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The Olympic miRnome: an analysis of the complete plasma miRNA profile in maximal aerobic tests during the same season in Olympic medalist kayakers.

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INTRODUCTION:
MicroRNAs (miRNAs) are small non-coding RNA molecules, conserved between species. They can be found intracellularly, controlling gene expression, or circulating in biological fluids, as plasma, creating a crosstalk between tissues (1). Several circulating miRNAs have been described to respond to acute exercise and training (2). However, Olympic medalist athletes were not analyzed until now, so the aim of this study was to identify new biomarkers in medalist athletes to define their training response to an aerobic macrocycle and their acute response to maximal tests previous and after that macrocyle.
METHODS:
Four plasma samples were collected from 4 kayakers (28.8.2±4.0 y) medalist in Tokyo Olympics. The four sampling points were done before and after two maximal aerobic capacity tests in kayakergometer. These two maximal tests had been done at the starting point of the season (A- pretest 1, and B- posttest 1) and after the macrocyle of aerobic development (C, pretest 2, and D posttest 2). In both tests, VO2max and HRmax were recorded. A 752-miRNA plasma profile was measured by qPCR using miRNome panels (Qiagen). Raw data was pretreated by 2^(-ddct) method using to normalize mean miRNA expression values. One factor ANOVA was carried out to compare between points. Pearson analysis was performed to correlate expression with VO2max and HRmax.
RESULTS:
Our results defined a specific response of miR-223-3p at each of the points, an increase in levels between A and D based on training response, and an increase in its expression in acute response in both maximal tests. Specifically in response to training, miR-19a-3p, miR-320b and miR-425-5p increase their expression. In acute response to the early season maximal test, miR-150-5p and miR-197-3p are overexpressed, while miR-132-3p and miR-192-5p levels are reduced, a response that is for the first time described in this work since all maximal test data so far defined an overexpression of miRNA levels. However, in the maximal aerobic performance phase the reality is different, obtaining only the response of overexpression in two miRNAs: one common to the other maximal test miR-197-3p and one specific to this phase, miR-103a-3p. On physiological response no differences were observed neither in HRmax nor in VO2max.
CONCLUSION:
Moreover, as previously described, miR-150-5p was increased in acute response and miR-106b-5p was correlated with aerobic performance (3). However, in these high-performing subjects, new miRNAs emerge as responders not previously considered in the exercise response.
All in all, we have defined a new specific miRNA profile in Olympic medallists in both acute and training response, which is also related to maximal aerobic performance. This opens the door to possible functional analyses of epigenetic differences on high-performance athletes.
1.Wang et al., J Cell Physiol,2016,231(1):25-30
2.Fernandez-Sanjurjo et al. Exerc Sport Sci Rev.,2018;46(3):160-171.
3. Fernandez-Sanjurjo et al. J Strength Cond Res,35(2):287-291

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