afghan goats in the summer.
2. Collective movement
3. Individual movement
4. Normal sperm
5. Live sperm
6. Dead sperm
7. Deformed sperm

Materials and methods

This study was conducted in the animal field of the Department of Animal Production/College of Agriculture/University of Diyala during the period from 10/6/2022 to 10/9/2022, and microscopic examinations of semen were conducted in the physiology laboratory of the Department of Animal Production.

This study used 16 male Afghan goats, ages ranging from one to one and a half years, and weights ranging from 45-55 kg. The animals were purchased from one of the farms in the Diyala regions (Al-Khalis, Kanaan, Baladruz). Experimental animals were kept inside semi-open barns. The animals were fed on concentrated feed (barley + bran), in addition to giving rough feed, represented by hay and green fodder, according to the animal's need (in an open form) with availability. Drinking water and mineral salt bars throughout the experiment.

The experimental animals were randomly divided into four groups and four replicates for each group. The first group was without injection (the comparison) and the other three groups were injected with different concentrations of L-carnitine every three days. My agencies: The second group was injected with 25 mg of carnitine/kg live weight, and the third group was injected with 50 mg. of carnitine/kg live weight. The fourth group was injected with 75 mg of carnitine/kg live weight, and the animals were trained in the process of collecting semen for 10 days before starting to conduct the tests. At the end of each month, semen was collected and semen tests were conducted.

Result and discussion

Injection with L-carnitine led to a significant increase in the percentage of mass movement in Afghan goats, as the injection treatment with a concentration of 75 mg of L-carnitine recorded the highest value for the percentage of mass movement, reaching $91.08 \pm 0.91\%$, while the control treatment recorded the lowest value, reaching $91.08 \pm 0.91\%$. $65.00 \pm 1.11\%$.

The injection treatment with a concentration of 75 mg of L-carnitine recorded the highest value for the individual movement

percentage, reaching $87.67 \pm 1.25\%$, while the control treatment recorded the lowest value, reaching $65.17 \pm 0.82\%$.

The reason for the increase in the percentage of individual movement in Afghan goats when L-carnitine at a concentration of 75 mg was injected may be due to the role of L-carnitine in controlling the male reproductive system and the normal function of the testicles, as it works on the maturation of the male gametes and has a major role in providing the energy available for animal movement. sperm [8] [9]

Table No. 1. Effect of L-carnitine injection in percentage on collective and individual motility and sperm concentration of male Afghan goats (mean $\pm$ standard error).

Treatment	% Mass moveme	Individual %movement	%Normal sperm
First) without injections)	C 0.11 ± 0.93	D 0.82 ± 65.17	B 0.79 ± 85.17
Injection of 25 mg of L-carnitine	C 0.10 ± 1.06	C 2.08 ± 76.67	B 0.74 ± 85.42
Injection of 50 mg of L-carnitine	B 0.23 ± 1.83	B 0.68 ± 81.25	B 1.24 ± 85.00
Injection of 75 mg of L-carnitine	A 0.20 ± 2.17	A 1.25 ± 87.67	A 0.69 ± 92.42

* The averages bearing different capital letters vertically indicate the presence of significant differences between the injection groups,

As for the increase in the percentage of collective movement in Afghan goats when L-carnitine is injected at a concentration of 75 mg, L-carnitine works to transfer fatty acids to the mitochondria inside the sperm cell, as they undergo beta oxidation, which leads to the generation of metabolic energy that the sperm needs for their movement [10]

The injection treatment with a concentration of 75 mg of L-carnitine recorded the highest value for the percentage of live sperm, reaching $1.71 \pm 83.33\%$, while the control treatment recorded the lowest value, reaching $1.37 \pm 72.92\%$.

It recorded a significant decrease ($P \leq 0.05$) in the percentage of dead sperm in the fourth group, which amounted to 16.77 ± 1.72 , over the first, second, and third groups, which amounted to 27.08 ± 1.37 , 21.67 ± 2.30 , and

21.00 ± 1.25 , respectively, while both groups excelled. The second and third group had no significant difference over the first group.

The comparison treatment and injections with concentrations of 25 and 50 mg of L-carnitine recorded the lowest percentage of sperm, reaching 0.79 ± 85.17 , 0.74 ± 85.42 , and 1.24 ± 85.00 . The fourth group, treatment with injections with concentrations of 75 mg of L-carnitine, recorded the lowest value, reaching $0.69 \pm 92.42\%$.

There was also a significant improvement to take the lowest value ($P \leq 0.05$) in the percentage of deformed sperm in the injection treatment with a concentration of 75 mg of L-carnitine, which amounted to $0.96 \pm 7.58\%$ compared to the other treatments, in which there was no significant difference.

Table No. 2. Effect of L-carnitine injection in percentage on live, dead and deformed sperm of male Afghan goats (mean $\pm$ standard error).

Treatment	%Live sperm	%Dead sperm	%Deformed sperm
without injections	C 1.37 $\pm$ 72.92	C 1.37 $\pm$ 27.08	B 0.79 $\pm$ 85.17
Injection of 25 mg of L-carnitine	B 2.30 $\pm$ 78.33	B 2.30 $\pm$ 21.67	B 0.74 $\pm$ 85.42
Injection of 50 mg of L-carnitine	B 1.25 $\pm$ 79.00	B 1.25 $\pm$ 21.00	B 1.24 $\pm$ 85.00
Injection of 75 mg of L-carnitine	A 1.71 $\pm$ 83.33	A 1.72 $\pm$ 16.77	A 0.69 $\pm$ 92.42

* The averages bearing different capital letters vertically indicate the presence of significant differences between the injection groups,

The reason for the superiority of the fourth group treated with injections with a concentration of 75 mg of L-carnitine in the percentage of live sperm may be because L-carnitine acts as an antioxidant, which led to the scavenging of free radicals, which reduces sperm death and thus increases live sperm [11] As for the lack of live sperm in the comparison treatment, it may be attributed to the formation of free radicals, since the oxygen and nitrogen atoms contain single electrons, thus withdrawing electrons from neighboring compounds to stabilize. Sometimes these interactions occur with the fatty membranes that make up the cell membranes, and this leads to death or deformation of the cells. [12], and these results are consistent with the findings of Al-[5] and [6] on male Levantine goats.

The reason for reducing the percentage of dead sperm in the fourth group treated with injections at a concentration of 75 mg of L-carnitine may be due to its role in repairing sperm DNA [13] protecting germ cells [14] and protecting animals. sperm from oxidative stress and reducing apoptosis of spermatogenic cells and inhibiting sperm aggregation [11].

The reason for the increase in the percentage of normal sperm in Afghan goats in the second and third groups when injected with concentrations of 25 and 50 mg of L-carnitine may also be attributed to the action of L-carnitine to scavenge free radicals that cause damage to the unsaturated fatty acids present within the cellular membranes of the sperm. Specifically, and cells in general, as lipid peroxides (production of lipid peroxidation) form, which leads to changes that affect the cellular membrane and change its rigidity and permeability. Free radicals cause damage to the lysosomes and the release of their enzymes that work to destroy cellular compounds and cause damage to the membrane lipids and proteins. Cellularity [15]

The reason for the significant decrease in the percentage of deformed sperm when treated with injections with a concentration of 75 mg of L-carnitine may be attributed to the role of the acid, which raised the concentration of testosterone, which worked to raise the percentage of normal sperm and reduce the percentage of deformed sperm [15]

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تأثير حقن الكارنتين L-Carnitine في بعض صفات السائل المنوي لدى ذكور الماعز الافغاني

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الملخص

الهدف من الدراسة هي تحسين صفات السائل المنوي لحيوانات الماعز الافغاني.تم اجراء هذه الدراسة في حقل الحيواني التابع لقسم الانتاج الحيواني/ كلية الزراعة /جامعة ديالى خلال المدة من 2022/6/10 ولغاية 2022/9/10 ، واجريت الفحوصات المجهرية للسائل المنوي في مختبر الفسلجة التابع لقسم الانتاج الحيواني فقد تم في مختبر الامين الطبي للتحليلات المرضية /بعقوبة، قسمت الحيوانات التجربة عشوائياً إلى اربع مجاميع واربعة مكررات لكل مجموعة، المجموعة الاولى بدون حقن (المقارنة) والمجاميع الثلاثة الاخرى حقنت بتركيزات مختلفة من الكارنتين L- كل ثلاثة أيام وكالاتي: المجموعة الثانية حقنت 25 ملغرام من الكارنتين/ كغم وزن حي والمجموعة الثالثة حقنت 50 ملغرام من الكارنتين/ كغم وزن حي والمجموعة الرابعة حقنت 75 ملغرام من الكارنتين/ كغم وزن حي ودربت الحيوانات على عملية جمع السائل المنوي لمدة 10 يوم قبل البدء بإجراء الفحوصات وفي نهاية كل شهر تم جمع السائل المنوي واجراء الفحوصات للسائل المنوي.

بينت نتائج الدراسة أن حقن L-Carnitine بالتركيز 75 ملغم أدى إلى ارتفاع معنوي في حجم القذفة والحركة الجماعية للنطف والحركة الفردية للنطف الطبيعية وتركيز النطف والنسبة المئوية للنطف الحية والنسبة المئوية للنطف الحية والميتة والمشوهة .