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ANTHROPOMETRIC AND NUTRITIONAL PROFILE OF MALE MOUNTAIN BIKERS

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ABSTRACT
ROSSI, L.; CANDELÁRIA, V. K. C. G.; GOMES, P. S. Anthropometric and nutritional profile of male mountain bikers. Brazilian Journal of Biomotricity, v. 4, n. 3, p. 180-189, 2010. Off-road cycling or mountain biking (MTB), the cross-country modality (XC), is an Olympic sport that physiologically requires high strength, endurance and aerobic capacity. However, little is known about the nutritional and anthropometric profile of practitioners of this modality. Purpose: To characterize the nutritional and anthropometric profile of male practitioners of off-road cycling (cross-country). Methods: Twelve male mountain bikers, aged 31.2 ± 6.2 years, were evaluated based on anthropometric measures, fat percentage, anamnesis, food intake and total energy expenditure (TEE), assessed to determine the adequacy of macro and micronutrient intake. Body composition was satisfactory and consistent with the adequate levels for health and performance. Dietary intake was normocaloric and the intake of carbohydrates was 54.4 ± 7.9%, proteins 17.3 ± 3.6%, lipids 28.3 ± 7.3%, and fiber 24.6 ± 10.7 g. Micronutrients were adequate: 91.8%, 169.5%, 67.3% for vitamins A, C and E, respectively, and 37.2% for iron. The food intake of mountain bikers is adequate for their TEE but should be balanced to enhance efficiency.

Keywords: Anthropometry, body composition, nutritional assessment, food intake, cycling.

RESUMO
ROSSI, L.; CANDELÁRIA, V. K. C. G.; GOMES, P. S. Perfil antropométrico e nutricional de praticantes de MOUTAIN BIKE

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RESUMO
ROSSI, L.; CANDELÁRIA, V. K. C. G.; GOMES, P. S. Anthropometric and nutritional profile of male mountain bikers. Brazilian Journal of Biomotricity, v. 4, n. 3, p. 180-189, 2010. Ciclismo off-road ou mountain bike (MTB) a modalidade cross-country (XC) é um esporte Olímpico que fisiologicamente exige força, resistência e capacidade aeróbica do competidor. Porém, pouco se sabe a respeito do perfil antropométrico e nutricional do praticante desta modalidade. O objetivo da pesquisa compreendeu caracterizar o perfil antropométrico e nutricional de praticantes do sexo masculino de ciclismo off-road (cross-country). Para tanto foram avaliados 12 desportistas do sexo masculino com idade 31.2 ± 6.2 anos; foram realizadas medidas antropométricas, avaliação do percentual de gordura, anamnese, avaliação do consumo alimentar e estimativas do gasto energético total (GET) para determinação da adequação no consumo de macro e micronutrientes. A análise da composição corporal se mostrou satisfatória e compatível com nível adequado de saúde e rendimento. A ingestão dietética foi normocalórica, sendo o consumo de carboidratos de 54.4 ± 7.9%, proteínas 17.3 ± 3.6%, lipídios 28.3 ± 7.3% e fibra de 24.6 ± 10.7 g. Os micronutrientes apresentaram adequação de 91.8%, 169.5%, 67.3% para as vitaminas A, C e E, respectivamente, e 37.2% para ferro. A ingestão alimentar de ciclistas de mountain bike é adequada para o GET mas deve ser equilibrada para melhorar a eficiência.
respectivamente e 37,2% para ferro. Assim, conclui-se que a alimentação apresenta-se adequada dentro do GET, porém necessita ser balanceada para potencializar o rendimento.

**Palavras-chave:** Antropometria, composição corporal, avaliação nutricional, consumo alimentar, ciclismo.

### INTRODUCTION

According to the Brazilian Olympic Committee (BOC), cycling was recognized as a sport with the creation of the International Cycling Union (ICU) in 1895. Competitions can be individual or in teams including velocity, time and pursuing disputes, whereas the Olympic Games involve four cycling modalities: track, road, mountain or mountain bike (cross-country) and cyclocross (COB, 2010). Professional cyclists in training and competition phase are subjected to high effort intensity to maintain a great potency over the practice (CARPES et al., 2005). Competitive cycling, either in tracks or in roads, is a physically demanding sport that overloads both the aerobic and the anaerobic system (STAPELFELDT et al., 2004). A typical cyclist has low body fat percentage, high oxygen capacity, good anaerobic capacity and strong musculature of the lower limb (KNECHTLE et al., 2005).

The history of cycling is remote; nevertheless, mountain biking (MTB) is comparatively a new modality that arose at the end of the 1970s in the United States and was recognized in 1990 by ICU (PRINS et al., 2007). In Brazil, the first championships started at the beginning of the 1980s and rapidly changed from a recreational activity to a sport (COB, 2010).

As regards the binomial anthropometry and efficiency, body mass (BM) is related to the athlete’s performance since to resist the force of gravity in uphill courses a great power output is needed, the latter being directly influenced by the cyclist BM and the bicycle weight (PRINS et al., 2007; MACHADO et al., 2002). The remaining compounds associated with efficiency are somatotype, body composition and fat mass/fat-free mass ratio (LEE et al., 2002). The interest and the participation in MTB competitions have increased in the last years in Brazil. Similarly to all sports, MTB requires specific nutritional cares. The complex metabolism and demands in competitions must be studied to establish appropriate recommendations for the practice of this modality. Although the bicycle evolution and the energetic, biomechanical and anthropometric aspects related to efficiency enhancement are well known (CARPES et al., 2005; STAPELFELDT et al., 2004; KNECHTLE et al., 2005; PRINS et al., 2007; MACHADO et al., 2002; LEE et al., 2002), there are scarce studies on the dietary habit of MTB practitioners and athletes, keeping their actual nutritional needs unknown.

The present work aimed to characterize the anthropometric and nutritional profile of cross-country mountain bikers using anthropometric assessment, nutritional anamnesis and food intake report to establish possible recommendations and nutritional strategies for the practitioners of this sport modality.

### MATERIAL AND METHODS

**Sample**

Fourteen assiduous MTB male practitioners were enrolled in this study; they were textually and orally informed about the study aims and methodology and signed a free and informed consent, approved by the Research Ethics Committee at Centro Universitário São Camilo under the number 047/05.
Anthropometric measures

For anthropometric measurement and bio-impedance test, participants were instructed as described in other works in this field (ROSSI e TIRAPEGUI, 2001).

Body mass (kg) was measured using a portable digital scale Tanita® (TBF-551), 150kg capacity and 0.2kg accuracy; all participants were barefoot and wore light clothes. Stature (cm) was measured though a portable stadiometer Seca® Bodymeter 208, 0.1mm accuracy. Based on these measures, Body Mass Index (BMI) was calculated using the body mass/stature ratio\(^2\), expressed as kg/m\(^2\); cutoff points were employed according to WHO (OMS, 1998).

As regards skin folds, the compass Lange® was used for the following sites, according to Benedetti el ali (2003): biceps (BI), triceps (TR), subscapular (SB), pectoral (PT), medial axillary (MA), supra-iliac (SI), abdominal (AB), thigh (TH) and medial calf (MC). Perimeters were determined using an inelastic tape measure model Sunny medical for the following sites, as described by Martins and Lopes (2003): wrist (WP), arm (AP), forearm (FAP), abdominal (ABP), hip (HP), medial thigh (MTP), medial calf (MCP) and supra-patellar (SPP).

Bio-impedance analysis (BIA) (Biodynamics® 310e) was used to assess total water in body mass (kg), water percentage relative to total body mass, hydration percentage in fat-free mass, basal metabolic rate (kcal); bio-endurance (\(\Omega\)) and reactance (\(\Omega\)) (ROSSI e TIRAPEGUI, 2001). To calculate body density (D), the anthropometric equation of Jackson & Pollock (1978) was employed: \[ D = 1.099075 - 0.0008209 (\sum \text{pectoral, abdominal and thigh skin folds}) + 0.0000026 (\sum \text{pectoral, abdominal and thigh skin folds})^2 - 0.0002017 \text{(age in years)} - 0.00018586 \text{(forearm perimeter in cm)}, \text{valid for the Brazilian population}; \text{to obtain fat percentage (%G), Siri (1961) equation was adopted.} \]

Anamnesis

Each participant was subjected to a nutritional anamnesis, in which personal data were obtained, including name, education level, birth date, age, diseases, body mass changes, profession, weekly sport practice, use of nutritional supplement and satisfaction with own body.

Food Intake

To collect data concerning food intake, a three-day food record and a 24h recall were employed to improve the reliability of mean food intake data. For nutrient calculation, the nutritional software Clinical DietWin®, version 3.0 (Brubins®), was used. To assess macronutrient requirement, the guidelines of “Sociedade Brasileira de Medicina do Esporte” (SBME, 2009), American Heart Association (AHA) (2000), and “Sociedade Brasileira de Nutrição e Alimentação” (SBME) (1990) were followed; for micronutrients, the dietary reference intake (DRI) of Food and Nutrition Board (FNB)/Institute of Medicine (IOM) (FNB, 1997; FNB, 2000; FBN,2001) was adopted.

Sport competition history

A competition history including the three main titles and records of participation in sport competitions was requested.

Total Energy Expenditure Calculation

To calculate total energy expenditure (TEE) the software Clinical DietWin®, version 3.0 (Brubins®), was used, considering that the sample was constituted of physically active practitioners and adopting a moderate activity factor (OMS, 1998).
Statistical Analysis

Data were expressed as central tendency and variability measures, and the coefficient of variation was calculated as follows: \( CV = \frac{\text{standard deviation}}{\text{mean}} \times 100 \).

RESULTS

Table 1 presents the mean characteristics of MTB practitioners, 91.7% of them being classified as eutrophic and 8.3% as low lightweight (ROSSI e TIRAPEGUI, 2001). Wrist perimeter and stature indicated that, on average, the sample had small frame (ROSSI et al, 2009).

**Table 1 -** Mean, standard deviation (SD) and coefficient of variation (CV) for data on the anthropometric profile of MTB practitioners.

<table>
<thead>
<tr>
<th>Individuals (n=12)</th>
<th>Age (years)</th>
<th>Body mass (kg)</th>
<th>Stature (cm)</th>
<th>BMI (kg/m²)</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>31.2</td>
<td>68.5</td>
<td>176.4</td>
<td>22.0</td>
<td>10.7</td>
</tr>
<tr>
<td>SD</td>
<td>6.2</td>
<td>6.7</td>
<td>6.3</td>
<td>1.8</td>
<td>0.5</td>
</tr>
<tr>
<td>CV</td>
<td>19.8</td>
<td>9.8</td>
<td>3.6</td>
<td>8.2</td>
<td>4.9</td>
</tr>
<tr>
<td>Minimal</td>
<td>24</td>
<td>60.0</td>
<td>165.4</td>
<td>17.98</td>
<td>9.7</td>
</tr>
<tr>
<td>Maximal</td>
<td>42</td>
<td>79.4</td>
<td>186.4</td>
<td>24.28</td>
<td>11.9</td>
</tr>
</tbody>
</table>

High education level was detected for 66.7% cyclists (complete higher education). Considering anamnesis, there was one report of hypertension; 58.3% had recent body mass change and 50% were satisfied with their current body mass. MTB practice frequency was 1-2 times per week for 33.3%, 3-4 times per week for 50%, and 5 times per week for 16.7% of the sample. Besides MTB, 33% practiced strength training, 16.7% swimming, and 8.3% surfing, jogging and walking. Supplement consumption was reported by 41.7%, predominating carbohydrates (energetic supplements), hydro-electrolytic solutions, poly-vitamins, protein bars and others.

The competition history showed that although all cyclists regularly participated in competitions, the MTB athlete profile was discarded based on their placing; thus, the sample was characterized as male practitioners engaged with this sport modality. Skin fold measures and perimeters are presented in Table 2; the highest coefficient of variation (CV) was obtained for arm (9.1%) and the lowest for wrist (3.5%). Among skin folds with the lowest CV are thigh, calf and subscapular, whereas those with the highest CV include pectoral, abdominal and medial axillary. There was lower variability in the values obtained for perimeters (3.5 < C >9.1) than for skin folds (27.9 < D > 48.7).

As shown in Table 3, BIA data indicate that the practitioners had adequate conditions for the trial, i.e. lean mass hydration percentage between 69.5 and 74.5% (mean 70.9 ± 1.3%) (ROSSI et al, 2009), suggesting they were euhydrated.

The nutritional values obtained through food record are shown in Table 4.

Table 5 contains information on fiber and micronutrient intake, as well as nutritional adequacy (%ADQ) when necessary.
Table 2 - Mean, standard deviation (SD) and coefficient of variation (CV) for anthropometric measures of skin folds and body perimeters of MTB practitioners.

<table>
<thead>
<tr>
<th>Skin folds</th>
<th>Perimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR SB PT MA SI AB TH MC AP FAP ABP HP MTP MCP SPP</td>
<td></td>
</tr>
<tr>
<td>11.2 13.5 9.6 9.7 18.0 19.0 14.7 7.7 29.1 25.8 77.6 93.9 52.2 35.5 38.0</td>
<td></td>
</tr>
<tr>
<td>4.3 3.9 4.7 4.5 7.7 8.9 4.1 2.2 2.5 1.3 8.7 4.0 1.9 2.0 2.0</td>
<td></td>
</tr>
<tr>
<td>38.6 28.8 48.7 46.2 43.1 47.0 27.9 28.3 9.1 4.9 8.6 4.2 3.6 5.8 5.4</td>
<td></td>
</tr>
<tr>
<td>5.0 8.0 2.5 4.5 7.0 8.0 6.0 4.0 22.5 23.0 68.0 88.5 49.0 31.0 35.0</td>
<td></td>
</tr>
<tr>
<td>18.5 21.5 17.0 18.0 28.0 31.0 20.0 10.0 22.5 27.0 90.0 99.0 56.0 37.5 41.0</td>
<td></td>
</tr>
</tbody>
</table>

Legend: Skin folds: BC (biceps), TR (triceps), SB (subscapular), PT (pectoral), MA (medial axillary), SI (supra-iliac), AB (abdominal), TH (thigh), MC (medial calf). Perimeters: AP (arm), FAP (forearm), ABP (abdominal), HP (hip), MTP (medial thigh), MCP (medial calf) and SPP (supra-patellar).

Table 3. Mean, standard deviation (SD) and coefficient of variation (CV) for body composition indicators of MTB practitioners.

<table>
<thead>
<tr>
<th>Individuals (n=12)</th>
<th>%F</th>
<th>BMR (kcal)</th>
<th>TBW (kg)</th>
<th>% body mass water (kg)</th>
<th>% H2O FFM</th>
<th>Endurance (ohms)</th>
<th>Reactance (ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>13.2 a</td>
<td>1799.3</td>
<td>42.0</td>
<td>60.6</td>
<td>70.9</td>
<td>493.1</td>
<td>59.9</td>
</tr>
<tr>
<td>SD</td>
<td>5.5</td>
<td>128.2</td>
<td>3.6</td>
<td>4.0</td>
<td>1.3</td>
<td>51.4</td>
<td>6.5</td>
</tr>
<tr>
<td>CV</td>
<td>41.7</td>
<td>7.1</td>
<td>8.5</td>
<td>6.6</td>
<td>1.9</td>
<td>10.4</td>
<td>10.9</td>
</tr>
<tr>
<td>Minimal</td>
<td>4.7</td>
<td>1584.0</td>
<td>36.6</td>
<td>54.4</td>
<td>69.1</td>
<td>410.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Maximal</td>
<td>20.8</td>
<td>1967.0</td>
<td>47.3</td>
<td>67.8</td>
<td>73.1</td>
<td>609.0</td>
<td>74.0</td>
</tr>
</tbody>
</table>

Legend: %F fat percentage by Jackson and Pollock 12; BMR: basal metabolic rate, TBW: total body water, FFM: fat-free mass.

Table 4. Mean, standard deviation and coefficient of variation (CV) of total energy expenditure (TEE), calorie and energetic macronutrient intake for MTB practitioners.

<table>
<thead>
<tr>
<th>Individuals (n=12)</th>
<th>TEE kcal</th>
<th>Calories kcal/kg</th>
<th>Carbohydrates g/kg</th>
<th>TCI</th>
<th>Proteins g/kg</th>
<th>Lipids TCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2878.9 (42.2)</td>
<td>2657.9 (39.3)</td>
<td>5.4 (54.4)</td>
<td>[1.6]</td>
<td>[17.3]</td>
<td>(1.2) [28.3]</td>
</tr>
<tr>
<td>SD</td>
<td>205.1 (3.0)</td>
<td>682.2 (11.3)</td>
<td>[1.9] [7.9]</td>
<td>(0.6)</td>
<td>[3.6]</td>
<td>(0.3) [7.3]</td>
</tr>
<tr>
<td>CV</td>
<td>7.1 (7.0)</td>
<td>25.7 (28.7)</td>
<td>(35.5) [14.6]</td>
<td>(34.5)</td>
<td>[20.9]</td>
<td>(28.4) [25.8]</td>
</tr>
<tr>
<td>Minimal</td>
<td>2534.4 (37.9)</td>
<td>1429.0 (18.6)</td>
<td>(1.7) [36.5]</td>
<td>(0.8)</td>
<td>[13.0]</td>
<td>(0.8) [19.3]</td>
</tr>
<tr>
<td>Maximal</td>
<td>3147.2 (47.2)</td>
<td>3989.5 (66.5)</td>
<td>(10.1) [65.7]</td>
<td>(2.7)</td>
<td>[25.5]</td>
<td>(2.0) [45.7]</td>
</tr>
</tbody>
</table>

Table 5. Mean, standard deviation and coefficient of variation (CV) of fiber and micronutrient intake for MTB practitioners.

<table>
<thead>
<tr>
<th>Individuals</th>
<th>Fiber (g)</th>
<th>Vitamin A (mcg)</th>
<th>Vitamin C (mg)</th>
<th>Vitamin E (mg)</th>
<th>Calcium (mg)</th>
<th>Iron (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>24.6</td>
<td>826.3</td>
<td>152.6</td>
<td>10.1</td>
<td>906.3</td>
<td>16.4</td>
</tr>
<tr>
<td>SD</td>
<td>10.7</td>
<td>374.9</td>
<td>124.2</td>
<td>6.0</td>
<td>341.3</td>
<td>6.1</td>
</tr>
<tr>
<td>CV</td>
<td>43.6</td>
<td>45.4</td>
<td>81.4</td>
<td>59.2</td>
<td>37.7</td>
<td>37.2</td>
</tr>
<tr>
<td>% ADQ</td>
<td>24.6</td>
<td>91.8</td>
<td>169.5</td>
<td>67.3</td>
<td>-</td>
<td>205</td>
</tr>
<tr>
<td>Minimal</td>
<td>12.7</td>
<td>347.9</td>
<td>18.8</td>
<td>2.6</td>
<td>411.8</td>
<td>9.4</td>
</tr>
<tr>
<td>Maximal</td>
<td>43.8</td>
<td>1488.0</td>
<td>450.0</td>
<td>26.2</td>
<td>1538.8</td>
<td>27.1</td>
</tr>
</tbody>
</table>

Legend: %ADQ (adequacy percentage) according to the committee of Food and Nutrition Board (FNB) / Institute of Medicine (IOM)17-19.
DISCUSSION

The sample was composed of healthy young male adults of high education level, which positively leads to great reliability of the data obtained from the questionnaire (such as anamnesis, three-day record, 24h recall, habits of hydration) filled in by the individuals themselves (ROSSI et al, 1999; CRUZ et al, 2009). As regards the practice of physical exercises and specially MTB, the sample had a physically active, assiduous, competitive profile. Exercise is known to provide innumerable advantages to the health, acting as an important element in the protection against the development of nontransmissible chronic diseases (DIAS et al, 2008; ALMEIDA et al, 2004). On average, participants had small frame, a positive and determining factor to achieve the minimal body mass for this sport modality, since several national and international works have highlighted the relationship between body composition and the cycling modality efficiency, especially when the body is demanded against gravity (uphill) (KNECHTLE et al, 2005; MACHADO et al, 2002). Physical characteristics such as size, body composition and stature influence the performance improvement (LEE et al, 2002), which can lead to long-term reaching of the competitive goals established by the study participants.

The highest variability in skin fold values was detected for trunk (PT > AB > MA > SI), probably reflecting differences in the training degree since the aerobic exercise provides, among other changes, an increase in fat oxidation and fat tissue mobilization in the trunk region (KNECHTLE et al, 2005). Regular physical activity stimulates the organism to physiologically and metabolically adapt, gradually increasing the exercise intensity and duration, enhancing triglyceride oxidation and favoring weight loss and control (FRANCHISCHI et al, 2001).

The fat percentage obtained through double indirect methodology indicates that the sample presents a value within the expected mean for the population, i.e. from 15 to 16% (ROSSI et al, 2009). Body fat distribution, besides indicating processes related to the risk and worsening of degenerative-chronic diseases, is associated with athletic patterns and is one of the efficiency determining factors for high-level cyclists (KNECHTLE et al, 2005). Among the studies related to body fat topography in Brazilian samples is that of Costa (COSTA, 2001), who determined the sum of skin folds to analyze the body fat quantity and distribution. Thus, the sum of nine selected skin folds ($\sum_9 = TR + SB + PT + BI + MA + SI + AB + TH + MCP$) was directed to total fat assessment. The mean of the sum of skin folds of MTB practitioners ($107.7 \pm 37.3$ mm, age range from 30.0 to 39.0 years) placed them within the P10-P25 percentile, i.e. below that expected for a healthy population, indicating reduced total body fat (SIRI, 1961). In addition, according to BMI, this sample included no overweight MTB practitioner. These results strongly suggest that the cyclists had greater amount of lean mass resultant of gain and/or preservation, compared to eutrophic sedentary individuals; this clearly means an advantage concerning health, cardiorespiratory conditioning and body composition (WOLF, 2006).

Another approach, used in the field of cineanthropometry and physical conditioning, adopts the definition of “Beneficial Health Zone” (PETROSKI, 2003), which suggests that within a certain age range (30 to 39 years), the relationship among the adequacy of BMI ($22.0 \pm 1.8$ kg/m$^2$), ABP ($77.6 \pm 6.7$ cm), and sum of five ($\sum_5 = TR + BI + SB + SI + MC = 54.7 \pm 16.5$ mm) and two skin folds ($\sum_2 = SB + SI = 31.5 \pm 10.7$ mm) classify the sample
of the present study as “body composition within the interval considered optimal to the health”. Globally, results reinforce the benefits from MTB practice relative to total body fat and its topographical distribution; although they were moderate practitioners, short- and long-term effects on their health are noticeable and measurable.

Comparing the results obtained based on energy consumption and expenditure, there was a deficit of 7.7% (221.0 kcal). Considering food record data are reliable, there is lower energy intake, which may cause body mass reduction. As a hypothesis, this deficit is of 3-4 times per week due to MTB practice, while on the other days the intake is normal or hypercaloric. However, information about energy expenditure and consumption on the days of no sport practice was not investigated, which restricts our discussion about this issue. The eutrophic anthropometric pattern (such as BMI, \( \sum \) skin folds, %F) reinforces that there is equilibrium between energy expenditure and consumption. Macronutrient intake was evaluated according to SBAN guidelines\(^{16}\) and indicated, on average, deficit in carbohydrate intake (54.4 \( \pm \) 7.9% versus 60-70% TCI). As the sample consisted of physically active individuals, an assessment following the guidelines of the SBME (2009), which recommends from 5 to 8 g/kg body mass/day for sport practitioners, indicate that the mean intake obtained (5.4 \( \pm \) 1.9 g/kg body mass/day) was close to the lower intake limit, reflecting inadequacy on days of competitions and/or more exhaustive training. Although the individuals were not athletes, carbohydrate intake should be adequate in any sport modality in order to recover liver and muscle glycogen reserves, the main energetic substrate in physical activities, as well as to potentiate physical efficiency for both the health and the athletic performance goals (ROSSI et al, 1999).

As regards proteins, according to the guidelines of the AHA (2000), there is an excess of total calorie mean intake (17.3 \( \pm \) 3.6% versus 15% TCI), characterizing a hyperproteic diet. Besides, although SBME (2009) recommends an intake adequacy, i.e. 1.6 g/kg body mass/day for endurance trials, including cycling, there is probably an excess of this macronutrient, especially if we consider this sample of cyclists (ROSSI et al, 2004). Furthermore, the intake for 3 individuals was above 2 g/kg body mass/day, extrapolating the recommendations of SBAN (1990). Scientific literature on this issue indicates that excessive protein and amino acid intake does not lead to efficiency improvement (ROSSI e TIRAPEGUI, 2000).

For lipids, according to the recommendations of SBAN (1990), there was an excess of mean intake (28.3% versus 20-25% TCI), showing a hyperlipidic diet. The mean of 1.2 \( \pm \) 0.3 g/kg body mass/day is also above that recommended by SBME (2009). Finally, the mean dietary fiber intake was adequate (24.6 \( \pm \) 10.7 g) according to the recommendations of SBAN (1990) and AHA (2000), which suggest the intake of 20g/day and 20-30g/day, respectively, reinforcing a healthy diet pattern.

The benefits from this sport practice are noticeable; however, the increase in aerobic metabolism can intensify the formation of free radicals and the use of metabolic pathways, the regulators of which are vitamins and minerals (LUKASKI, 2004). To evaluate the intake of nutrients important to combat free radicals, the micronutrients vitamins A, C and E, calcium and iron were analyzed according to the dietary reference intake (DRI’s) for healthy males, elaborated by the committee of Food and Nutrition Board (FNB)/Institute of Medicine (IOM) (FNB, 1997; FNB, 2000; FNB, 2001). There was a deficit in the mean intake of vitamin A (retinol) according to RDA recommendations (826.3 \( \pm \) 374.9 versus 900 \( \mu \)g/day). On the other hand, there was excessive mean intake of vitamin C (ascorbic acid), according to RDA (152.6 \( \pm \) 124.2 mg versus 90 mg), but below the UL (2,000 mg); the recommendation of SBME (2009) for athletes subjected to intense training schedule is 500 mg/day, due to its important antioxidant action besides immune system improvement. The...
mean intake of vitamin E (tocopherol) was inadequate according to RDA and EAR (10.1 ± 6.0 mg versus 15 and 12 mg, respectively), which evidences insufficient consumption, requiring an increase in the consumption of food sources, mainly due to the synergism between vitamins C and E on the sport efficiency and practice (EVANS, 2000).

For calcium, there was an inadequate mean intake according to AI and SBME (2009) (906.3 ± 341.3 mg versus 1,000 mg/day). At last, iron intake was adequate according to SBME (2009) and RDA (16.4 ± 6.1 mg versus 10-8 mg/day) in 164% and 205%, respectively.

In general, the results concerning macronutrients indicate that slight food intake corrections could improve the diet adequacy; however, a limitation of the study is the investigation of reported food intake instead of biochemical markers of consumption, which could be more reliable to establish bioavailability and deficiency relationships. Nevertheless, the recommendation of not prescribing vitamin-mineral supplements still prevails for this sample since scientific evidence is needed even for athletes (EVANS, 2000).

CONCLUSION

Results indicate that the studied group of mountain bikers has adequate body composition with developed muscular mass and ideal fat percentage, as well as favorable topographic fat distribution (trunk), being at low risk for cardiovascular diseases. The analysis of macronutrient intake indicates that MTB practitioners consume a diet compatible with their total energy expenditure. For micronutrients, vitamin E intake is deficient; however, vitamins A and C, calcium and iron intake is adequate, evidencing a healthy diet and its possible positive correlation to the high socio-economic level of the group. Supplementation for ergogenic purposes is totally unnecessary, only food intake corrections are advisable to prevent nutritional deficiencies.

REFERENCES


