Introduction
The mountain bike Santa is rising and is highlighting launching in the national scene of elite athletes who represent Brazil in international competitions. The city of São Bento do Sul, in the northern plateau is contesting relevant national prominence. The topography of the city seems to influence the development of athletes in the mode mountain bike. Thus it is open searches to identify some strength that will prove to be better than the other partners in the state of Santa Catarina.

It is known that the elite cyclists to have a high capacity for oxygen consumption. During the competition the system of transport of oxygen of the cyclist (cardiac output) and consumption (cellular enzymes) are often loaded on the maximum or near maximum (80 to 85% VO₂max. - GARRETT & KIRKENDALL, 1997). The VO₂ max, (…) decreases with increasing altitude this decrease in VO₂ 2 max. It is due to reduction in the blood concentration of oxygen that occurs will measure the pressure of oxygen decreases with altitude progressive (HOWLEY & FRANKS, 2000).

The objective of this study was to evaluate and compare indirectly maximum oxygen uptake alveolar (VO₂ max.) and the maximum oxygen uptake by the myocardium (MVO₂ max.) an athlete born in the mode mountain bike acclimated will altitude of 838m above the sea that participated in the Pan American Games 2007 in Rio de Janeiro and compares it to the level of the sea. The cities chosen for the survey were St. Benedict South to 838m above sea level and Joinville at sea level, both in the state of Santa Catarina.

The effects of training at altitude are similar to those observed at sea level, as well as the lack of training and the rest excessive accru benefits acquired (VIVACQUA & HESPAHNA, 1994). It is important to note that is not the MVO₂ and VO₂, which provides for how to increase the myocardial blood flow during exercise (THOMPSON, 2004). According to McArdle; Katch & Katch (1998, p. 472) "The training at altitude does not provide any additional benefit in relation to the performance observed at sea level, compared equivalent undertaken at sea level."

Methods
Indirect methods allow an assessment of consumption of oxygen bases in the exercises undertaken by individuals in the laboratory or in the field. These indirect tests for the evaluation of VO₂max testing can be divided into sub-maximum and maximum (AMORETTI & BRION, 2001). It is emphasized that the requirements requested by Resolution No. 196/96 of the National Council of Health on the role of human beings in research were followed.

The choice of the sample for testing occurred due to some pre-set criteria such as: young athlete, 27 years of age, healthy, participating evidence of extreme exhaustion and high duration, experienced maximum tests more than once, not reported any commitment to health in recent months. The athlete was evaluated by the maximum oxygen consumption using the protocol test Astrand maximum cycle, which is applied to 838m above sea level, where the athlete is and realize their training and compared to the same test conducted at sea level.

The tests were conducted in the month of October 2007; In room with temperature of 21 to 24 degrees Centigrade and relative humidity of the air between 40 to 60% there interval of 48 hours between their application, with a view to respect the physiological recovery of cyclist. The calibration was used a bicycle stationary model monark mechanical braking, to the protocol itself. The athlete was stimulated will be pedaling a speed of 60 rpm, and each stage of 3 minutes in length, will each stage plus 50 watts of power. The test was interrupted when the athlete failed to produce work due to the locking of the wheel.

The data were: body weight pre-participation, CF (heart rate) pre, intra-and post-test, PA (blood pressure) pre, intra-and post-test. The VO₂ max The formula was derived using indirect: 12 watts x + (weight x 3.5) proposal Astrand & Rodahl (1987). Parameters inotropic and cronotropic were followed for the monitoring of physiological behavior buster, ensuring better security to the test the achievement of the maximal oxygen uptake by the myocardium (MVO₂ max.) If given by the formula indirect employment of Hellerstein: (double product x 0.0014 to 6.3 ml) in (O₂ 100g VE/min).

The product has been obtained using double calculation: (FFháx X SBPmax). The VO₂max alone reflects the functional capacity of the system buster (…) a classification and close to real shows the limit of 40ml/kg/min as the lowest amount of physical capacity for aerobic athletes aged between 20 and 54 years (YAZBEK, 1994). The athlete was accompanied during the period of recovery, noting the behavior athlete, and that all fell to the same parameters found in the pre-participation of the test.

Analysis of the Results
The athlete tested to 838m above sea level (Fig 01) ended the test completing the placement of 350watts, maintained will 60rpm, VO₂max be obtained on 64.4 ml/kg/min and MVO₂ max. Will O2 100g VE 44 ml/min, tests conducted on the campus of St. Benedict Univille-South-SC. After 48 hours, was tested at sea level with the same climatic conditions of the first test.

The same athlete ended the test at sea level (Fig 02) completing the placement of 350watts, maintained will 60rpm and VO₂max on of 64.4 ml/kg/min and MVO₂ max. 48.5 ml of O2 100g VE/min. tests performed at the Academy Coradelli Sports Fitness-Joinville-SC. Except remarks where in the first test, the athlete started the stage during of 400 watts for 12 seconds until the locking of the wheel and stopping, not completing this stage. In the second test, the athlete started the stage of 400 watts during by 33 seconds for the locking of the wheel and stopping, so not completing the stage.

The average values for the maximum oxygen intake for the elite cyclists are among the highest levels recorded; Subject to the male elite if ranged from 67.1 to 77.4 ml/kg/min (GARRETT & KIRKENDALL, 1997). Due to be an elite athlete to athlete and main mode of contesting national and hoped to find a result of VO₂max. At sea level greater than 838m to above sea level. We suspected that their income - if you gave your acclimatization and training in high altitude.

When the control groups were included appropriate, not been proven to live and train at altitude were better than the same training done on the level of the sea (MELLION, 1994). In intra-tracking test was cronotropic and inotropic physiological

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behavior, with no need for any interruption of work early. His recovery is troctópic and inotropic, had physiological behavior.

**Conclusion**

We conclude that the athlete has no variation in their maximum oxygen uptake will alveolar level (VO\textsubscript{max}) Measured indirectly in their environment acclimated will altitude of 838m related to its performance at sea level. His curve of maximum oxygen uptake (VO\textsubscript{max}) Receive no differences between the altitudes where he was evaluated, remaining with the same parameters between the first and second test of 64.4 ml/kg/min.

The athlete remained the same maximum oxygen uptake on the tests, and that their maximum oxygen consumption by the myocardium (MVO\textsubscript{max}). Suffered indirectly observed variations in relation to altitude at which it was tested. Analyzing the curve of the maximal oxygen uptake (Fig. 03) by the myocardium (MVO\textsubscript{max}), I noticed that there was a greater uptake at sea level of 48.5 ml O\textsubscript{2}/100g VE/min. Compared to the test altitude of 838m which were obtained O\textsubscript{2}/100g VE 44 ml/min. A difference of 4.6 ml O\textsubscript{2}/100g VE/min, in their consumption will increase 9.5% at sea level.

The athlete got more performance at sea level for the MVO\textsubscript{max}. Data obtained and evaluated with some corroborating statements found in the literature. According McArdle; Katch & Katch (1998, p. 643) "The aerobic capacity not suffer any measurable change to a higher altitude of 1,500 m. Thereafter, the VO\textsubscript{max}. Suffer a linear reduction of approximately 10% for each increase of 1,000 in altitude. " Aware that tests indirect generate differences in the standard deviation and can be significant in the context in reaching the most accurate, it is so then research the athlete Pan American and its yield using equipment from direct measurement of VO\textsubscript{max}. Need for more acutely their income.

**REFERENCES**


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**COMPARATIVE OF VO\textsubscript{MÁX} AND MVO2MÁX CYCLIST ATHLETES PARTICIPANT IN THE PAN AMERICAN GAMES 2007 MODALIDADE MOUNTAIN BIKE, ACCLIMATIZED ALTITUDE COMPARED TO THE TEST IN THE SEA LEVEL.**

**ABSTRACT**

The literature points to studies on the behavior of the body in the consumption of oxygen at altitude and that individual can benefit from that difference in relation to its performance. This study aimed to assess and compare general will indirectly maximum oxygen uptake alveolar (VO\textsubscript{max}) and maximum oxygen uptake by the myocardium (MVO\textsubscript{max}). An athlete born in the mode mountain bike acclimatization wills altitude of 838m above the sea that participated in the Pan American Games 2007 in Rio de Janeiro, acclimated in altitude of 838m to the test in sea level.
Janeiro e compara-o ao nível do mar. O teste foi realizado de acordo com as seguintes condições: atleta com 27 anos de idade, em boa saúde, participando de prova de ciclismo de alta duração, realizou testes de capacidade máxima de oxigênio pelo miocardio (MVO máx.) e comparou as suas capacidades máximas de oxigênio ao nível do mar, onde foi obtido 48,5 ml de O2/100g VE/min. Comparado ao mesmo teste realizado em altura de 838m acima do nível do mar, que foi obtido 100g VE/min. A diferença de 4,6 ml O2/100g VE/min, aumentando sua capacidade de oxigênio em relação ao nível do mar, e que foi comparado ao mesmo teste realizado ao nível do mar. O atleta recebeu alta de performance significativa ao nível do mar.

KEY-WORDS: VO2Max, Altitude, Cyclist.

COMPARATIVO DE VO2MAX Y MVO2MAX ATLETA CICLISTA PARTICIPANTE EN LOS JUEGOS DE 2007 PANAMERICANOS MODALIDAD DE BICICLETAS DE MONTAÑA, ACCLIMATADO EN ALTURA EN COMPARACIÓN CON LA PRUEBA EN EL MAR.

RESUMO:

A literatura indica que os estudos sobre o comportamento do corpo em relação ao consumo de oxigênio em altitude e sua possível relação com a performance esportiva são inovadores. O objetivo deste estudo foi avaliar e comparar a capacidade máxima de oxigênio alveolar (VO2max) do atleta com 27 anos, em boa saúde, participando de provas de agotamento extremo e de alta duração, com a capacidade máxima de oxigênio alveolar em relação ao nível do mar. O atleta foi avaliado pelo consumo máximo de oxigênio utilizando o protocolo de prova de oxigênio Agóstrã (VO2max) e comparado com o protocolo de prova de oxigênio Agóstrã realizado ao nível do mar. O atleta recebeu alta de performance significativa ao nível do mar.

MOTS-CLES: VO2Max, Altitude, Cyclistes.

COMPARATIFS DE VO2MAX ET MVO2MAX CYCLISTE PARTICIPANT AUX JEUX PANAMÉRICAINE 2007 MODALITÉ VÉLO DE MONTAGNE, ACCLIMATÉ ALTITUDE, COMPARÉ À L’ESSAI DANS LE NIVEAU DE LA MER.

RESUME:

La littérature des points à l’étude sur le comportement de l’organe de la consommation d’oxygène en altitude et que l’individu peut bénéficier de cette différence par rapport à ses performances. Cette étude vise à évaluer et à comparer la capacité maximale de consommation d’oxygène alvéolaire (VO2max) et le maximum d’oxygène par le myocarde (MVO2max). Un athlète née dans le mode VTT acclimatation tests altitude de 838m au-dessus de la mer qui ont participé à la Jeux panaméricains 2007, à Rio de Janeiro et les compare au niveau de la mer. L’échantillon pour l’essai a été, à cause de la base des critères suivants: Jeune athlète à l’âge de 27 ans, en bonne santé, en participant preuve d’une extrême fatigue et de haute durée maximum de l’expérience des tests plus d’une fois, pas signalé aucun engagement pour la santé au cours des derniers mois. L’athlète a été évaluée en fonction de la maximum de la consommation d’oxygène en utilisant le protocole d’essai maximum Astrand cycle, qui est appliqué à 838m au-dessus du niveau de la mer, où l’athlète et de concrétiser leur formation et leur rapport à la même te test effectué au niveau de la mer. Les résultats de cet essai ont été l’athlète resté le même maximum d’oxygène par rapport à 48,4 ml O2/kg de poids/min, et que leur consommation maximale d’oxygenen en essais, et par conséquent homogène (MVO2max). Subies indirectement variations observées sur l’altitude à laquelle se il a été testé. L’analyse de la courbe de la consommation maximale d’oxygène par le myocarde (MVO2max), J’ai remarqué qu’il y avait une plus grande absorption au niveau de la mer de 48,5 ml de O2/100g VE/min. Par rapport à la même test altitude de 838m, qui a été obtenue O2 100g VE 44 ml/min. La différence de 4,6 ml O2/100g VE/min, en augmentant leur consommation de 9,5% au niveau de la mer. L’athlète a reçu de performance significatifs au niveau de la mer.

MOTS-CLES: VO2Max, Altitude, Cyclistes.