In this study is presented the details of an alternative methodology for iron blood evaluation using a portable X-Ray Fluorescence Spectrometry (PXRFS). The main advantage for using this portable instrument is the fast procedure for iron analysis in blood (few minutes) combined with the viability to use small quantities of blood (10 times less, at least) compared with the conventional clinical tests. Our data can be useful to a well-planned nutritional proposition that could contribute to performance of endurance athletes.

**INTRODUCTION**

**MOTIVATIONS**

**Clinical Tests**
High aerobic activity and dietary habits may result in depletion of body iron stores, which could decreases the aerobic performance increasing the risks of fatigue and immune disorders. Athletes, particularly those involved in endurance sports, are commonly diagnosed with iron deficiency.

**Economic Viability**
According to the last Program External Quality Assessment of clinical laboratories (Brazil, 2014), 1.4 billion clinical tests have been done (~ 4% are biochemical test, mainly for Fe, Na, Ca and K); moreover, it is estimated an increase of ~2% of clinical examinations in 2015.

**OBJECTIVE**

In this study, the iron status was determined in whole blood of amateur athlete’s using the X-Ray Portable X-Ray Spectrometer (PXRFS).

These results were compared with the Control Group (subjects of same age but not involved with sports).

**MATERIAL AND METHODS**

**Runners:** 18 male amateur athletes participated.
These athletes have balanced diet, without multivitamin or mineral supplements

**Control Group (CG):**
46 male healthy donators with the same age and not involved with physical activities

**Sample Collection**

**Runner:** The blood samples were collected at Laboratório de Bioquímica do Exercício (LABEX/UNICAMP - Brazil).

**Control Group:** Samples were collected at Paulista Blood Bank

All the samples were collected through digital puncture with micro capillary (at rest), in the morning.

**Quality control**

IAEA-A13 Blood Animal was used for an analytical quality control

**EXPERIMENTAL PROCEDURE**

**Neutron Activation Analysis**
A) Aliquots of 500μL blood were transferred to plastic bag;
B) Sample and Certified Reference Material (IAEA-A-13) were irradiated (4hs) in the IAEA-R1 nuclear reactor;
C) Gamma-ray (1099 keV) was counted for 6hs using HPGe detector (FWHM=1.92 keV);
D) Iron concentration was determined using the Activation software.

**X-Ray Fluorescence**
A) Aliquots of 50μL (duplicate) was then transferred to the filter paper and dried for few minutes using an infrared lamp.

✓ aliquots of Fe standard solutions was also transferred to filter paper and prepared in the same manner as the biological samples.

B) Si Drift detector (25 mm² x 500μm / 0.5 mil) with Be window;

✓ X-ray characteristics intensities (Kα lines) measured with 30kV and 5 μA excitation;

✓ each samples was irradiated for 300s using 30 kV and 5 μA excitation;

✓ the quantitative analysis (was performed using WinXcom software.

**RESULTS**

| The concentration results in blood for CG |
|-----------------|---------|---------|
| Fe, mgL⁻¹ | NAA | XRF |
| Mean value | 409 | 354 |
| ± 1SD | 60 | 54 |
| Range | 289 - 553 | 246 - 462 |
| Median | 407 | 343 |
| Mode | 420 | 343 |
| Minimum | 315 | 267 |
| Maximum | 495 | 482 |

**Comparison**

Individual concentrations of Fe in blood of Runners with the indicant interval of Control Group

**CONCLUSIONS**

• We presented a new clinical methodology for iron evaluation in blood with the respective confidence interval;

• These data can be considered for evaluating the performance of the athletes during the period of competition preparation, for preparation of balanced diet as well as to contribute for proposing new protocols of clinical evaluation.

Moreover, This alternative procedure can also be used in sports medicine for different modalities...

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