

presentaron foco respiratorio; 15 (31.25%), foco abdominal; 7 (14.58%) foco dérmico, y 4 (8.33%) foco urinario. Como antecedente patológico de importancia mencionaremos; H.A.T. con 14.9%; I. Renal Crónica con 10.4% y Diabetes Mellitus con 9.5%.

**Conclusiones:** En este trabajo confrontamos

la epidemiología más frecuente de la mortalidad de los pac. críticos en la Altura (3,340 m.s.n.) remarcando la patología infecciosa como primera causa en pacientes a predominio de la tercera edad que de por sí cursan con depresión inmunocompetente.

### AEROBIC CAPACITY ( $\dot{V}O_2$ max) IN 64 WORKERS PERMANENT DWELLERS AT CHUQUICAMATA (2800 m) AND 24 ANDEAN NATIVES OF ISLUGA (<100 m)

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Maximal exercise was performed in cycle ergometer by 64 workers of Chuquicamata Copper mine (P.B. 548 Torr): 25 truck drivers (CHOF) (age 38.7; Weight/Height Index (W/H I.) 119.3% s.d. 11.6); 21 amateurs sportsmen in habitual training (DEP) (age 33.2; W/H I. 106.3% s.d. 10) and 18 workers of different areas of the mine (TRAB) (age 39.7; W/H I. 111.5% s.d. 15); and 24 Andean indigenous natives studied at Colchane (NAT) (P.B. 484 Torr) (age 30.8; W/H I. 94.2% s.d. 6.7). All the subjects performed progressive workload (3-5) 6 minutes each, under ECG control. Heart rate (HR) (2 min-4 min-6 min), blood pressure, respiratory rate, minute volume of breathing ( $\dot{V}E$ ) (5 min-6 min) were measured. Oxygen uptake ( $\dot{V}O_2$ ),  $CO_2$  production ( $\dot{V}CO_2$ ) and R were calculated by Scholander analysis. Exercise was performed until exhaustion (W max), obtaining HR max directly. Brachial venous blood lactate (BLa) was measured at the beginning and the end of

the exercise in 64 workers of Chuquicamata. Results (mean-SD):

CHOF: W max 2.13 Watt/kg (0.34); HR max 179.7 (11.3)  $\dot{V}O_2$  max 30 ml/min/kg (5.5); BLa max 92.7 mg/dl (19)

DEP: W max 3.2 (0.51); HR max 179.9 (9);  $\dot{V}O_2$  max 43.2 (8.1); BLa max 106.3 (31)

TRAB: W max 2.32 (0.31); HR max 181.1 (9.5);  $\dot{V}O_2$  max 31.4 (5.5); BLa max 84.9 (12.6)

NAT: W max 3.27 (0.25); HR max 174.4 (10.4);  $\dot{V}O_2$  max 45 (4.7)

It is concluded that Wmax and  $\dot{V}O_2$ max of the trained workers is significantly larger than the values of the other groups of Chuquicamata (2800m) ( $p=1 \times 10^{-6}$ ) and similar to the values of the Andean untrained natives studied at 3800m. The HRmax of the group with the worst fitness was similar to the theoretical values of sea level, but the subjects with the best fitness, especially natives and the younger sportsmen, reached the lowest HR max.

### RESPONSE TO THE $CO_2$ AND BUCCAL INSPIRATORY PRESSURE AS AN EXPRESSION OF THE DIAPHRAGMATIC CONTRACTION IN SUBJECTS WITH ERITROCITOSIS PATHOLOGY OF ALTITUDE

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The designation «*Eritrocitosis Patológica de Altura (EPA)*», commonly known as «*Polyglobulia of Altitude*», shows characteristics that differentiates it from other pathologies,

among them the absence of functional respiratory disturbances with a hyposensitivity of the peripheral chemoreceptors to hypoxia and hyperoxia stimulation.



The present communication demonstrates the clinical exploration of the response of the centers of central respiration in subjects with EPA.

We present the application of a novel technique: the diaphragmatic contraction as a manifestation of the ventilatory response to CO<sub>2</sub> stimulation. We analyze the interest in this type of exploration to benefit affected patients.

The objective of this present study is to determine the ventilatory sensitivity to the increasing of CO<sub>2</sub> concentration (PET CO<sub>2</sub> 35, 5, and 55 mmHg) in subjects with EPA, comparing them with normal subjects.

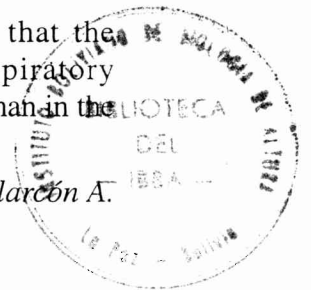
There were 40 male subjects ranging between 15 and 40 years of age and Ht between 56 and 61%. In all subjects received: clinical radiological exam, measurements of pulmonary volumes and

capacities (static and dynamic) with spirometer, arterial gases, (direct puncture) mechanical ventilation, (esophageal balloon method) peripheral sensibility test (Test of Dejours) and resting ECG.

The neuroventilatory system and the response to CO<sub>2</sub> stimulus was studied in closed-circuit, measuring the pressure modifications of occlusion (P.01) at the buccal level, to the beginning of the inspiratory phase, with the respective calculation of the different elements of the ventilatory cycle: VT/Ti and Ti/T tot (Millic, Emili and Grunstein 1976).

The obtained results demonstrate that the sensitivity to CO<sub>2</sub> equal to the respiratory sensitivity is less in subjects with EPA than in the control group.

With the technical participation of Alarcón A. M. and Gonzales C.



## EFFECTS OF ENALAPRIL ON HEMATOCRIT AND CHRONIC MOUNTAIN SICKNESS SCORE.

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People with chronic mountain sickness (CMS) lose their adaptation to high altitude hypoxic environment. The major pathophysiological findings are excessive erythrocytosis (EE) and oxyhemoglobin desaturation (OD).

Enalapril and captopril, angiotensin-converting enzyme inhibitors, have proved to be effective in the treatment of erythrocytosis secondary to chronic renal failure at sea level.

According to this observation we conducted a clinical trial to test the efficacy of enalapril (20 mg/day orally during 30 days) in the reduction of EE of CMS, in 8 men and 6 post-menopause women (aged 34-73 years) native to Cerro de Pasco (4,300 m). CMS was judged by high level of hematocrit (> 64%; measured in a finger stick blood sample) and low levels of oxygen saturation (<82%; measured by pulse oximetry). A CMS score (CMSsc) was elaborated on the basis of ten most frequent symptoms and/or signs found in this disease. The subjects did not have history of smoking or any other serious medical illness. The changes in systolic and diastolic arterial

pressure were not statistically different and no side effects of enalapril were reported.

Before the beginning of treatment subjects showed mean (SE) values of 64.6±1.3% for hematocrit and 17.58±0.68% for CMSsc respectively. They presented significantly lower mean values of hematocrit (62.6±1.07%, p<0.05) and CMSsc (15.08±0.72, p<0.001) after the first 15 days of treatment. At the end of the treatment hematocrit mean values did not decrease significantly in relation to the beginning of treatment (63.7±1.5%) but CMSsc remained significantly lower (14.9±0.87, p<0.02).

The lack of significant differences related to hematocrit values, the last 15 days of treatment, could be explained by the low power of comparison, caused by a decrease in the sample size with time.

Enalapril may be a therapeutic drug for CMS but more clinical trials are necessary to perform in order to reach a definitive conclusion.

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## FUNCTIONAL RESPIRATORY EXPLORATION IN PNEUMOCONIOSIS

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We present the results of functional respiratory exploration in two series of patients with silicosis arising from ten mines situated at high altitude.

The objective of this study is to show the importance of a complete functional respiratory evaluation in silicosis for the assessment of labor-related injury.

We studied 91 patients (series A: n=74, series B: n=17). In addition to clinical-radiological exams, other measurements were taken: pulmonary volume and capacities (spirometer), pulmonary compliance (intraesophageal balloon method), arterial gases (direct puncture), in both resting and exercising states. In series B, the alveolar-capillary diffusion (DLCO, CO method) was also measured.

The most outstanding results in both series

show hypoxia with desaturation accentuated during exercise. In series B, the DLCO was found diminished. The radiological-functional correlation with values obtained during exercise is more evident than when obtained with functional values at rest.

In conclusion, the functional respiratory evaluation in patients with silicosis in our average should appeal to the major quantity of exams that permit certainty in the appraisal and should consider the altitude from which the patients come. Isolated radiological analysis has only diagnostic value, and in no case can serve as a functional evaluation.

With the technical participation of Alarcón A. M. and Gonzales C.

