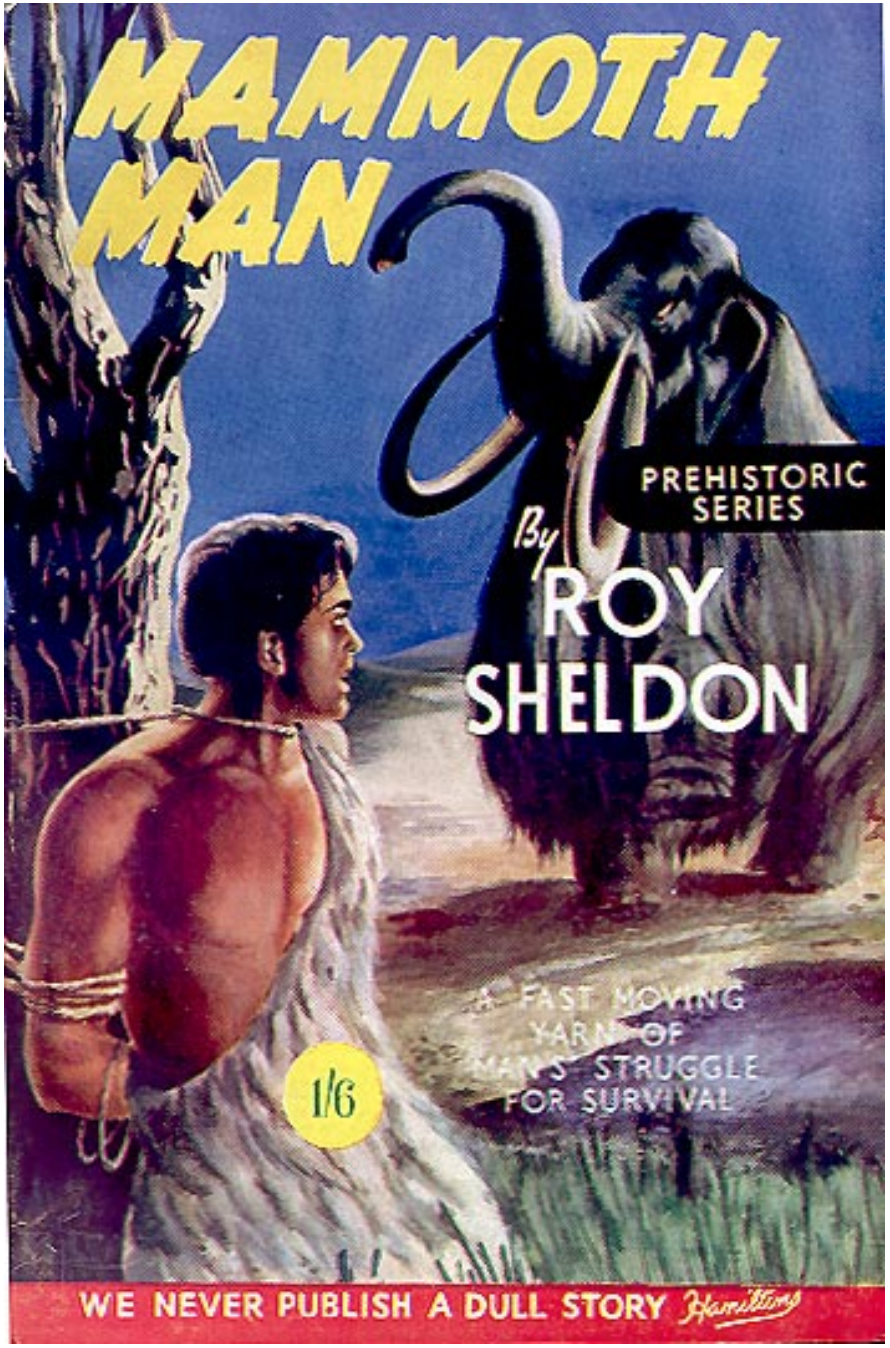
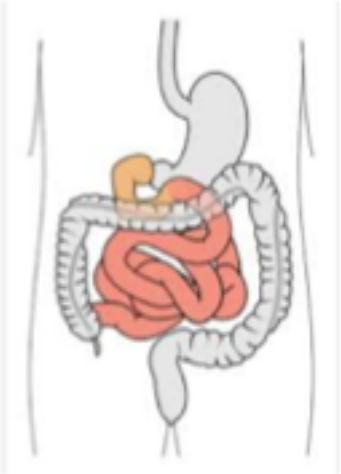

MAMMOTH MAN
PREHISTORIC SERIES
By ROY SHELDON
A FAST MOVING YARN OF MAN'S STRUGGLE FOR SURVIVAL
1/6
WE NEVER PUBLISH A DULL STORY
Hamilton


Black Diamond

- Big Headache Mountain
  - Himalayan peak where mountain sickness was first reported by Too Kin, a Chinese official in 37 BC

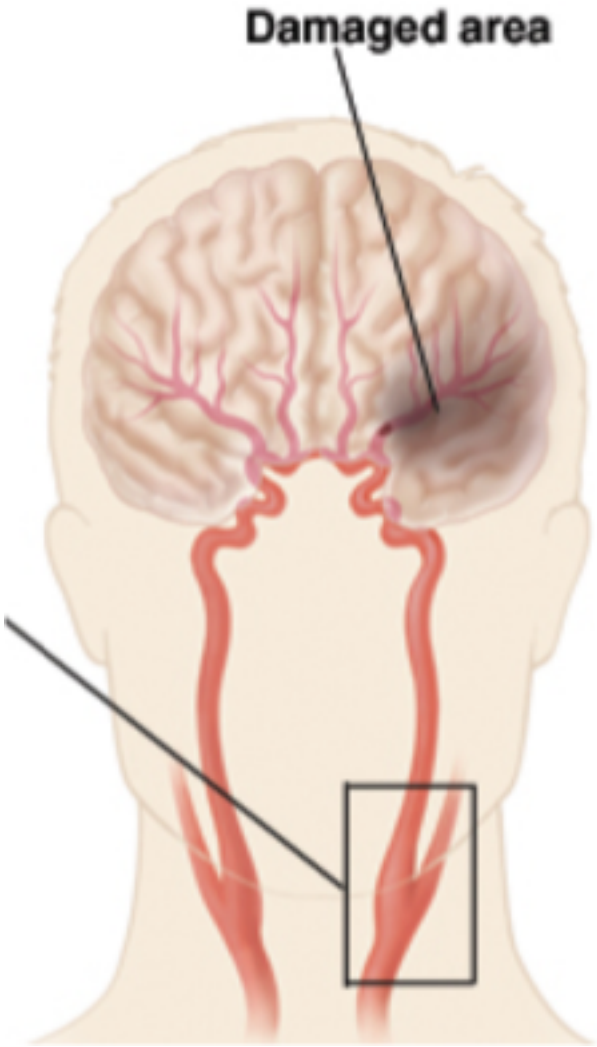


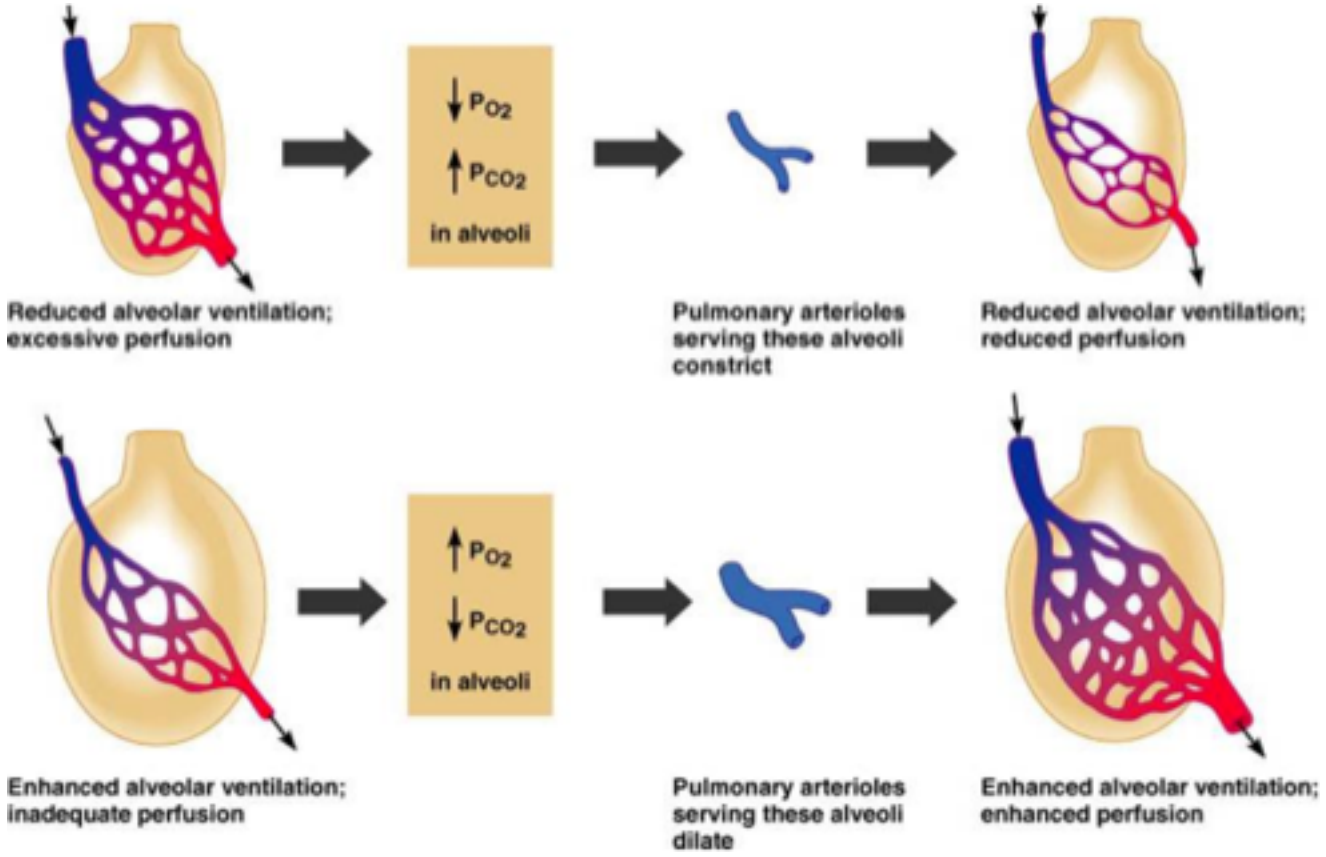
High Altitude Headache

- hypoxemia-induced intracranial vasodilation and subsequent cerebral edema

- acute hypoxia

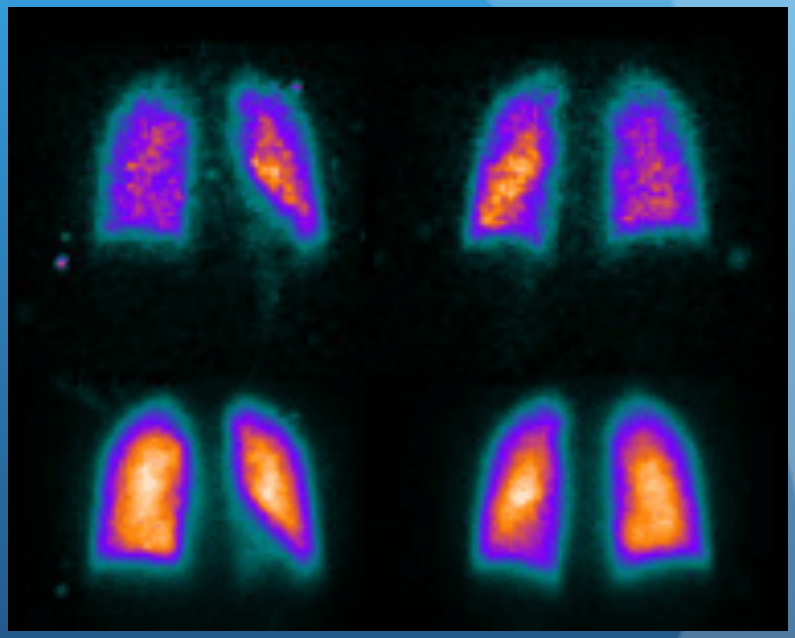
Lopez et al. 2013Curr Pain Headache Rep. 2013 Dec;17(12):383.
Imray et al. 2014 High Alt Med Biol. 2014 Apr;15(1):21-7.


Damaged area

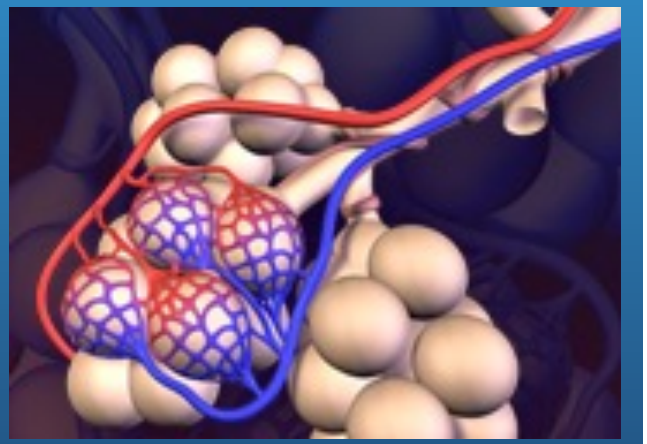

↓ P_{O_2}
↑ P_{CO_2}
in alveoli
Reduced alveolar ventilation; excessive perfusion
Pulmonary arterioles serving these alveoli constrict
Reduced alveolar ventilation; reduced perfusion
↑ P_{O_2}
↓ P_{CO_2}
in alveoli
Enhanced alveolar ventilation; inadequate perfusion
Pulmonary arterioles serving these alveoli dilate
Enhanced alveolar ventilation; enhanced perfusion

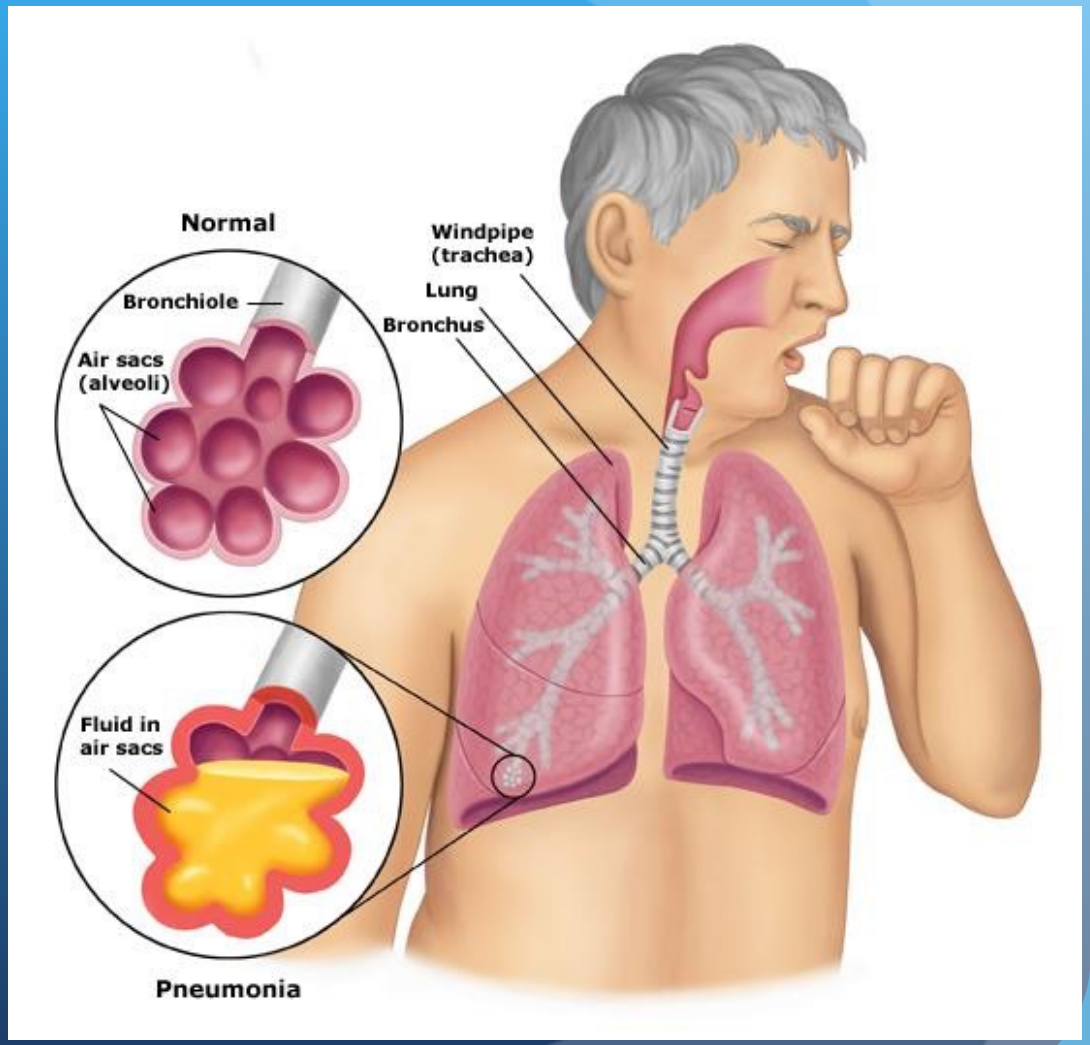
V/Q matching – maintains blood oxygenation

- Air flow and blood flow
- Moves blood towards normal part of lung to maintain normal oxygen levels in arteries.



Vasoconstriction & Pneumonia

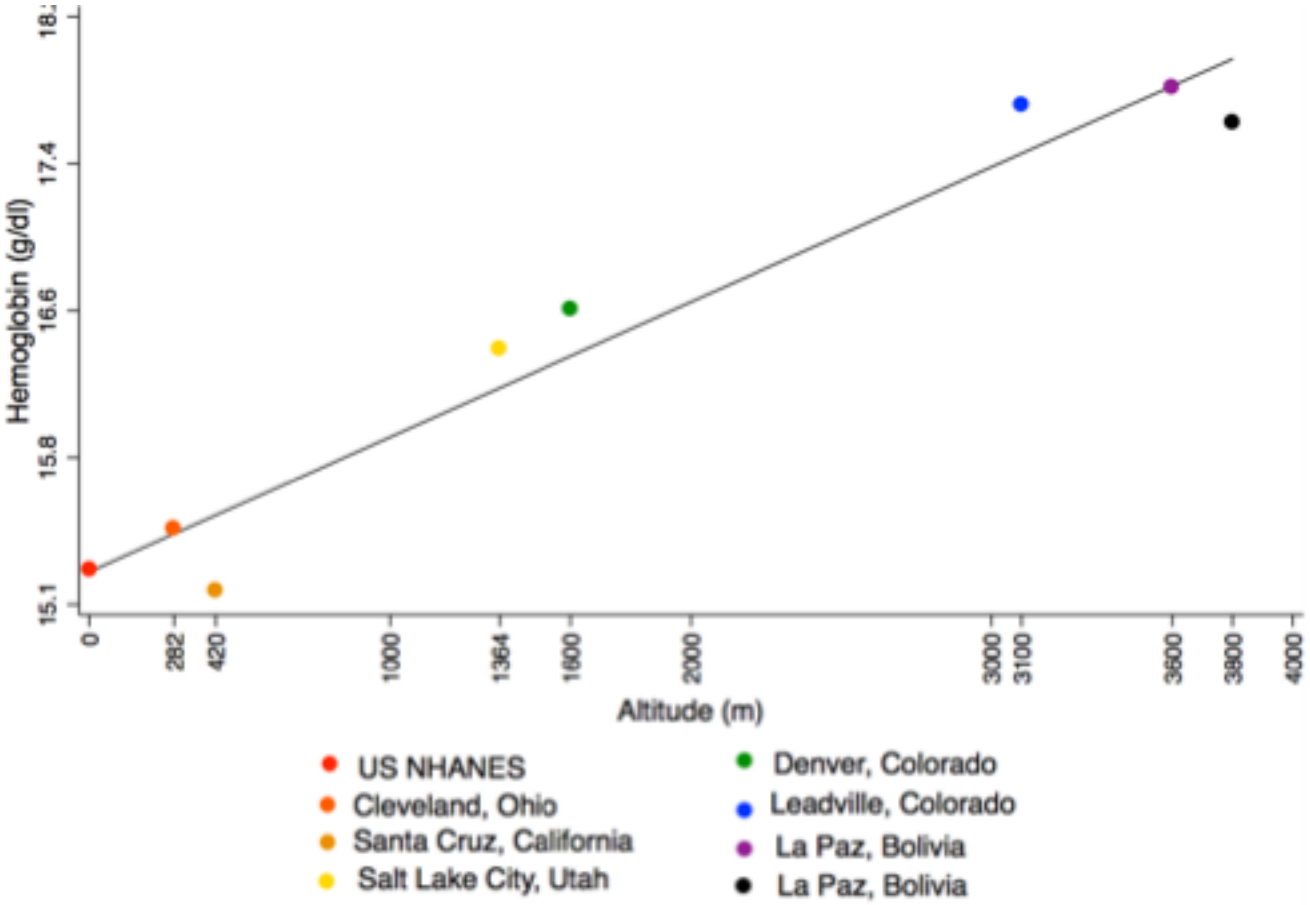




High Altitude Pulmonary Edema

- Lung vessels shrink, pressure goes up, fluid leaks

Hemoglobin and altitude



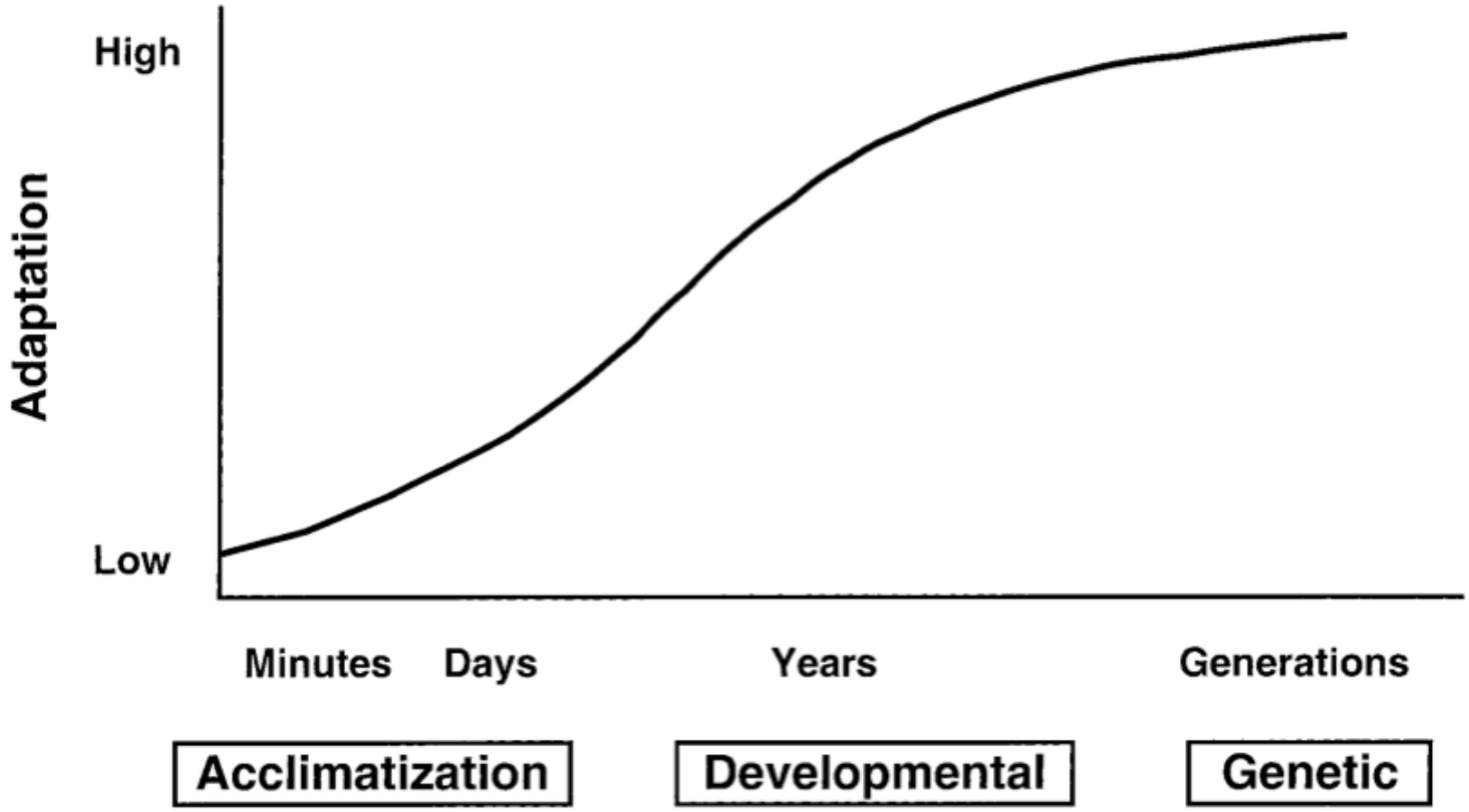


FIG. 1. Adaptation to high altitude in relation to time.

Andes

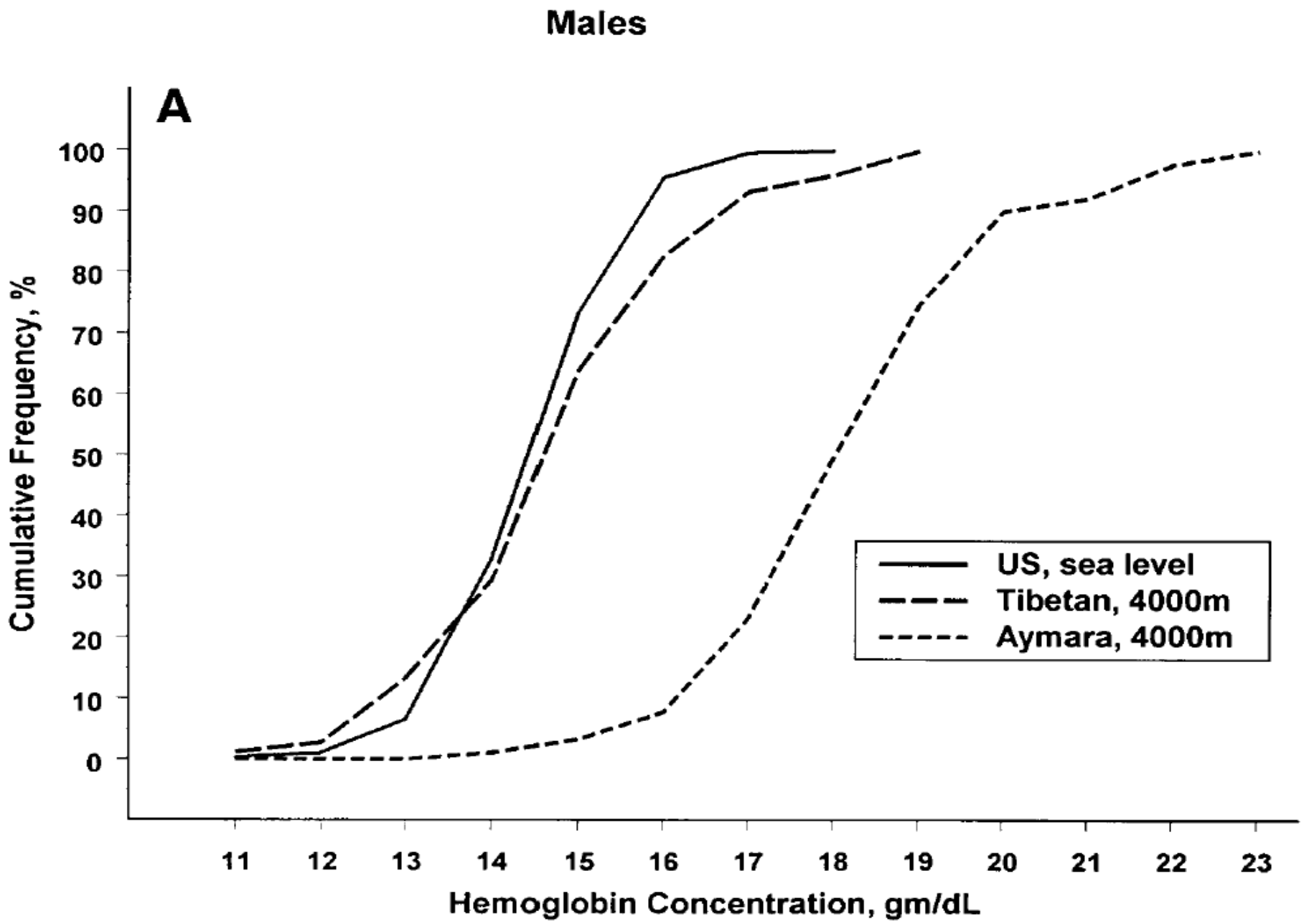
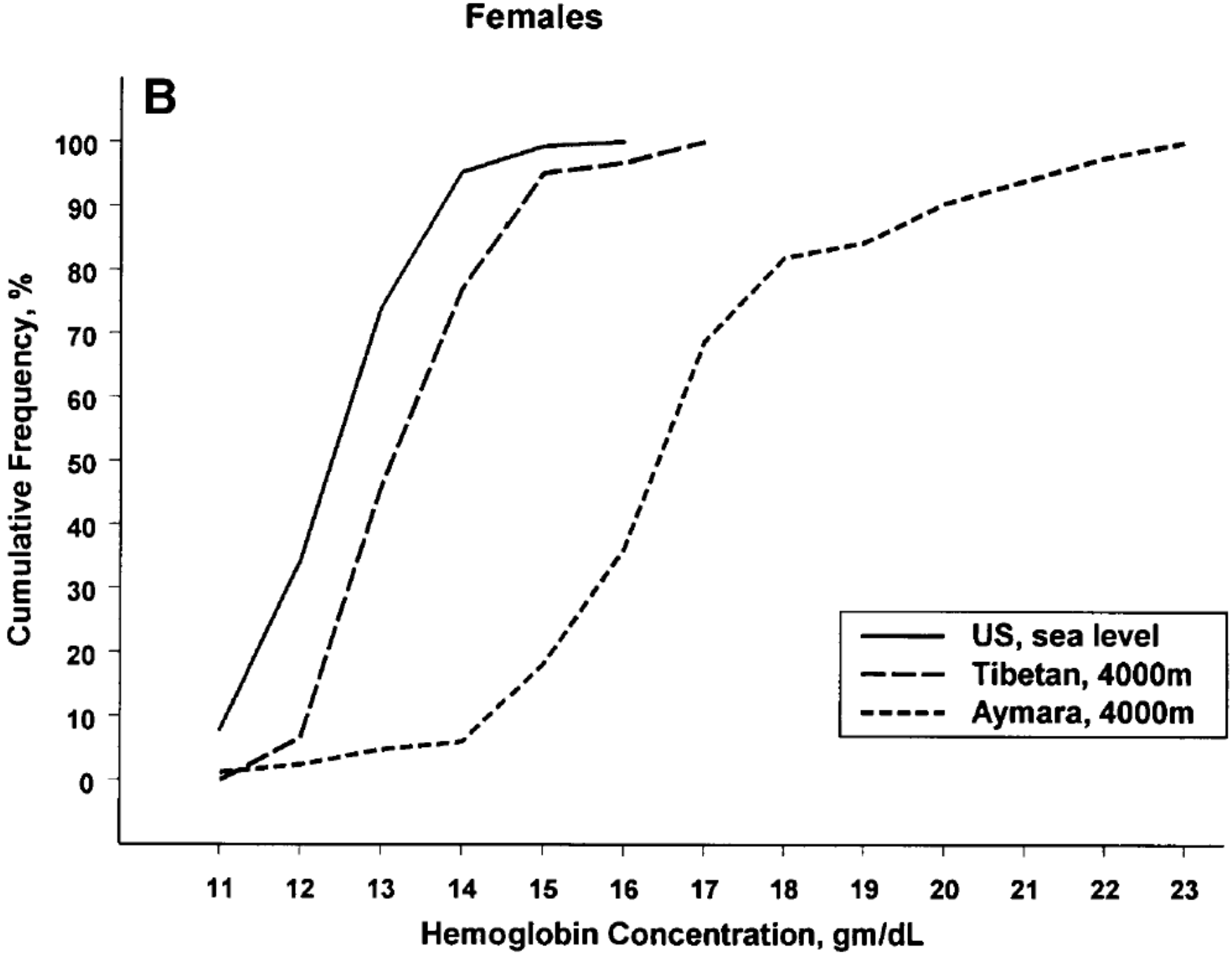


Fig. 4. Cumulative frequency distribution of United States, Tibetan, and Aymara hemoglobin concentrations. **A:** Males. **B:** Females.


Females
B
100
90
80
70
60
50
40
30
20
10
0
Cumulative Frequency, %
US, sea level
Tibetan, 4000m
Aymara, 4000m
11
12
13
14
15
16
17
18
19
20
21
22
23
Hemoglobin Concentration, gm/dL

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LIFE IN THE ANDES AND CHRONIC MOUNTAIN SICKNESS

By Dr. CARLOS MONGE

UNIVERSITY OF SAN MARCOS, LIMA, PERU

Tibet

Richard I'Anson

Moore LG, et al. Human adaptation to high altitude: regional and life-cycle perspectives. Am J Phys Anthropol. 1998;Suppl 27:25-64

Who is more likely to suffer mountain sickness?

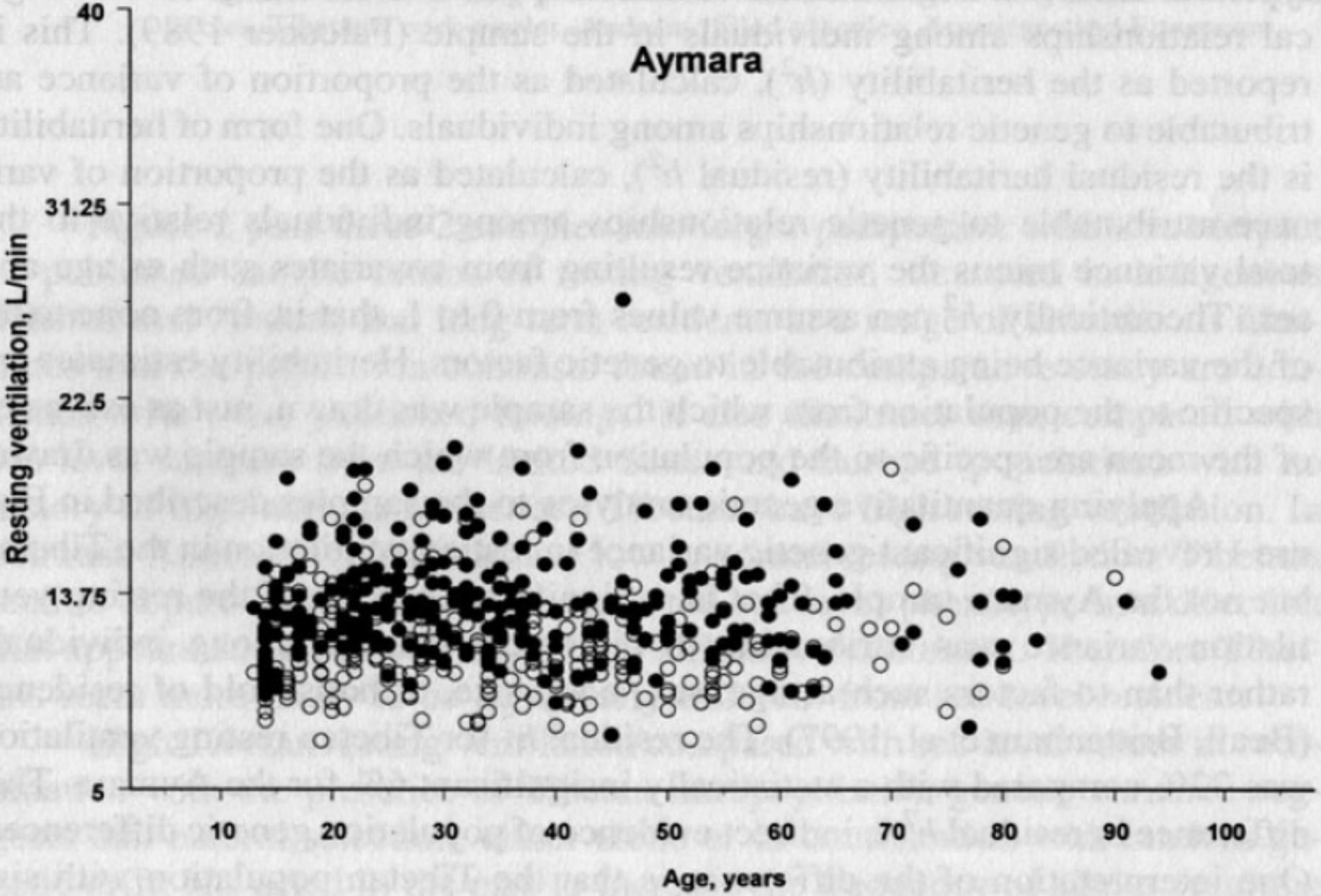
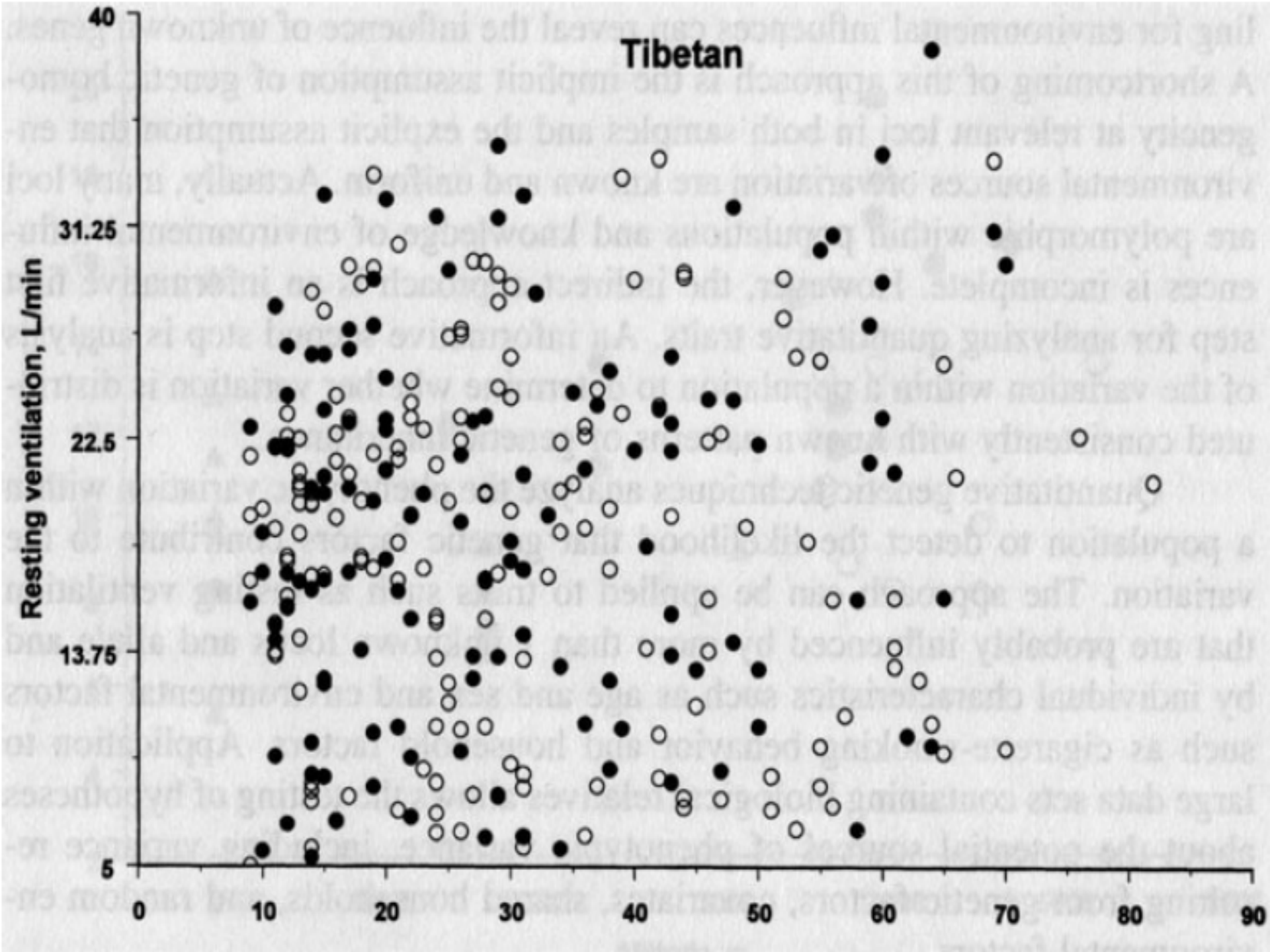


Figure 1. Scatterplot of resting ventilation with age comparing Tibetan and Aymara high-altitude natives at a median altitude of 4,000 m. Filled circles, males; open circles, females.


Tibetan
Resting ventilation, L/min
40
31.25
22.5
13.75
5
0
10
20
30
40
50
60
70
80
90

American Physiological Society
Journal of Applied Physiology

Minimal hypoxic pulmonary hypertension in normal Tibetans at 3,658 m

B. M. Groves, T. Droma, J. R. Sutton, R. G. McCullough, R. E. McCullough, J. Zhuang, G. Rapmund, S. Sun, C. Janes, L. G. Moore

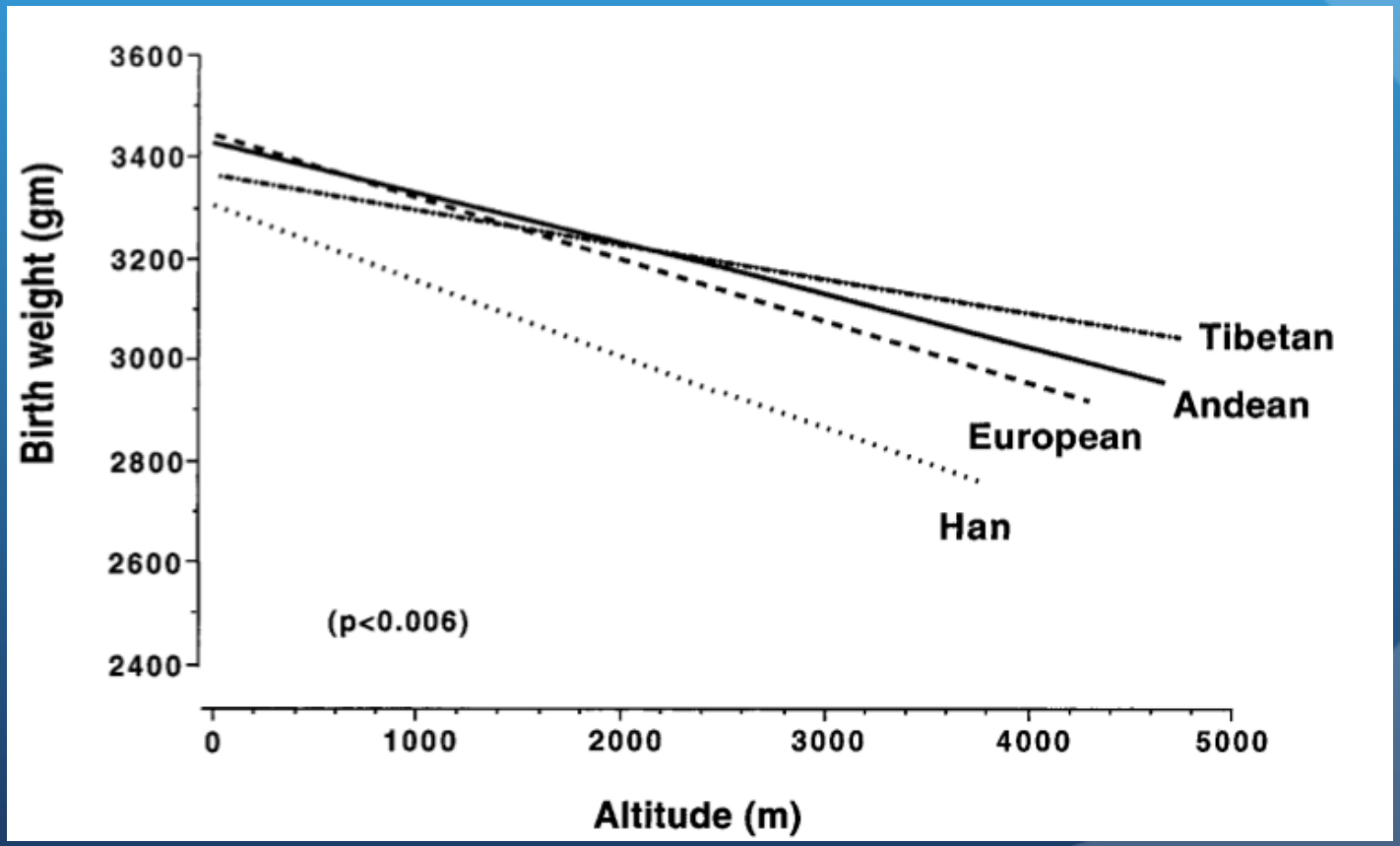
Journal of Applied Physiology Published 1 January 1993 **Vol.** 74 **no.** 1, 312-318 **DOI:**

Tibetan adaptations to altitude

- Higher oxygen uptake
- greater ventilation
- larger lung volumes
- better quality of sleep
- lower incidence of acute mountain sickness

Tibetan vs. Han Chinese

- Babies were born 600 g heavier after adjusting for gestational age and maternal parity.



(Moore et al. 2000)

Ethiopia

Ethiopians

- Ethiopian highlanders living at 3,530 meters (11,580 feet)
- Unlike Tibetans- they don't breathe more rapidly and aren't able to more effectively synthesize nitric oxide
- Unlike the Andeans- they don’t have higher hemoglobin counts

Ethiopians insensitive to hypoxia

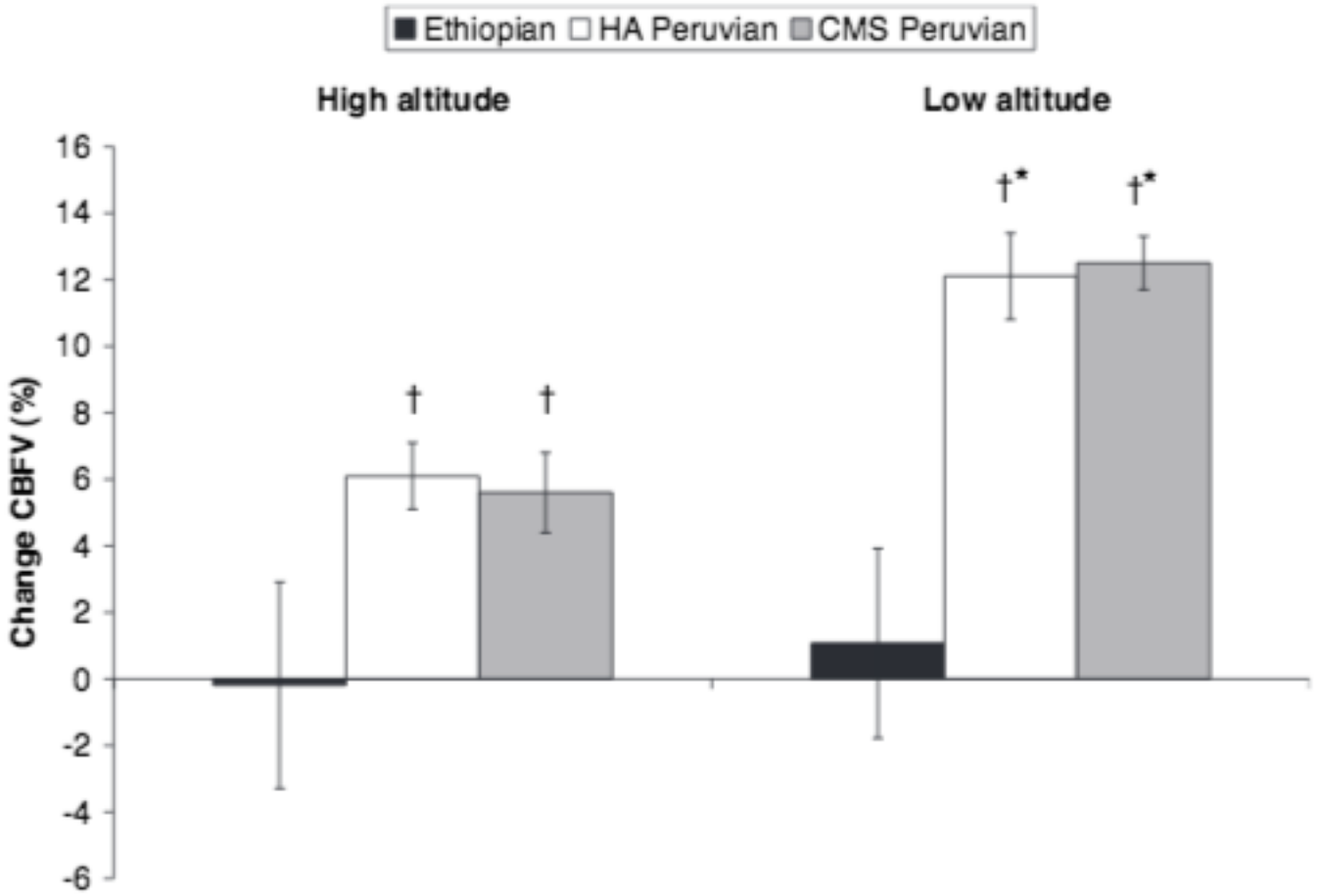


Figure 2. Cerebrovascular responses to normocapnic hypoxia.

Claydon, Victoria E., et al. Cerebrovascular responses to hypoxia Stroke 39.2 (2008): 336-342.

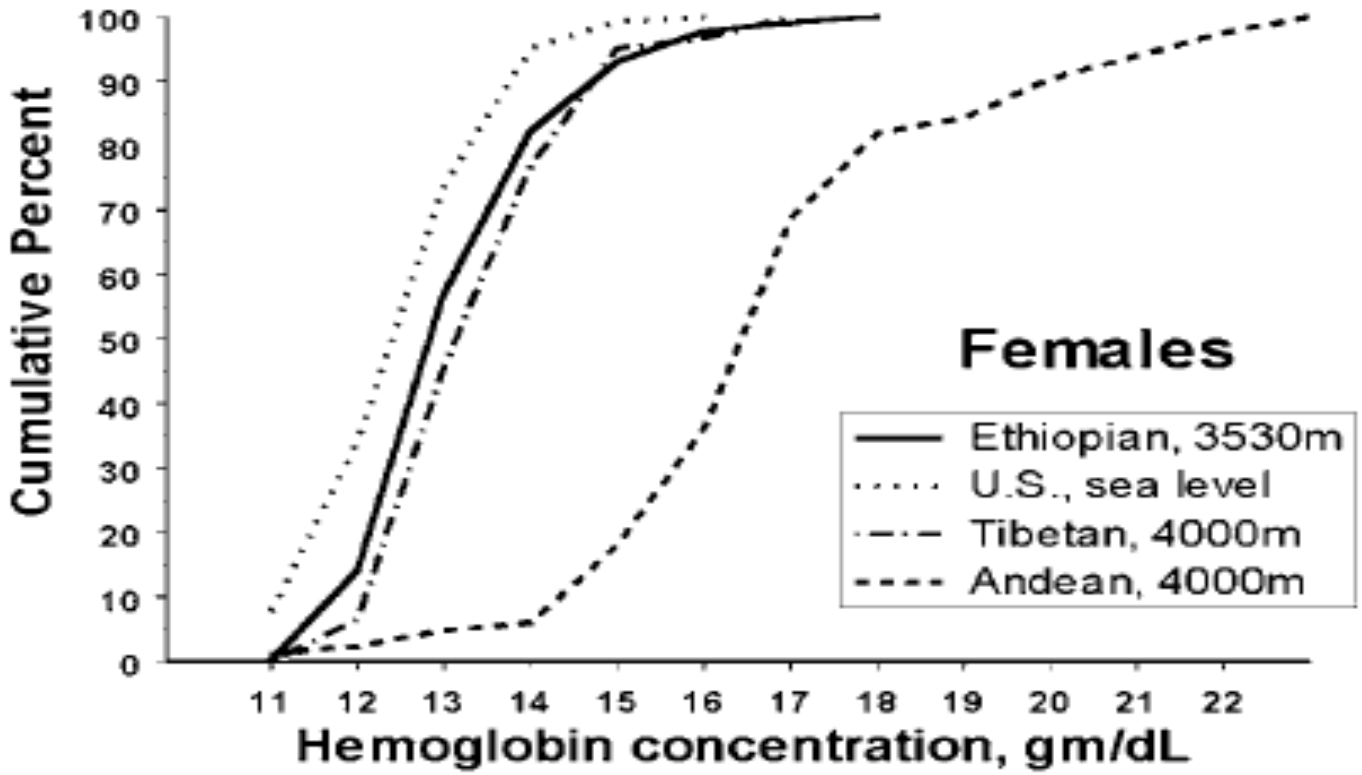


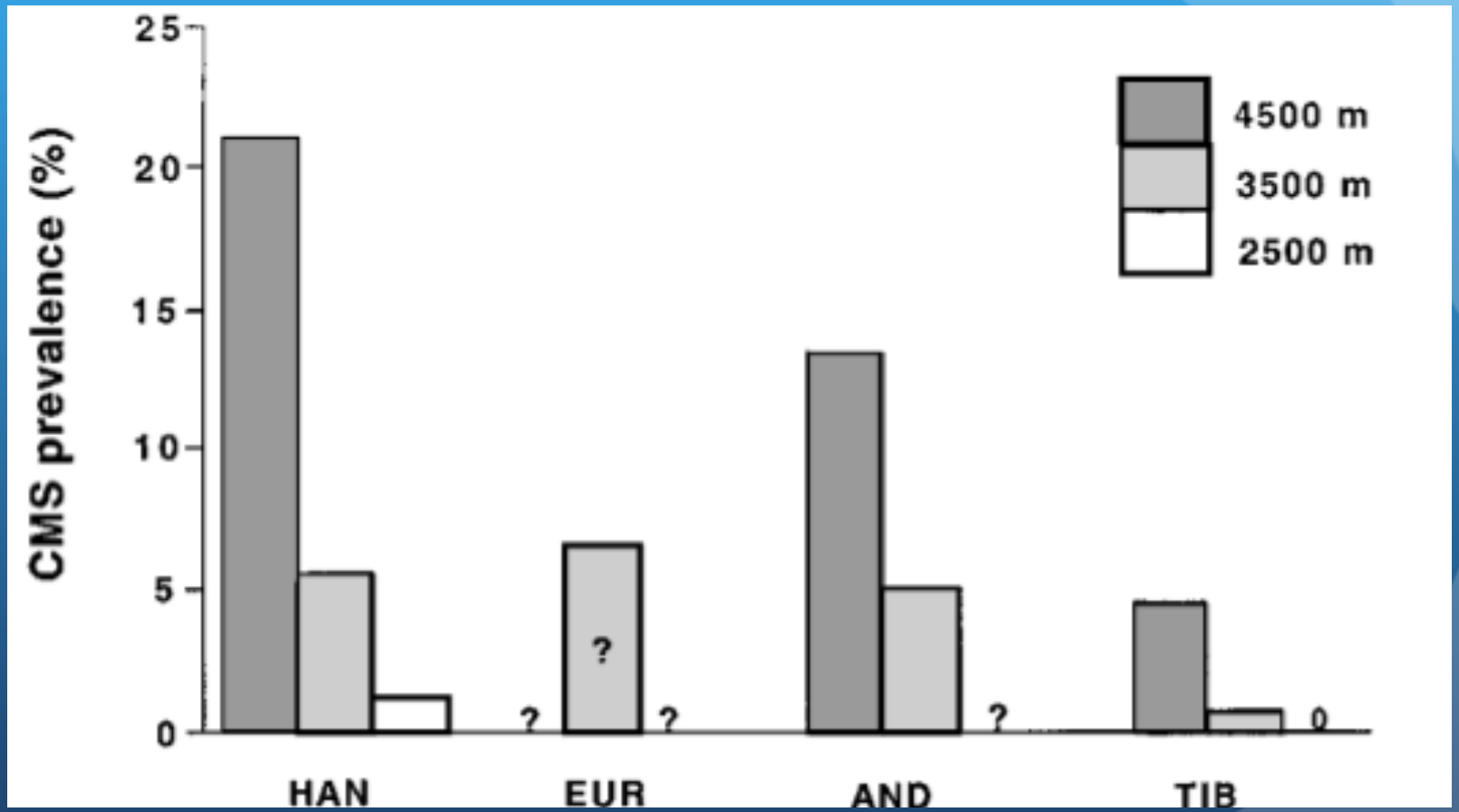
Fig. 2. Hemoglobin concentration distributions of U.S. sea level and Ethiopian and Tibetan high-altitude females coincide and contrast with the higher hemoglobin concentrations of Andean females. Shown is the cumulative frequency distribution of hemoglobin concentration of Ethiopian high-altitude, U.S. sea level, and Tibetan and Andean high-altitude females.

Table 1. Three patterns of adaptation to high-altitude hypoxia are identified by comparing the presence (+) or absence (−) of erythrocytosis and arterial hypoxemia

	Partial pressure of inspired oxygen, % of sea level	Erythrocytosis	Arterial hypoxemia
Sea level	100	−	−
Ethiopian	64	−	−
Tibetan	60	−	+
Andean	60	+	+

Data were obtained by using the mean values of hemoglobin concentration and oxygen saturation of hemoglobin of sea level populations as a point of reference, published values from Andean and Tibetan high-altitude populations at 4,000 m (12, 17, 18), and the present Ethiopian sample.

Chronic Mountain Sickness



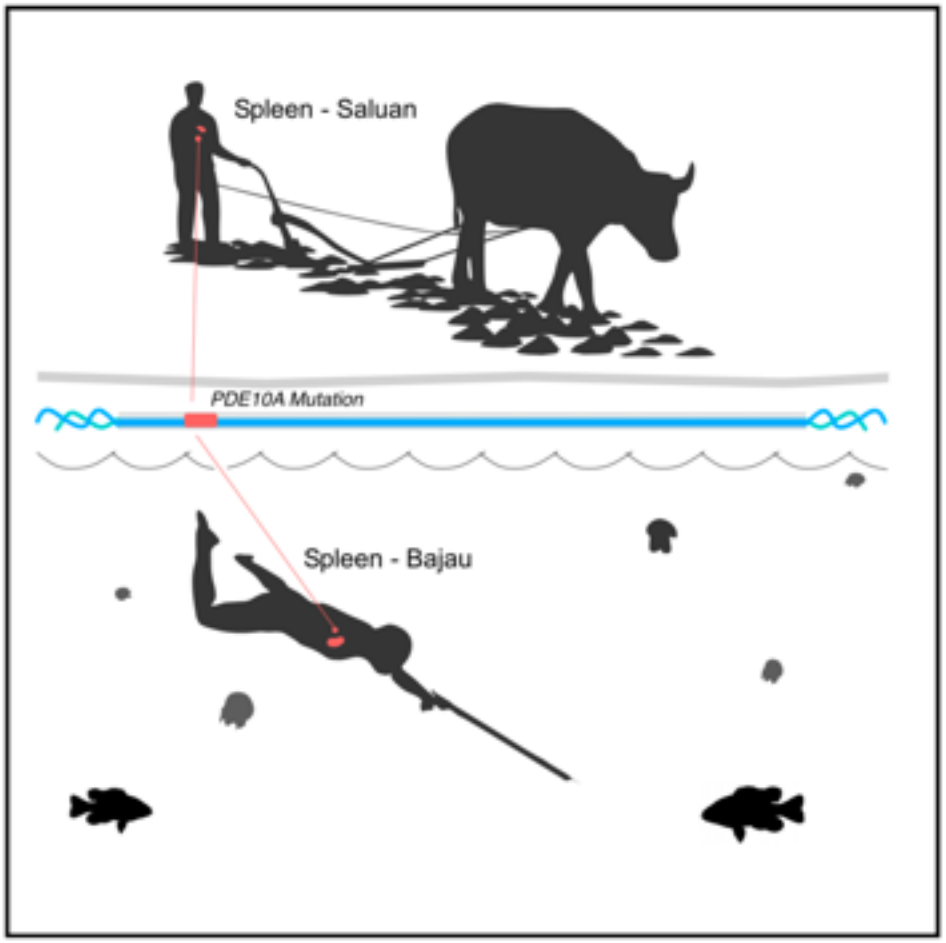
Cold

- ADRA2A
- ADRA2C


SCUBAPRO
DACOR
DACOR

Physiological and Genetic Adaptations to Diving in Sea Nomads

Graphical Abstract



Authors

Melissa A. Ilardo, Ida Moltke, Thorfinn S. Korneliussen, ..., Suhartini Salingkat, Rasmus Nielsen, Eske Willerslev

Correspondence

rasmus_nielsen@berkeley.edu (R.N.), ewillerslev@snm.ku.dk (E.W.)

In Brief

Genetic and physiological adaptations enable the remarkable breath-holding ability of marine nomads.

An ethnic group of Malay origin, the Bajau Laut have lived almost entirely at sea for centuries. They are some of the last true nomads of the ocean.

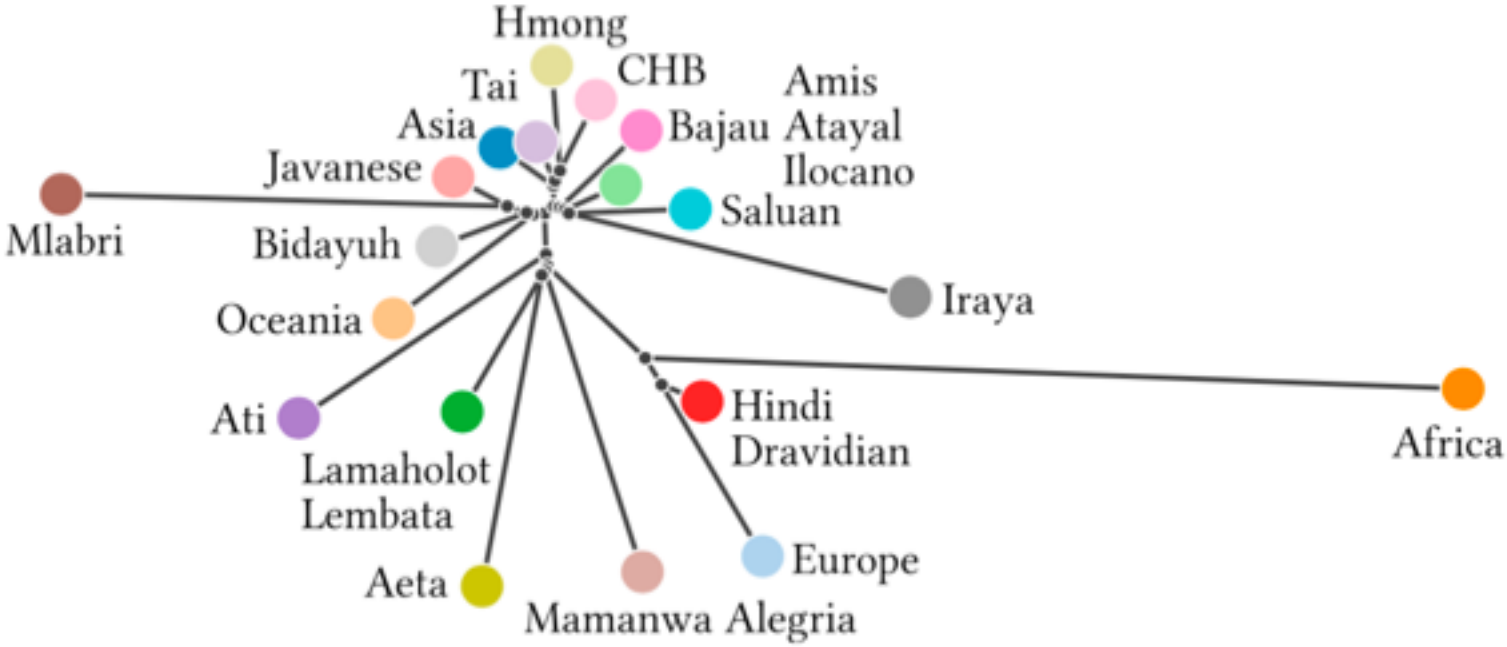
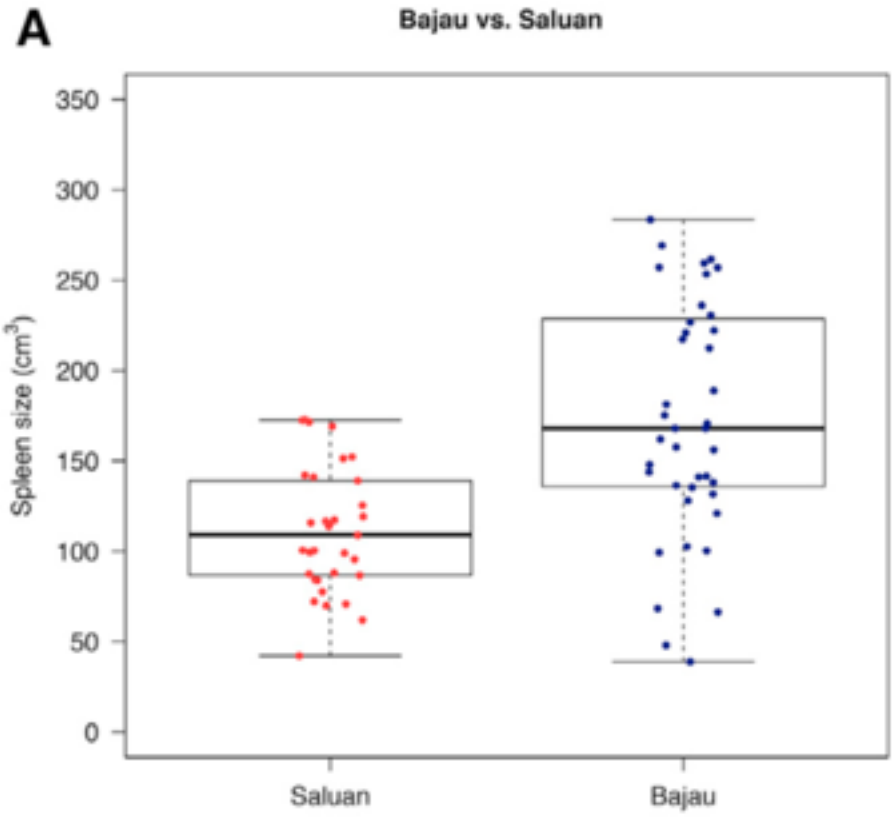
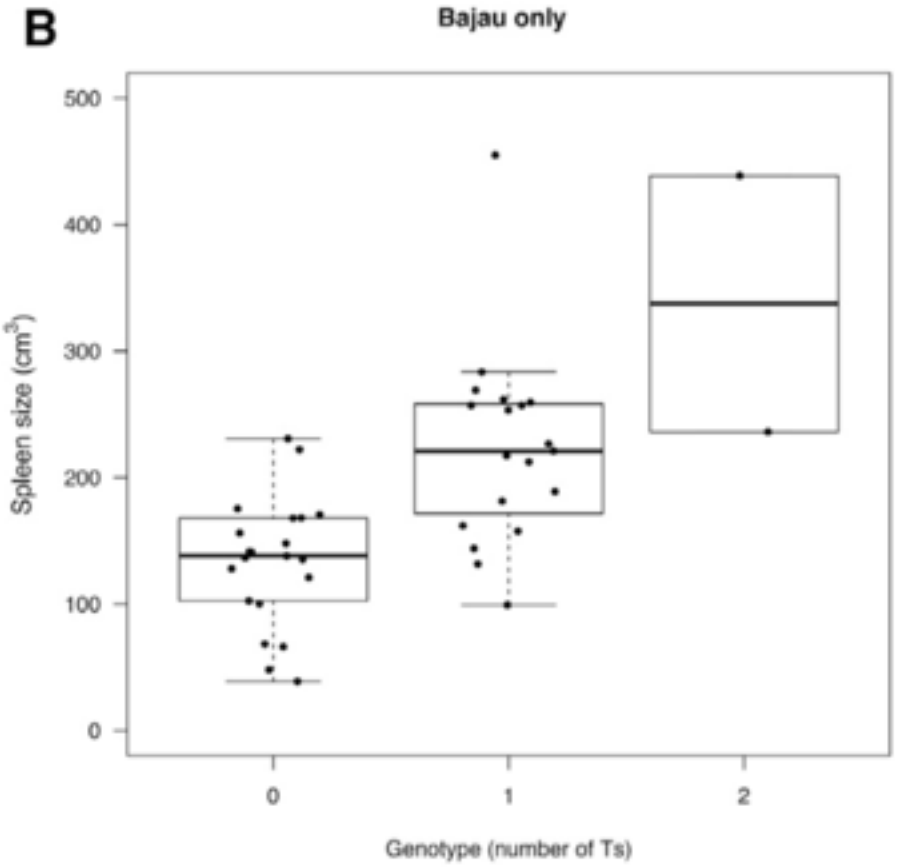


Figure 3. Pan-Asian Admixture and Tree Estimate for $K = 19$, Where Bajau and Saluan Receive Their Own Unique Components

See also Figure S4.


A
Bajau vs. Saluan
Spleen size (cm3)
350
300
250
200
150
100
50
0
Saluan
Bajau


B
Bajau only
Spleen size (cm3)
500
400
300
200
100
0
0
1
2
Genotype (number of Ts)