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## ABSTRACT

PURPOSE: To compare the blood markers of a group of college athletes with low vegetable/animal protein intake rate against a group of college athletes with high vegetable/animal

tes (83 males; 58 females). We evaluated their total protein intake (vegetable and animal protein) with a 24-h dietary recall. Their lated and the sample was divided in tertiles adjusted by sex. We also evaluated cholesterol, triacylglycerides, glucose, uric acid, urea, and blood samples. The blood markers were compared between the first (low vegetable/animal protein intake ratio, T1) and the third (high vegetable/animal protein take ratio. T3) tertiles.

RESULTS: The absolute (151±82 g vs 106±4 g; p=0.03) and relative (2.1±1.0 g/kg vs 1.4±0.6 g/kg; p=0.02) protein intake was higher in males in the T1 than T3. The animal protein was higher in T1 than T3 (126±76 g vs 60±28 g; p=0.001), and vegetable protein intake was higher in T3 than T1 (24±14 g vs 48±17 g; p=0.001). There were no significant blood markers between males in T1 vs T3. In females, the absolute (140±51 g vs 63±2 g; p=0.001) and relative (2.2±1.0 g/kg vs 1.1±0.6 g/kg; p=0.001) protein intake higher in T1 than T3. Similarly, the animal protein intake was higher in T1 than T3 (118±46 g vs 34±15 g; p=0.001), however, the vegetable protein intake was similar for both ertiles (T1 23±10 g vs T3 29±16 g; p=0.19). The creatinine blood concentration was significantly higher in T1 compared with T3, and there was a trend for difference in urea blood centrations (table 1). All other blood markers did not show significant differences; and all markers were within normal values. CONCLUSIONS: A low vegetable/animal protein intake rate may not affect the blood markers in male athletes. However, in female athletes it may be related with higher creatinine

## INTRODUCTION

High protein diets are very popular in the field of sports. It is common that the main source of protein is coming from animal products (meat, poultry, processed meat, eggs, dairy, etc.)<sup>1</sup>, and protein from vegetable foods (legumes, nuts, tubers, vegetables, etc) is consumed in smaller amounts<sup>2</sup>. In general, animal products and processed meat contain cholesterol, saturated fats, and sodium, instead, vegetable foods contain unsaturated fatty acids, fiber, and antioxidants. These differences are largely the reason why they exert different effects on health<sup>3</sup>.

Currently, there are not recommendations about the vegetable/animal protein intake proportion, however, the intake of animal products is related with a higher risk of diabetes mellitus, hypertension, cardiovascular and renal disease<sup>4,5</sup>. In addition, meat and processed meat intake is related with a higher risk of chronic kidney disease (CKD), and a higher intake of vegetable foods is related with a lower risk to develop CKD<sup>4</sup>. We hypothesize that the concentration of blood markers will differ depending on the vegetable/animal protein intake rate. Therefore the purpose of this study was to compare the concentration of blood markers between groups of college athletes with low and high vegetable/animal protein intake rate.

## METHODS

We included 141 college athletes (83 males; 58 females). We evaluated their total protein intake with a 24h dietary recall, and we calculated the amount of vegetable and animal protein intake. Their vegetable/animal protein intake rate was calculated dividing the amount of vegetable protein intake between the amount of animal protein intake, and the sample was divided in tertiles by sex. We evaluated cholesterol, triacylglycerides, glucose, uric acid, urea, and creatinine levels by blood samples, analyzed by a certified clinical laboratory (RANDOX Equipment). The blood markers were compared between the first (low vegetable/animal protein intake rate, T1) and the third (high vegetable/animal protein intake rate, T3) tertiles.

# **BLOOD MARKERS IN COLLEGE ATHLETES ACCORDING TO THEIR VEGETABLE/ANIMAL PROTEIN INTAKE RATE**

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## RESULTS

The range and mean of vegetable/animal protein intake rate are shown in table 1, and the protein intake, as well. For both sexes, the subjects in T1 showed a higher absolute and relative protein intake compared with T3. The animal protein intake was higher in T1 than T3 for both sexes, however the vegetable protein intake was higher in T3 than T1 in males, and it was similar between tertiles in females (Figure 1).

Table 1 Absolute and relative protein intake according to the vegetable (animal protein intake rate by sev					
Table 1. Absolute and relative protein intake according to the vegetable/animal protein intake rate by sex.					
	Τ1	Т 3	р		
Males (28 per tertile)					
V/A rate range	(0.03 – 0.32)	(0.54 – 2.48)			
V/A rate	$0.22 \pm 0.09$	$0.93 \pm 0.50$	<0.001		
Absolute protein (g)	151 ± 81	106 ± 41	0.03		
Relative protein (g/kg)	$2.1 \pm 1.04$	$1.4 \pm 0.64$	0.02		
Females (19 per tertile)					
V/A rate range	(0.06 – 0.28)	(0.56 – 4.07)			
V/A rate	$0.20 \pm 0.70$	$1.03 \pm 0.84$	<0.001		
Absolute protein (g)	140 ± 51	63 ± 27	< 0.001		
Relative protein (g/kg)	2.2 ± 1	$1.1 \pm 0.60$	0.001		
Data are expressed as mean ± standard deviation. V/A: Vegetable/animal protein intake.					

### **Figure 1.** Animal and vegetable protein intake in tertile 1 and tertile 3 by sex.



\*Significantly different to T3 (p<0.05). *T1: Tertile 1; T3: Tertile 3.* Bars represent mean, and whiskers SD.



There were no significant differences in the blood markers on males between T1 vs T3. For females, creatinine blood concentration was significantly higher in T1 compared with T3, and there was a trend for difference (p<0.1) in urea blood concentration (Table 2). All other blood markers did not show significant differences; and all markers were within normal values.

Table 2. Comparisor animal protein intak Sex

> Males (n 28 per tertile

Females (19 per tertile)

T1: Tertile 1; T3: Tertile 3.

## CONCLUSIONS

A low vegetable/animal protein intake rate may not affect the blood markers in male athletes. However, in female athletes it may be related with higher creatinine blood levels.

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n of blood makers concentrations (mg/dL) according to the vegetable/					
ke rate by sex.					
Blood marker	<b>T1</b>	<b>T2</b>	р		
Urea	29 ±4	28 ±3	0.35		
Uric acid	4.6 ±0.9	4.4 ±1.1	0.36		
Creatinine	1.01 ±0.21	0.97 ±0.16	0.42		
Triacylglycerides	94 ±44	81 ±34	0.30		
Cholesterol	159 ±33	167 ±31	0.36		
Glucose	73 ±10	72 ±9	0.79		
Urea	29 ±3	27 ±3	0.09		
Uric acid	4.5 ±1.4	3.8 ±1.2	0.12		
Creatinine	0.95 ±0.16	0.85 ±0.15	0.04		
Triacylglycerides	75 ±29	83 ±36	0.45		
Cholesterol	162 ±29	167 ±19	0.59		
Glucose	75 ±10	75 ±9	0.92		

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