"altitude." This we find pivotal because the organism of high altitude residents going down to sea level, has to adapt to the "relative hyperoxic environment." It is wrongly assumed that for high altitude residents, going to a lower altitude where there is more oxygen pressure, as a result of a higher barometric pressure, is beneficial. We strongly question this, as high altitude residents, being born, developed, and carrying out normal lives in the mountain cities of the world living in perfect harmony with our environment. We, as Andean high altitude residents, have higher hematocrit and hemoglobin values, as the fundamental compensating biological response. All living beings, humans, animals and plants and presumably other microscopic organisms suffer biologic changes on barometric pressure changes. In other words, physical changes in the environment, induce biological changes. The rules governing physics are imbedded within biology.

The formula of adaptation is not only useful for high altitude adaptation, but rather can be used for any type of adaptation, where the organism in order to survive, needs to find the most energy efficient, fastest rebuild or healing process of the organic systems. An example can be found with a wound in the skin. When the two borders are sutured, the healing process takes around 1 week. This would be:

$$\text{healing adaptation} = \text{time/tissue.}$$

This formula changes in time if the tissue is skin or bone, the later requiring a longer time of a few months. This formula also varies with age, taking longer for the older people:

$$\text{Adaptation to healing} = \text{time/age.}$$

It should be well understood, that the healthier the subject, the better the adaptation. But it also applies to allergic reactions to mosquito bites in those not habituated to them in comparison to those living in those areas. Likewise, a viral aggression like flu, has a latent period of immunity that follows the same rule:

$$\text{Adaptation to viral aggression} = \text{time/type of viral agent.}$$

This formula has other additional variables like nutrition, stress and aggressiveness of the viral agent. Furthermore it also applies to adaptation to smell. When a new perfume is smelled for the first time it is very strong, but persistent use of it changes the capacity of sensing it:

$$\text{Adaptation to smell} = \text{time/scent.}$$

Muscle adaptation to exercise also follows the same formula:

$$\text{Adaptation to exercise} = \text{time/exercise } \Delta.$$

The more exercise, the greater the hypertrophy of the muscles and vice-versa.

In conclusion the Adaptation Formula is a fundamental formula that applies to all biological adaptation processes in the multiple survival mechanisms of all living beings, and can be generalized as:

$$\text{Adaptation} = \text{time/change.}$$

Neural Mechanisms Involved in Autonomic and Respiratory Changes in Rats, Submitted to Short-Term Sustained Hypoxia

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Humans ascending to high altitudes are submitted to sustained hypoxia (SH), activating peripheral chemoreflex with several autonomic and respiratory responses. We analyzed the effect of short-term SH (24 hours, F_{iO_2} 10%) on the cardiovascular parameters in non-anesthetized rats and on the processing of cardiovascular and respiratory reflexes using *in situ* and *in vitro* preparations. SH produced hypertension in awake rats and increased the basal sympathetic activity in an *in situ* preparation and these effects may be related to changes in respiratory-sympathetic coupling. SH increased both the sympatho-inhibitory and bradycardiac components of baroreflex and the sympathetic and respiratory responses of peripheral chemoreflex. Electrophysiological properties and synaptic transmission in the *nucleus tractus solitarius* (NTS) neurons, the first synaptic station of afferents of baro- and chemoreflex, were also evaluated using brainstem slices (*in vitro* studies). The second-order NTS neurons were identified by previous application of fluorescent tracer onto carotid body for chemoreceptor afferents or onto aortic depressor nerve for baroreceptor afferents. SH increased the intrinsic excitability of NTS neurons. Delayed excitation, caused by A-type potassium current (I_{K_A}) was observed in most of NTS neurons from control rats. The I_{K_A} amplitude was higher in identified second-order NTS neurons from control than in

SH rats. SH also blunted the astrocytic inhibition of I_{K_A} in NTS neurons and increased the synaptic transmission in response to afferent fibers stimulation. The reduction of glial cell density was also observed after SH protocol. Therefore, short-term SH produces changes in structural and functional integrity of glial cells, which are essential for neuronal activity and may contribute to the increase in cardiovascular reflex sensitivity (baro- and chemoreflex) and the development of hypertension in awake rats. Financial support: FAPESP, CAPES and CNPq.

Prospective Validation of Framingham Criteria for Congestive Heart Failure Diagnosis in a High-Altitude Population

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Purpose.—To determine the validity of Framingham criteria for heart failure diagnosis in a high-altitude population.

Material and Methods.—This is a prospective, observational, descriptive, and transversal study. The study population was comprised of 97 inpatients hospitalized at Internal Medicine Service at Hospital Nacional del Centro - EsSalud Huancayo, located at an altitude of 3240 m above sea level. Patients included presented with dyspnea on exertion or at least one major Framingham criterion. Echocardiograms were performed with a Sonos 1000 echocardiographer, with color Doppler, B-mode and M-mode techniques. Dichotomous variables were analyzed by Mantel - Haenszel chi square test. A $p < 0.05$ was considered significant.

Results.—Most patients were male (51.6%). Subject age was $69.5 \pm [SD 14.647]$ (20–90) years (mean $\pm$ SD with range). A total of 73.2% of patients were elderly ($n=71$). The most frequent major criteria found were: cardiomegaly (88.9%), hepatojugular reflux (79.2%) and jugular engorgement (69.4%). The most important minor criteria were: exertional dyspnea (91.7%), pleural effusion (69.4%) and lower limb edema (58.3%). Framingham diagnostic criteria were present in 98.6% of patients with heart failure but had a specificity of only 12%. The specificity rose to 76% by using 4 major criteria and to 100% when using 5 criteria. Unfortunately, the sensitivity fell at the same time to 62.5% and 31.9%, respectively.

Conclusions.—Framingham criteria are highly sensitive but nonspecific for the diagnosis of heart failure in high-altitude populations.

Development and Validation of New Sepsis Criteria at High-Altitude

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Introduction.—Current sepsis diagnostic criteria lose precision at high altitude due to physiological variation in vital functions. Because of that, it is necessary to elaborate new sepsis diagnostic criteria, especially designed for its use at populations living at 2000 m above sea level or higher altitudes.

Methods.—This is a prospective, longitudinal and observational study, that took place at EsSalud Regional Hospital at Huancayo. Two cohorts were studied: a derivation cohort (394 patients) and a validation cohort (123 patients). A total of 147 adult patients with sepsis diagnosis and 247 healthy controls were included in the derivation cohort. Sepsis was confirmed with cultures, and diagnosis of infection was made according to CDC and McGeer criteria, in patients admitted to Intensive and Intermediate Care Unit from January 2007 to April 2008. Each case was followed up to discharge or death. With the obtained data, new diagnostic models were devised. A validation cohort of 72 patients with sepsis, 51 hospitalized patients without sepsis and 120 nonhospitalized normal subjects was developed (validation cohort) with patients admitted to Internal Medicina Seervice from January 2012 to December 2013. Diagnostic criteria were evaluated with 2x2 tables, and specificity, sensitivity, negative and positive predictive values, as well as ROC AUC values were determined. Relative risk values and 95% confidence intervals are presented.

Results.—A total of 10 physiological variables were obtained to develop the new criteria. Three of them were selected: respiratory rate >23 , temperature $>37.8^\circ\text{C}$ or 37.5°C , and heart rate >85 beats/minute. More specific alternative