7° Congreso Argentino de Neumonología Pediátrica

El Control de la Respiración en Diferentes Situaciones

Mecanismos de Adaptación a Diferentes Condiciones de Hipoxia

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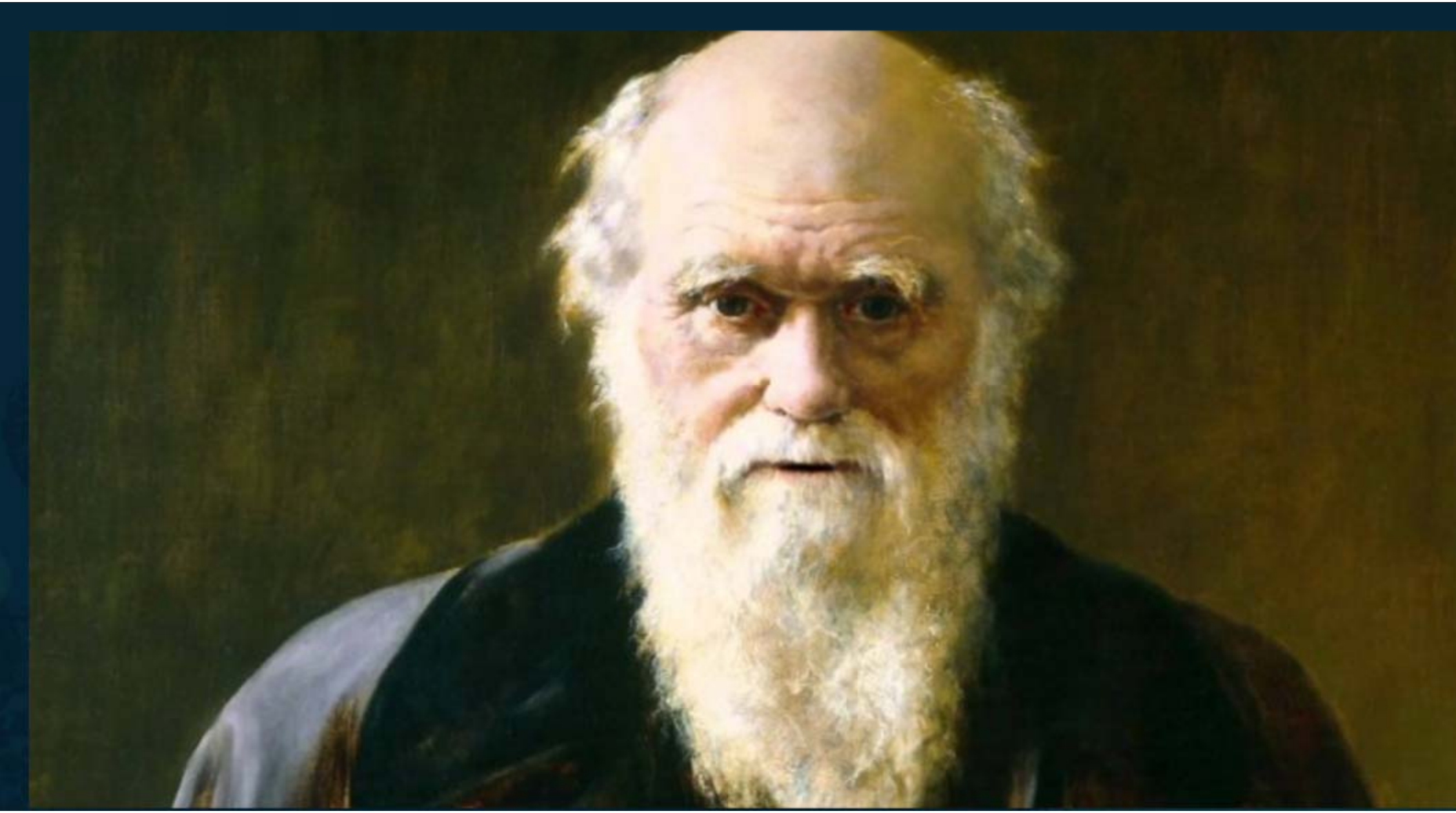
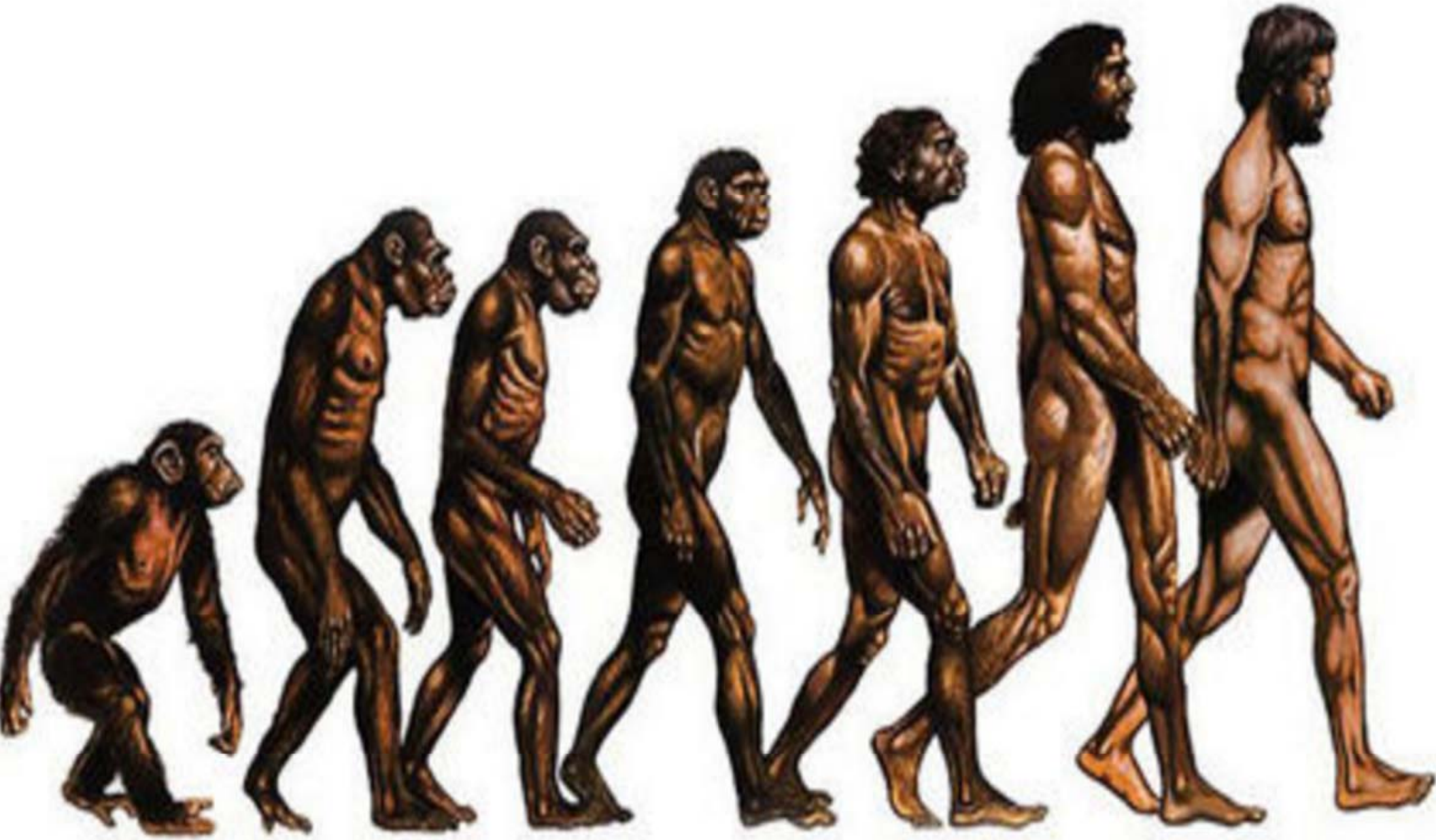
Charles Darwin: 1809-1882
TEORIA DE LA ADAPTACION



ADAPTACION

Es el proceso mediante el cual una población se adecua mejor a su hábitat y también el cambio en la estructura o en el funcionamiento de un organismo que lo hace más adecuado a su entorno. Este proceso tiene lugar durante muchas generaciones y es uno de los fenómenos básicos de la biología.

La importancia de una adaptación sólo puede entenderse en relación con el total de la biología de la especie.



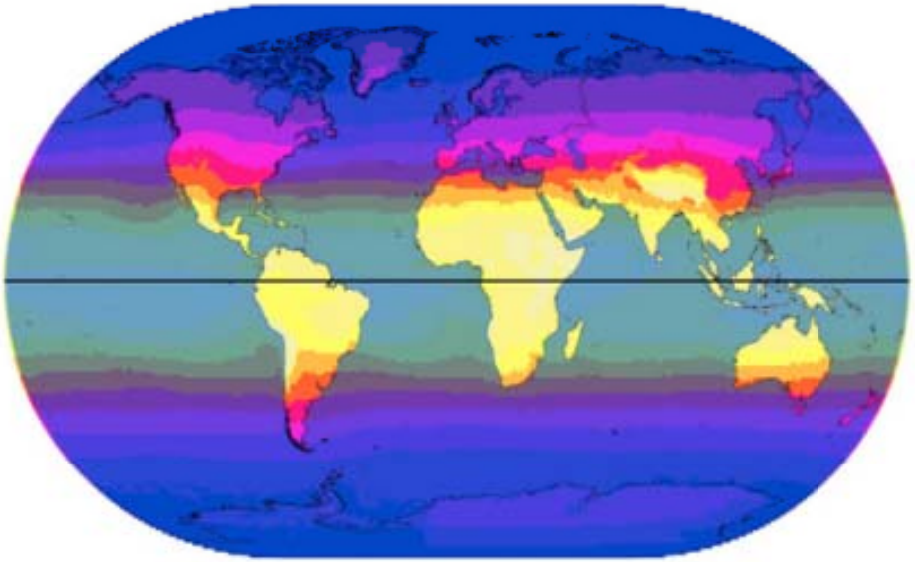
LA ADAPTACION

Las características de cada animal se relacionan con el medio en el que viven facilitándoles la supervivencia.

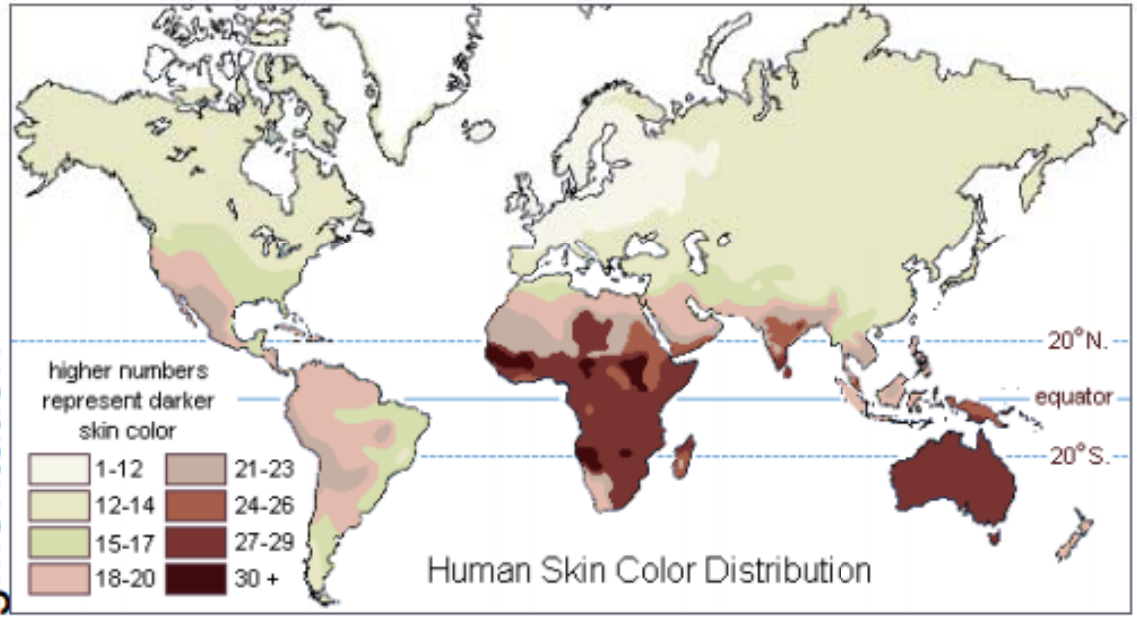
Haz click en las fotos para ver videos y páginas

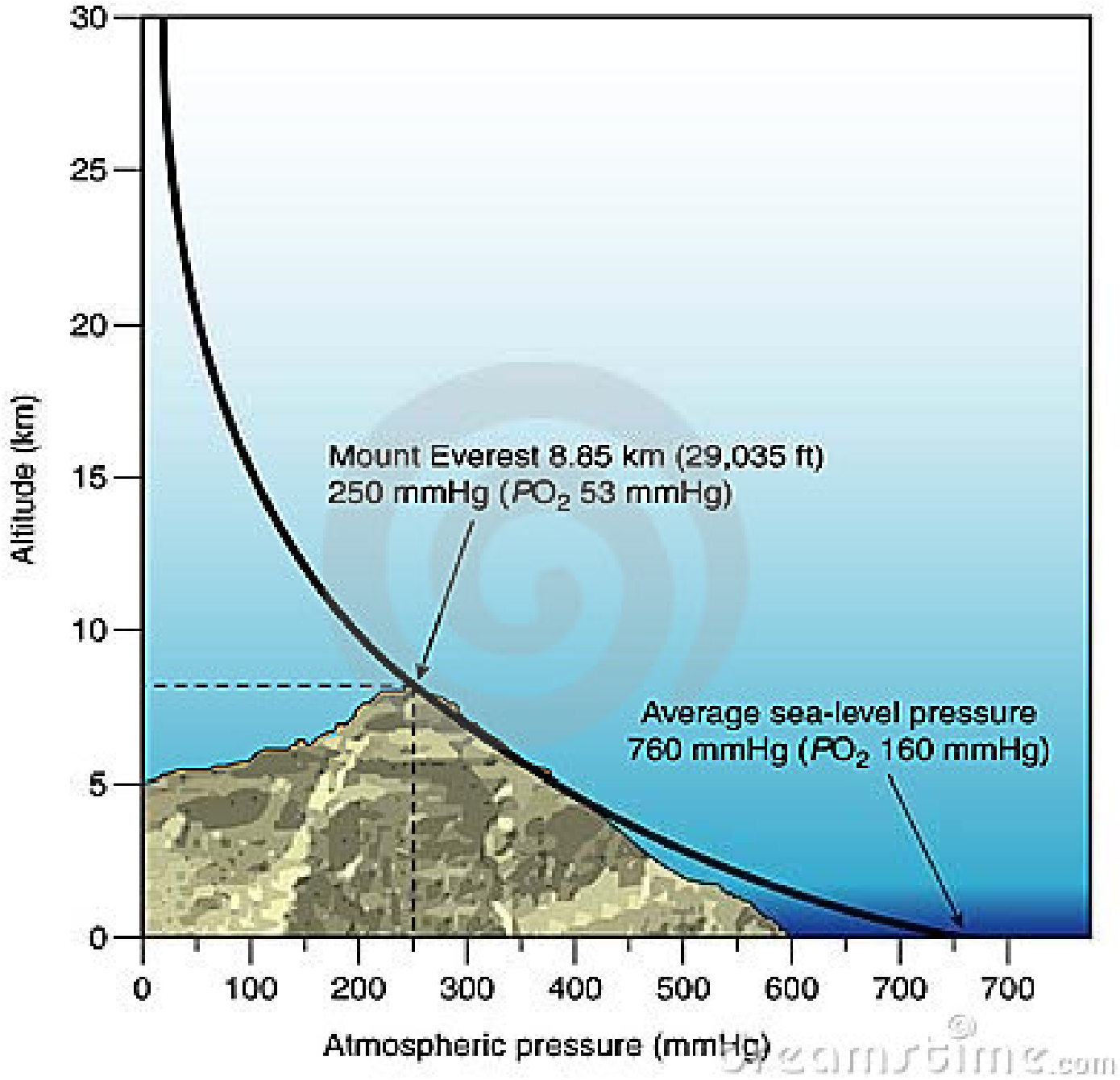
Changes in skin pigmentation

UV light intensity



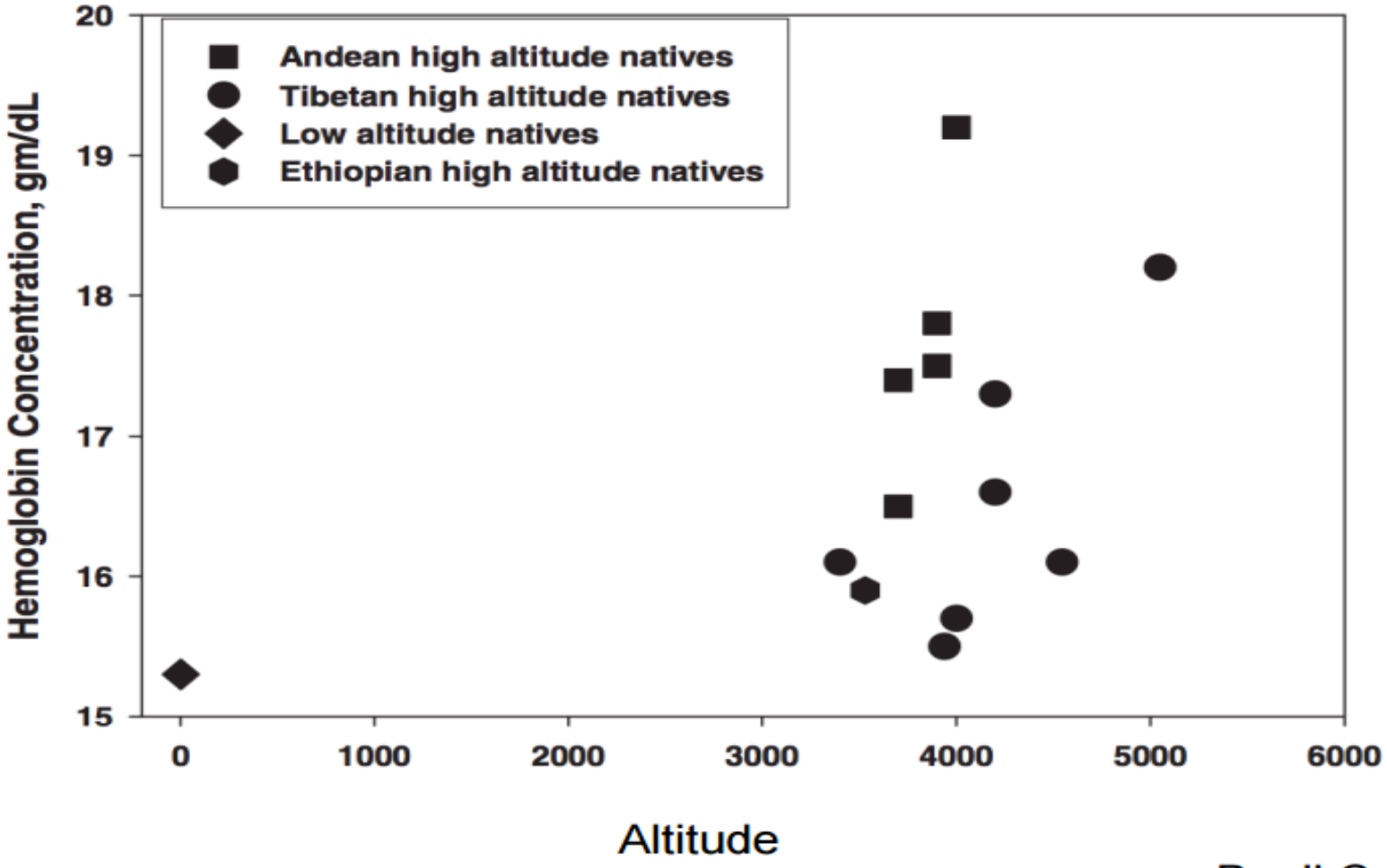
Distribution of skin pigmentation




30
25
20
15
10
5
0
Altitude (km)
Mount Everest 8.85 km (29,035 ft)
250 mmHg (PO_2 53 mmHg)
Average sea-level pressure
760 mmHg (PO_2 160 mmHg)
0
100
200
300
400
500
600
700
700
Atmospheric pressure (mmHg)

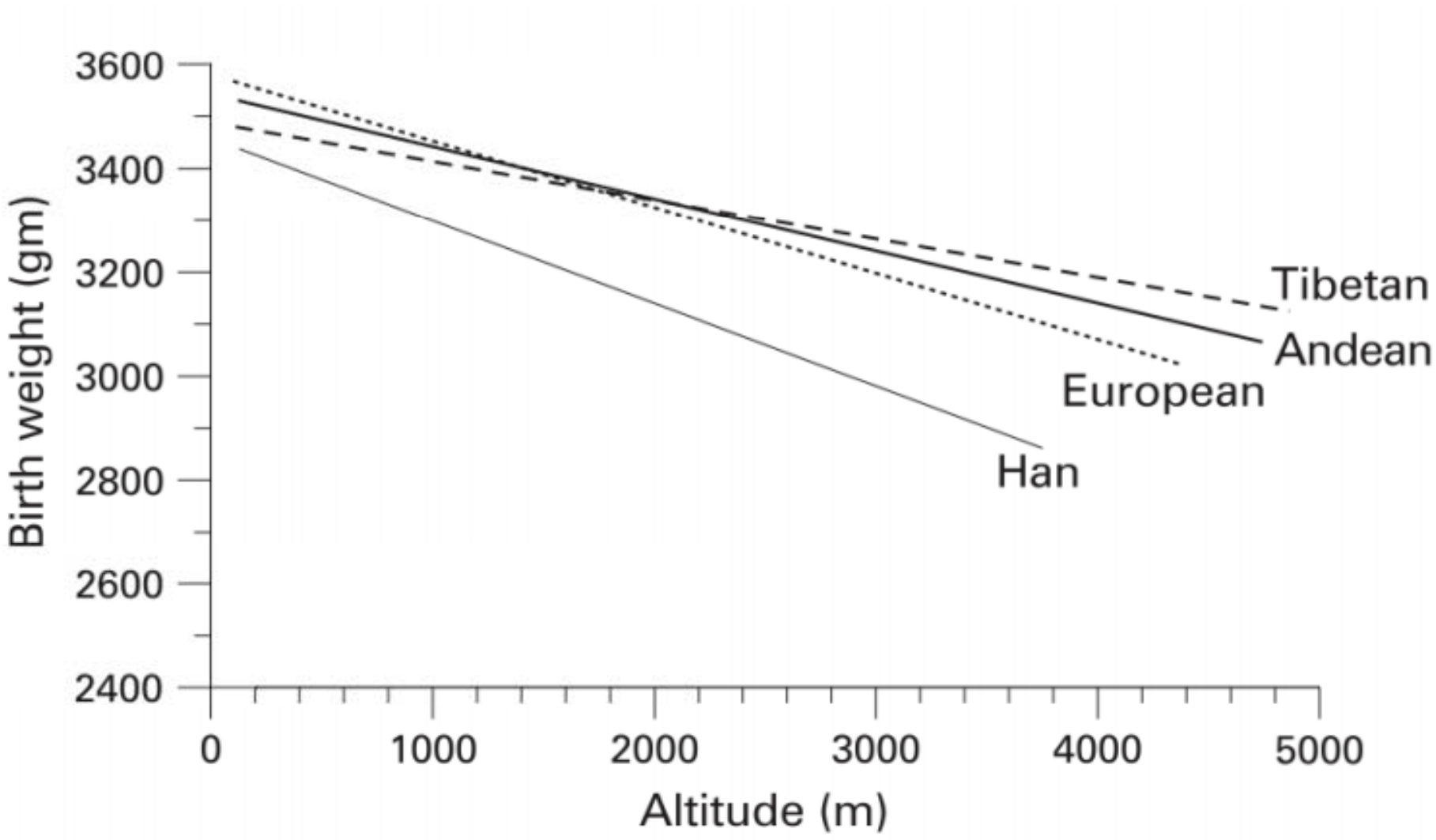
Adaptacion a la Hipoxia Ambiental

Contrasting Tibetans, Andeans and Ethiopian response



Beall Cynthia, 2006

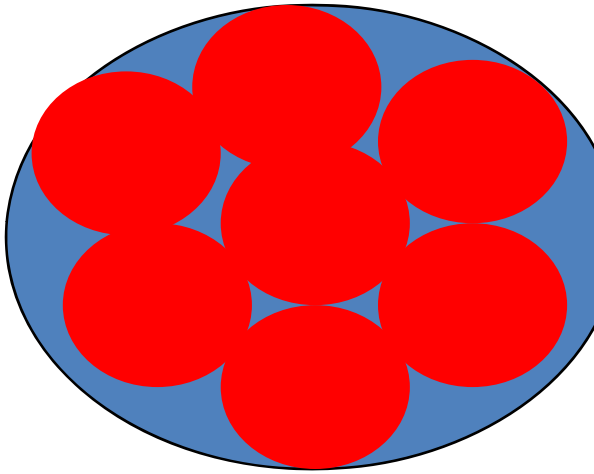
Higher fertility and lower infant mortality rate in high altitude natives than in acclimatized low altitude natives



Crecimiento y Desarrollo Pulmonar

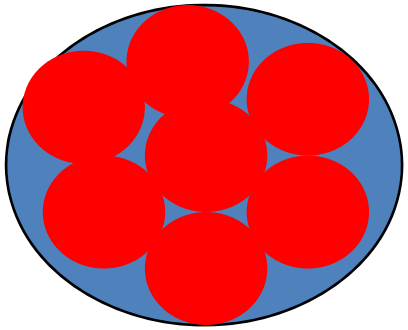
Niños hasta Adultez

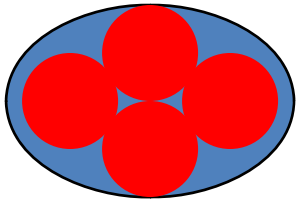
Expansion Alveolar



RN y Lactantes

Aumenta el N° Alveolos





Pediatric Pulmonology

Increased Lung Volume in Infants and Toddlers at High Compared to Low Altitude

Conrado J. Llapur, MD,[1,2,3] Myriam R. Martínez, MD,[1] María Marta Caram, BC,[3] Federico Bonilla, BC,[4] Celia Cabana, BC,[5] Zhansheng Yu, PhD,[6] and Robert S. Tepper, MD, PhD[7]*

Summary. Children and adults residing at high altitude (HA) compared to low altitude (LA) have larger lung volumes; however, it is unknown whether this response to chronic hypoxia begins early in life. Our objective was to determine whether infants and toddlers at HA have larger lung volumes compared to infants and toddlers at LA. Oxygen saturation (SaO_2), functional residual capacity (FRC), as well as serum levels of vascular endothelial growth factor (VEGF) and erythropoietin (EPO) were measured in infants and toddlers from HA ($N = 50$; 3,440 m) and LA ($N = 35$; 440 m). There were no significant differences in somatic size for HA and LA subjects; however, HA subjects had significantly lower SaO_2 (88.5% vs. 96.7%; $P < 0.0001$). Subjects at HA had significantly greater FRC compared to subjects at LA (group mean: 209 and 157 ml; $P < 0.0001$), adjusting for body length. Male infants at HA had a significantly greater FRC compared to males at LA (57 ml; P-value < 0.001); however, the increase in FRC for females at HA compared to LA was not significant (20 ml; P-value $= 0.101$). VEGF and EPO were significantly higher for subjects at HA compared to LA with no gender differences. In summary, infants and toddlers at HA have lower oxygen saturations, higher serum levels of VEGF and EPO, and higher FRC compared to subjects at LA; however, chronic hypoxia appears to generate a more robust response in lung growth in male compared to female infants early in life. **Pediatr Pulmonol.**

Key words: chronic hypoxia; functional residual capacity; oxygen saturation; vascular endothelial growth factor; erythropoietin.

Funding source: NIH and Fogarty International Center Research Grant, Numbers: 1R03TW007807, R01 HL54062.

OBJETIVO

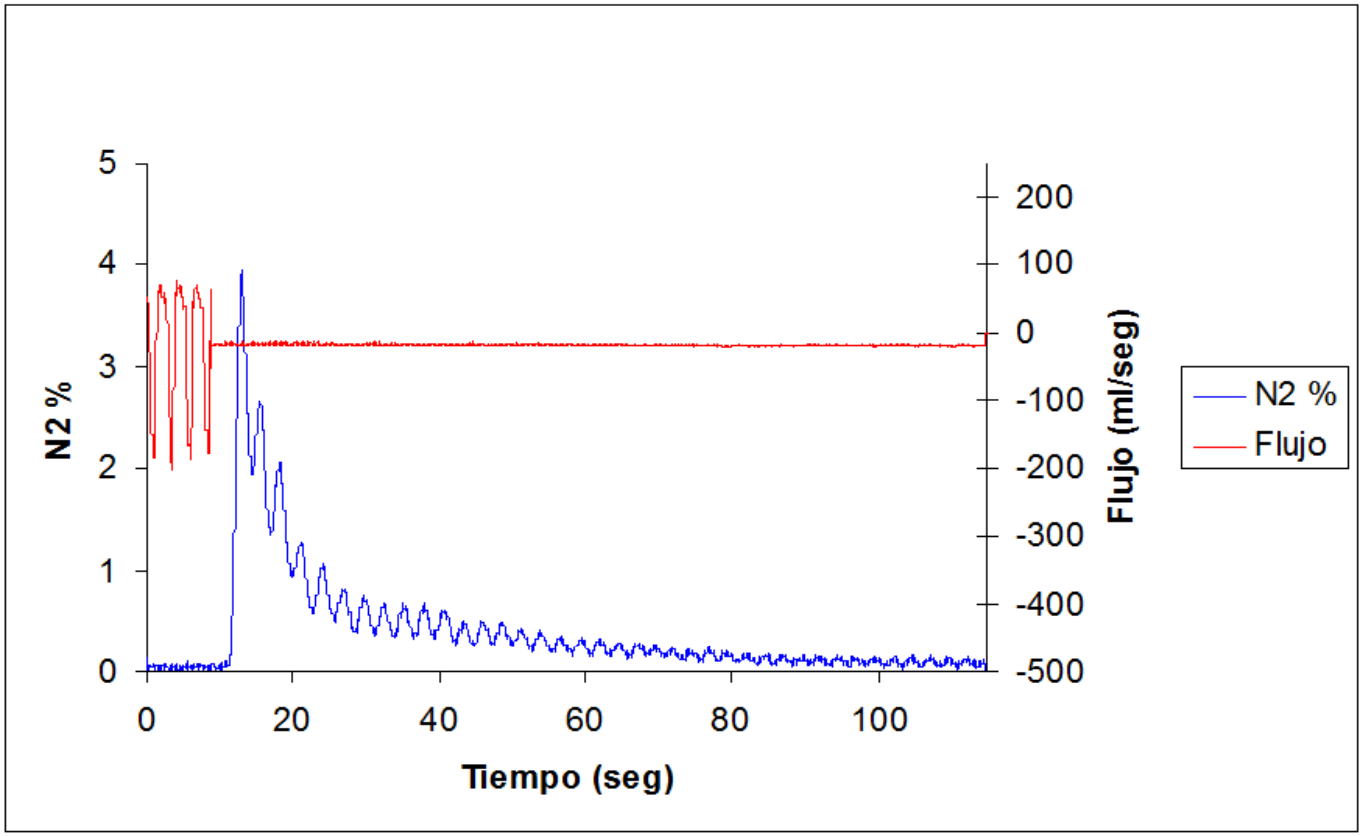
Evaluar volúmenes pulmonares y VEGF en niños menores de 2 años nacidos a Gran Altitud (GA) y Baja Altitud (BA).


Caribbean Sea
North Atlantic Ocean
South Pacific Ocean
South Atlantic Ocean
HONDURAS
Tegucigalpa
NICARAGUA
Managua
Isla de San Andrés (COLOMBIA)
Barranquilla
Cartagena
Maracaibo
Barquisimeto
Caracas
Valencia
Port-of-Spain
TRINIDAD AND TOBAGO
BARBADOS
ST. LUCIA
ST. VINCENT AND THE GRENADINES
GRENADA
Aruba (NETH.)
Netherlands Antilles (NETH.)
San José
COSTA RICA
Panama
PANAMA
Cúcuta
San Cristóbal
VENEZUELA
Ciudad Guayana
Georgetown
Paramaribo
Cayenne
GUYANA
SURINAME
French Guiana (FRANCE)
Medellín
Bogotá
Cali
COLOMBIA
Isla de Malpelo (COLOMBIA)
Río Magdalena
Río Orinoco
Boa Vista
Equator
Quito
ECUADOR
Guayaquil
Iquitos
Piura
Trujillo
Huánuco
PERU
Lima
Cusco
Río Ucayali
Río Madeira
Río Negro
Amazon
Manaus
Macapá
Santarém
Belém
São Luís
Fortaleza
Teresina
Natal
Recife
Maceió
Salvador
Río Branco
Pôrto Velho
BRAZIL
Río Tocantins
Río Xingú
Río Purús
Río Madre de Dios
Río Beni
Río Mamoré
Trinidad
La Paz
BOLIVIA
Cochabamba
Santa Cruz
Sucre
Potosí
Arequipa
Arica
Iquique
Antofagasta
Tropic of Capricorn
Cuiabá
Río Paraguai
Brasília
Goiânia
Uberlândia
Belo Horizonte
Vitória
Rio de Janeiro
São Paulo
Santos
Curitiba
Florianópolis
Pôrto Alegre
Campo Grande
Río Paraná
PARAGUAY
Asunción
Salta
San Miguel de Tucumán
Resistencia
Río Pilcomayo
Isla San Félix (CHILE)
Isla San Ambrosio (CHILE)
CHILE
Córdoba
Santa Fe
Salto
URUGUAY
Mendoza
Rosario
Valparaíso
Santiago
Buenos Aires
La Plata
Montevideo
ARCHIPIÉLAGO JUAN FERNÁNDEZ (CHILE)
Concepción
ARGENTINA
Bahía Blanca
Mar del Plata
Puerto Montt
San Carlos de Bariloche
Comodoro Rivadavia
Río Gallegos
Strait of Magellan
Punta Arenas
Ushuaia
Stanley
Falkland Islands
(Islas Malvinas)
(administered by U.K., claimed by ARGENTINA)
South Georgia and the South Sandwich Islands
(administered by U.K., claimed by ARGENTINA)
Scale 1:35,000,000
Azimuthal Equal-Area Projection
0 500 Kilometers
0 500 Miles
Boundary representation is not necessarily authoritative.


CIUDAD DE
LA QUIACA
ALTURA S/NIVEL DEL MAR 3445 m
GAP

METODOS

- SaO_2, VEGF, EPO
- FRC, Washout de N2.



RESULTADOS

Menores de 2 años

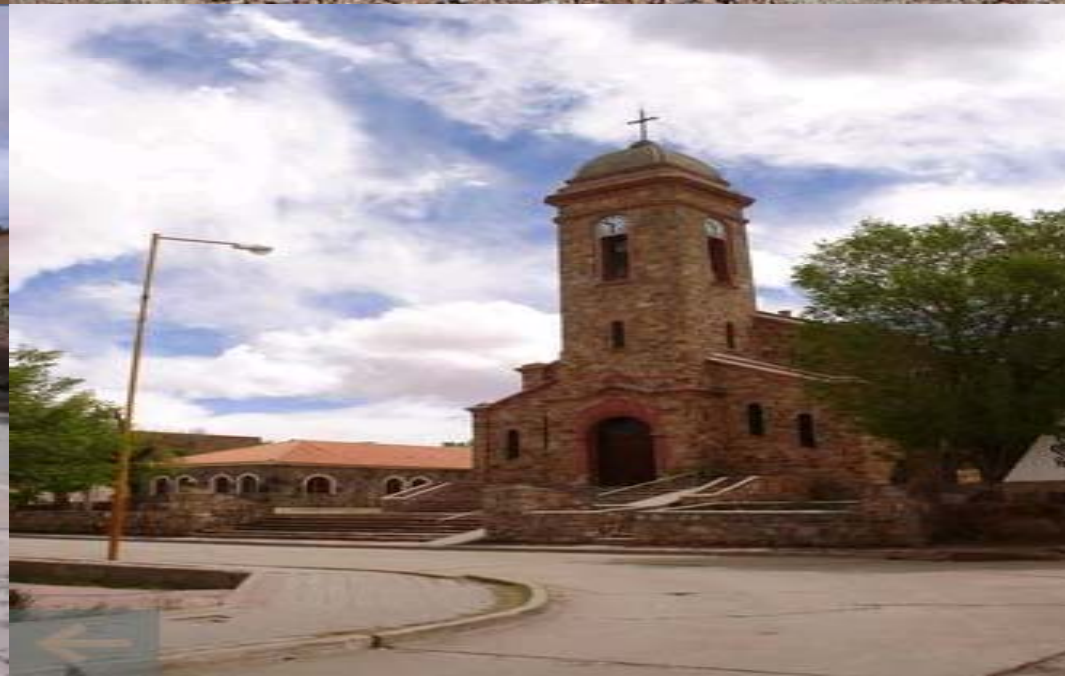
GA (N= 50; La Quiaca 3445msnm)

BA (N= 35; S. M. de Tucuman 440 msnm)

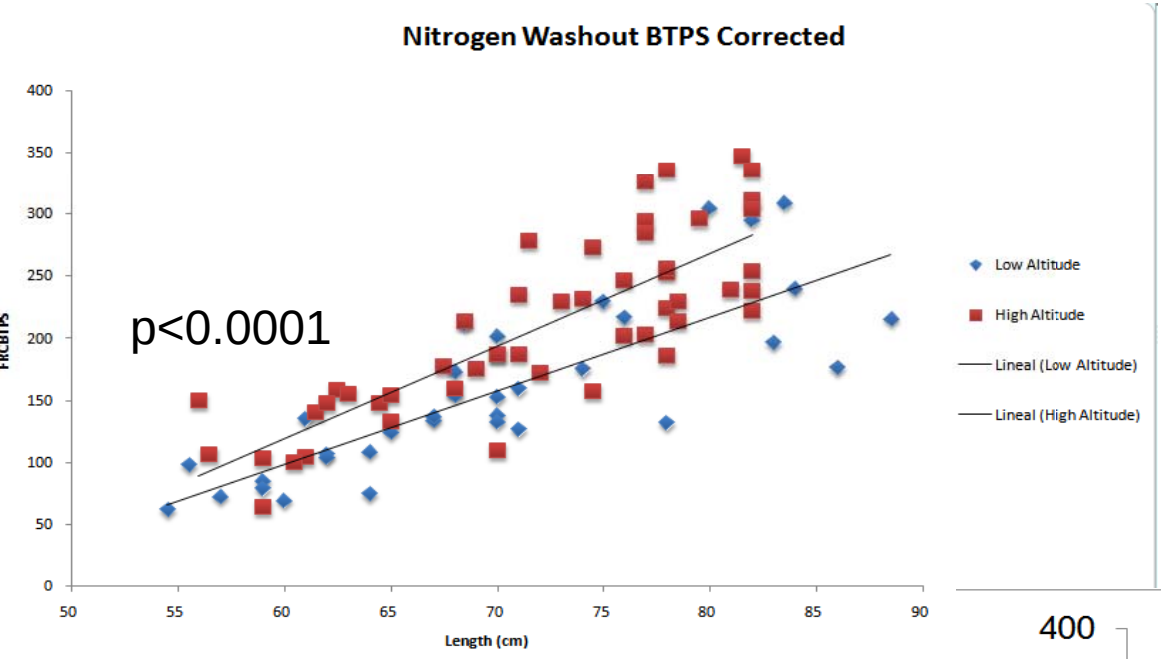
	N	Gender Females/Males	Age Months	Weight (Kg)	Length (cm)
Low Altitude	35	18/17	10.7 (±7.3)	8.9 (±2.3)	70.2 (±9.3)
High Altitude	50	27/23	12.5 (±7)	8.7 (±1.8)	72.0 (±7.7)
p=value			0.26	0.79	0.32

Mean (±SD)

LA QUIACA (3442 msnm)

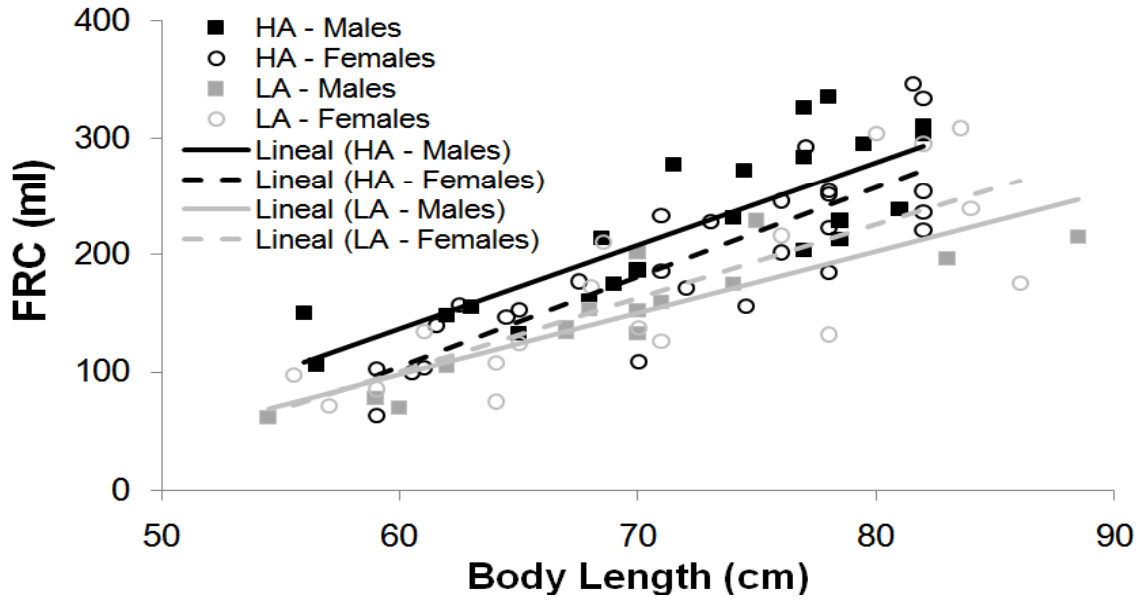


RESULTADOS

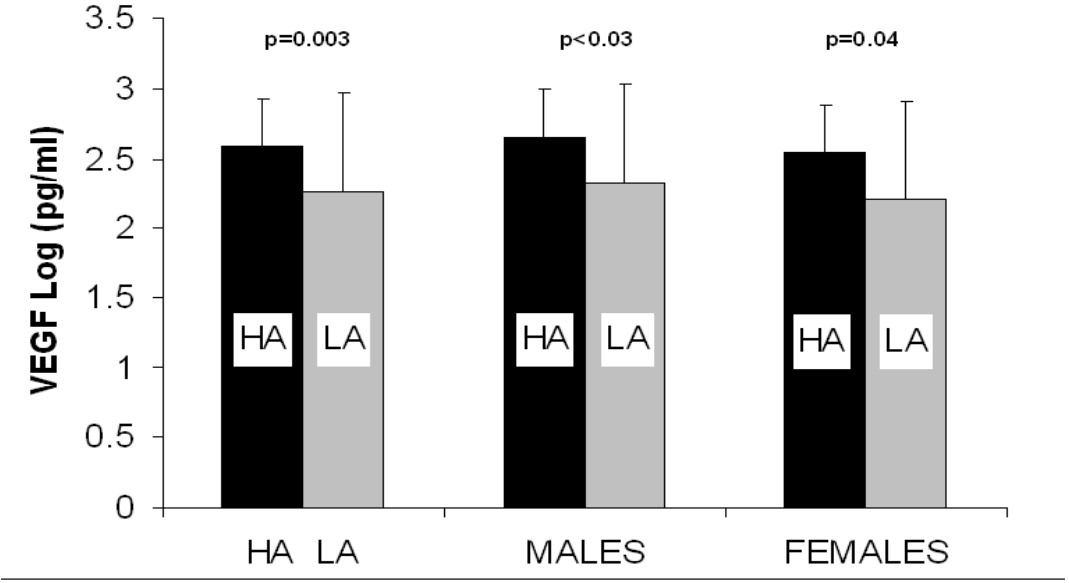


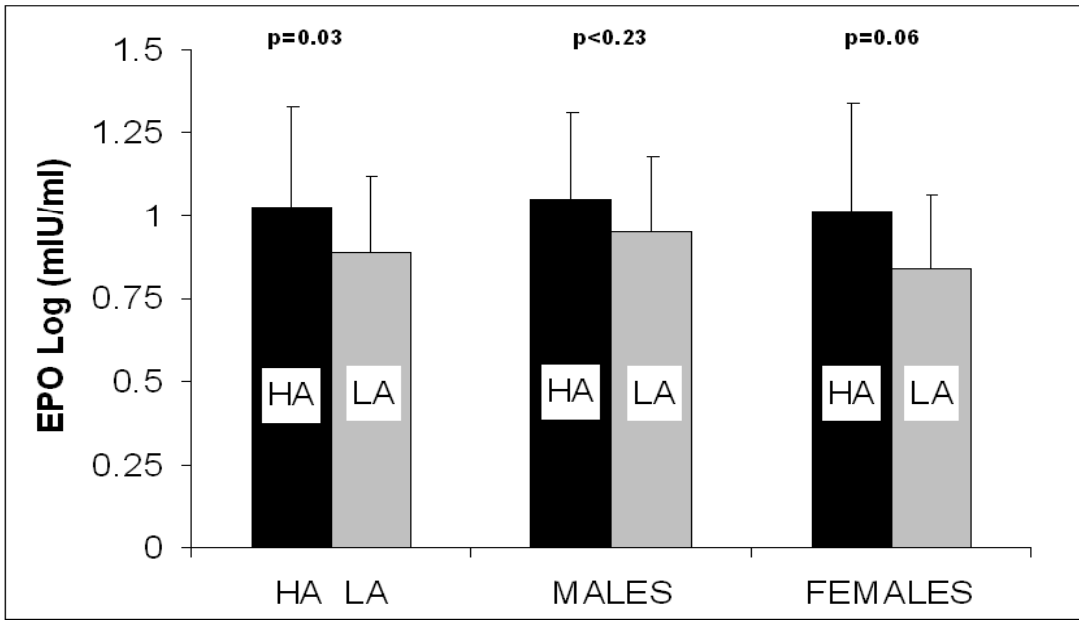
Saturación

HA: 88.5% vs. LA 96.7%



RESULTADOS


VEGF Log (pg/ml)
3.5
3
2.5
2
1.5
1
0.5
0
p=0.003
p<0.03
p=0.04
HA
LA
HA
LA
HA
LA
HA LA
MALES
FEMALES


EPO Log (mIU/ml)
1.5
1.25
1
0.75
0.5
0.25
0
p=0.03
p<0.23
p=0.06
HA
LA
HA
LA
HA
LA
HA LA
MALES
FEMALES

CONCLUSIONES

- Niños nacidos a GA presentan volumenes pulmonares aumentados comparados con niños nacidos a baja altitud.
- SaO2 mas baja
- Niveles mas altos de VEGF y EPO.
- Sin embargo la hipoxia crónica parece producir un mayor efecto en los varones.

Reduced Lung Function in Healthy Preterm Infants in the First Months of Life

Luciana Friedrich, Renato T. Stein, Paulo M. C. Pitrez, Andrea L. Corso, and Marcus H. Jones

Department of Pediatrics, Pontificia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil

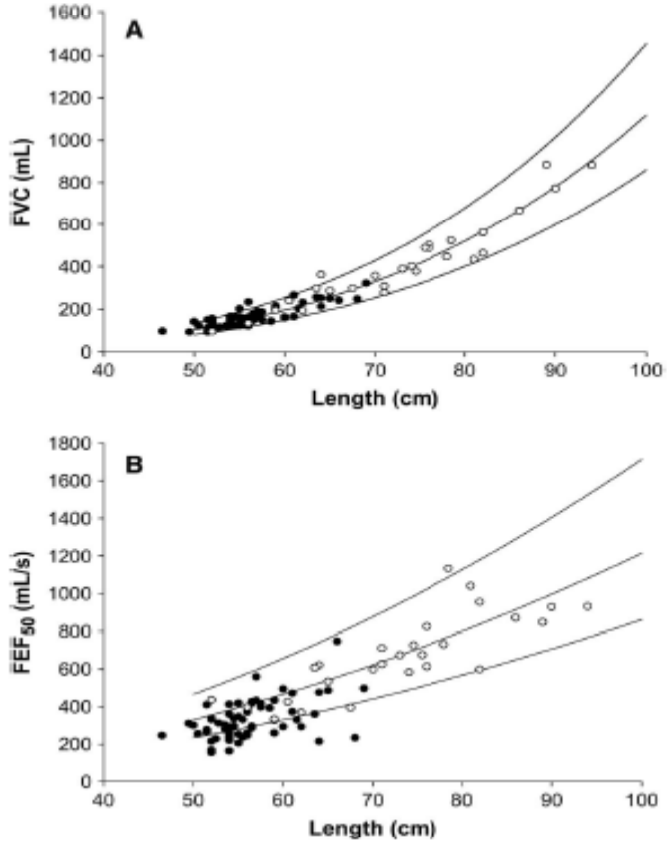


Figure 1. (*A*) FVC and (*B*) forced expiratory flow measured at 50% expired volume (FEF_{50}) plotted against length in 62 preterm infants (*solid circles*) and 27 full-term control infants (*open circles*). *Lines* represent 5th, 50th, and 95th percentiles from published equations (22).

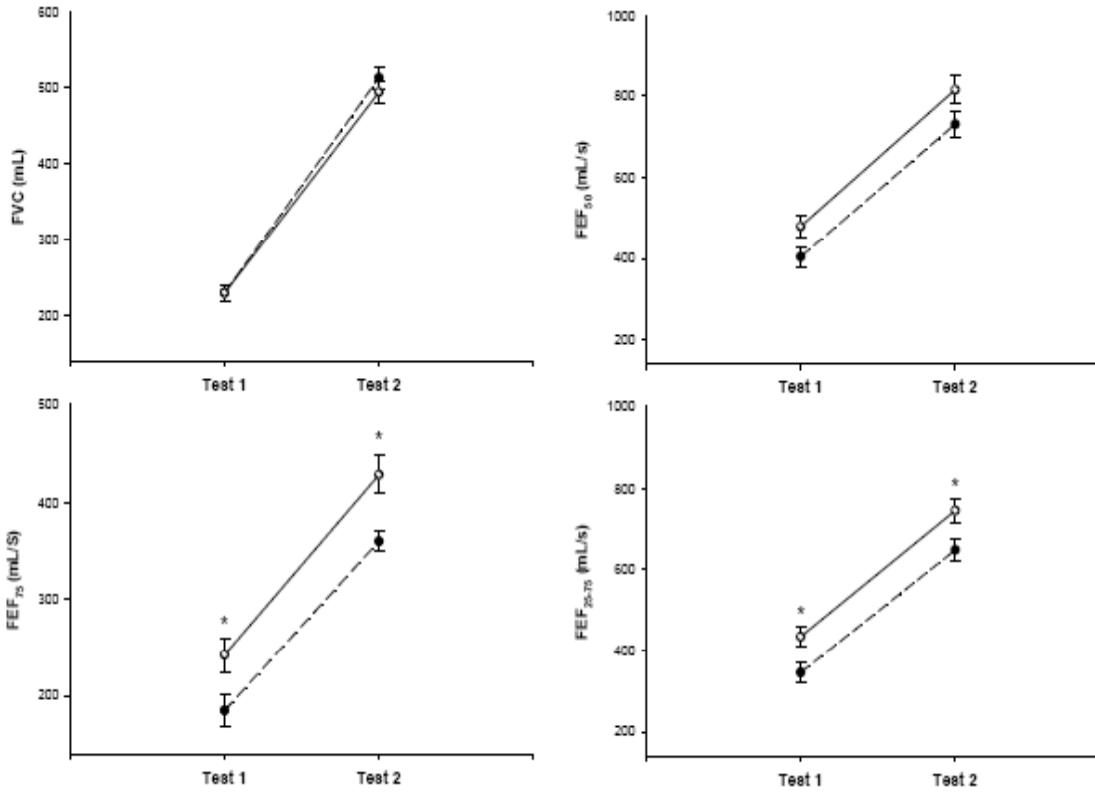
AJRCCM Articles in Press. Published on September 20, 2007 as doi:10.1164/rccm.200703-476OC

Growth rate of lung function in healthy preterm infants

Luciana Friedrich, MD[1]; Paulo M. C. Pitrez, MD PhD[2]; Renato T. Stein, MD PhD[2]; Marcelo Goldani MD PhD[1], PhD; Robert Tepper, MD PhD[3], Marcus H. Jones, MD PhD[2].

	Adjusted Least-Square Means			
	Preterm	Control	95% CI	*p*
TEST 1				
FVC	230±10	234±11	-29 to 37	0.814
FEF_{50}	404±26	480±27	-157 to 6	0.068
FEF_{75}	185±16	242±17	-109 to -6	0.030
FEF_{25-75}	346±24	435±25	-165 to -13	0.022
$FEV_{0.5}$	179±8	191±9	-39 to 15	0.371
$FEV_{0.5}$/FVC	0.78±0.02	0.86±0.02	-0.14 to -0.02	0.006
TEST 2				
FVC	513±14	494±15	-22 to 60	0.364
FEF_{50}	731±32	816±34	-179 to 10	0.078
FEF_{75}	360±19	428±20	-124 to -13	0.017
FEF_{25-75}	649±29	746±30	-182 to -12	0.027
$FEV_{0.5}$	364±11	379±11	-47 to 17	0.348
$FEV_{0.5}$/FVC	0.72±0.01	0.78±0.01	-0.10 to -0.03	0.001

Figure 1.



PEDIATRIC PULMONOLOGY

Pediatric Pulmonology 50:1313–1319 (2015)

Lung Parenchymal Development in Premature Infants Without Bronchopulmonary Dysplasia

Santiago J. Assaf, MD,[1] Daniel V. Chang, MD,[1] Christina J. Tiller, RRT,[1] Jeffrey A. Kisling, RRT,[1] Jamie Case, BS, PhD,[2,3,4] Julie A. Mund, MS,[2,3,4] James E. Slaven, MS,[5] Zhangsheng Yu, MS, PhD,[5] Shawn K. Ahlfeld, MD,[2,4] Brenda Poindexter, MD,[2] Laura S. Haneline, MD,[2,3,4,6] David A. Ingram, MD,[2,4,7] and Robert S. Tepper, MD, PhD[1,4]*

Summary. Rationale: While infants who are born extremely premature and develop bronchopulmonary dysplasia (BPD) have impaired alveolar development and decreased pulmonary diffusion (DL_{CO}), it remains unclear whether infants born less premature and do not develop BPD, healthy premature (HP), have impaired parenchymal development. In addition, there is increasing evidence that pro-angiogenic cells are important for vascular development; however, there is little information on the relationship of pro-angiogenic cells to lung growth and development in infants. Objective: and Methods Determine among healthy premature (HP) and fullterm (FT) infants, whether DL_{CO} and alveolar volume (V_A) are related to gestational age at birth (GA), respiratory support during the neonatal period (mechanical ventilation [MV], supplemental oxygen [O_2], continuous positive airway pressure [CPAP]), and pro-angiogenic circulating hematopoietic stem/progenitor cells (CHSPCs). We measured DL_{CO}, V_A, and CHSPCs in infants between 3–33

TABLE 1—Group Demographics, DL_{CO}, V_A, and pCHSPC:nCHSPC

	Full term controls	Preterm without BPD	*P*-value	
Gestational age at birth (wks)	39.3 (37–41)	31.7 (27 – 35)	n/a	
Corrected-age at testing (mths)	14.4 (3.1–32.8)	13.7 (5.6–21.3)	0.499	
Body length at testing (cm)	75.8 (60.0–97.5)	76.1 (63.2–96.1)	0.798	
Body weight at testing (kg)	10.0 (5.9–15.7)	9.9 (6.1–17.8)	0.817	
Gender (Female, %)	47 (53.4)	22 (45.8)	0.398	
Race (Caucasian, %)	57 (64.8)	39 (81.3)	0.044	
Supplemental O_2 (days)				
0 days	–	12 (25.0)	n/a	
1–5 days	–	14 (29.2)		
6–10 days	–	5 (10.4)		
11+ days	–	17 (35.4)		
Mechanical ventilation (days)				
0 days	–	32 (66.7)	n/a	
1–5 days	–	14 (29.2)		
6–10 days	–	1 (2.1)		
11+ days	–	1 (2.1)		
CPAP (days)				
0 days	–	29 (60.4)	n/a	
1–5 days	–	17 (35.4)		
6–10 days	–	1 (2.1)		
11+ days	–	1 (2.1)		
Hgb (gm/dL)	12.1 (1.0)	12.2 (1.0)	0.681	
DL_{CO} (ml/min/mmHg)	3.76 (1.74–6.87)	4.11 (2.30–7.11)	0.100	0.027[1]
V_A (ml)	612 (260–1154)	642 (351–1161)	0.406	0.614[1]
pCHSPC:nCHSPC	1.76 (0.79–2.94)	1.59 (0.70–2.86)	0.184	0.101[1]

Values are means (standard deviation) for all variables except time/day variables which are represented by frequency (percent) for given categories. Values are means (range) for Gestational Age at Birth, Body Length at Testing, Body Weight at Testing, Corrected-Age at Testing, DL_{CO}, V_A and pCHSPC:nCHSPC.

[1]Comparison adjusted for body length, gender, and race.

ORIGINAL ARTICLE

Lung function after preterm birth: development from mid-childhood to adulthood

Maria Vollsæter,[1,2] Ola Drange Røksund,[2] Geir Egil Eide,[3,4] Trond Markestad,[1,2] Thomas Halvorsen[1,2]

▶ Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/thoraxjnl-2012-202980).

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[3]Centre for Clinical Research, Haukeland University Hospital, Bergen, Norway
[4]Department of Global Public Health and Primary Care,

ABSTRACT

Background As a result of advances in perinatal care, more small preterm infants survive. There are concerns that preterm birth and its treatments may harm pulmonary development and thereby lead to chronic airway obstruction in adulthood.

Objective To assess the development of spirometric lung function variables from mid-childhood to adulthood after extreme preterm birth.

Methods Two population-based cohorts born at gestational age ≤28 weeks or with birth weight ≤1000 g performed lung function tests at 10 and 18 and at 18 and 25 years of age, respectively, together with matched term-born controls. The results are

ır age, sex and
as compared for

Key messages

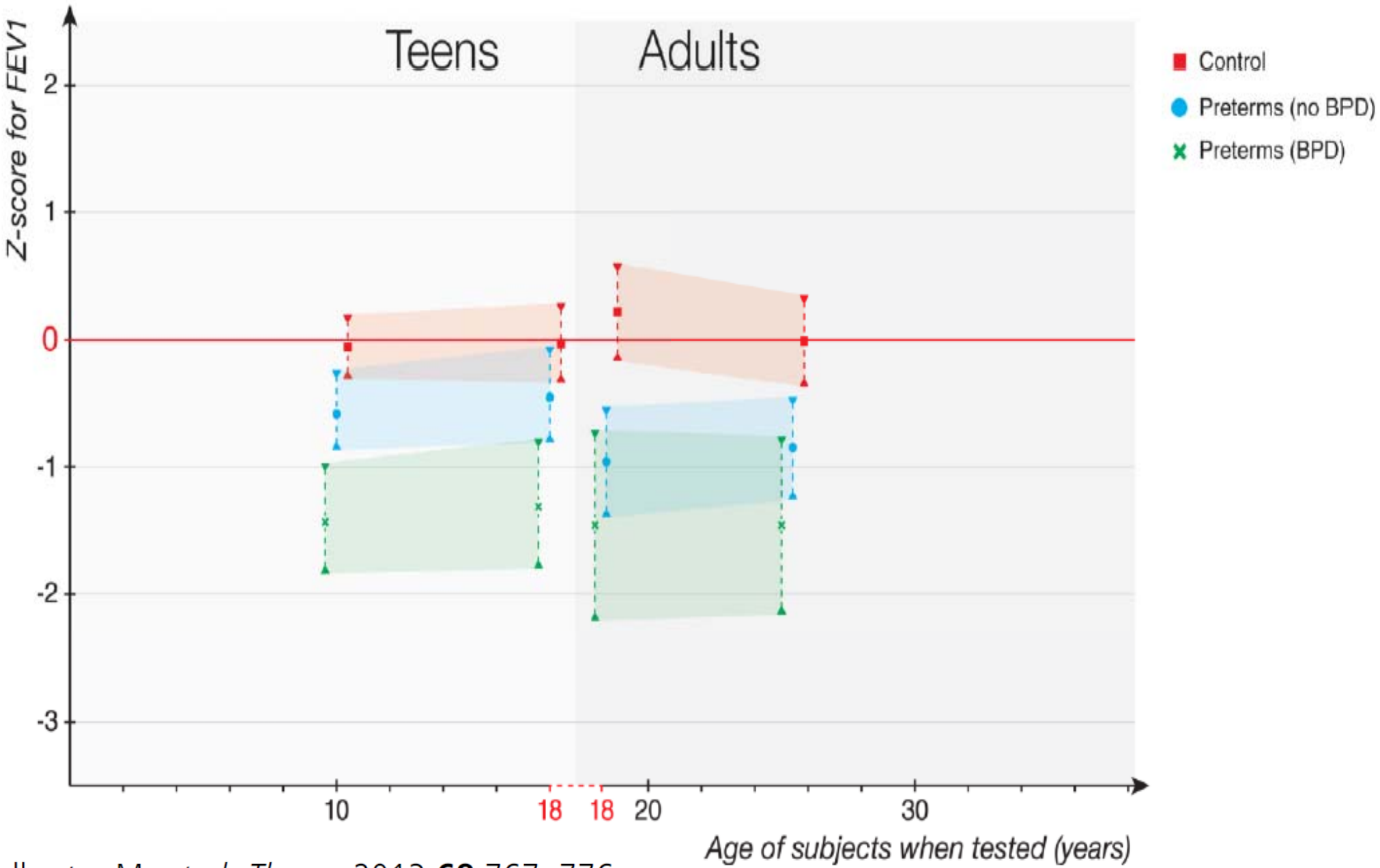
What is the key question?

- Does the development of lung function from childhood to adulthood after extremely preterm birth differ from that of peers born at term?

What is the bottom line?

- Airway obstruction was observed throughout the study period for those born preterm and was most pronounced after neonatal bronchopulmonary dysplasia; however, lung function trajectories were basically parallel in all subgroups.

Vollsæter M, *et al*. *Thorax* 2013;**68**:767–776.



Vollsæter M, *et al*. *Thorax* 2013;**68**:767–776.

Growth of Lung Parenchyma in Infants and Toddlers with Chronic Lung Disease of Infancy

Juan E. Balinotti[1], Valentina C. Chakr[1], Christina Tiller[1], Risa Kimmel[1], Cathy Coates[1], Jeffrey Kisling[1], Zhangsheng Yu[2], James Nguyen[2], and Robert S. Tepper[1]

[1]Department of Pediatrics, James Whitcomb Riley Hospital for Children, and Herman B. Wells Center for Pediatric Research, and [2]Department of Biostatistics, Indiana University, Indianapolis, Indiana

Rationale: The clinical pathology describing infants with chronic lung disease of infancy (CLDI) has been limited and obtained primarily from infants with severe lung disease, who either died or required lung biopsy. As lung tissue from clinically stable outpatients is not available, physiological measurements offer the potential to increase our understanding of the pulmonary pathophysiology of this disease.

Objectives: We hypothesized that if premature birth and the development of CLDI result in disruption of alveolar development, then infants and toddlers with CLDI would have a lower pulmonary diffusing capacity relative to their alveolar volume compared with full-term control subjects.

Methods: We measured pulmonary diffusing capacity and alveolar volume, using a single breath-hold maneuver at elevated lung volume. Subjects with chronic lung disease of infancy (23–29 wk of gestation; n = 39) were compared with full-term control subjects (n = 61) at corrected ages of 11.6 (4.8–17.0) and 13.6 (3.2–33) months, respectively.

Measurements and Main Results: Alveolar volume and pulmonary

AT A GLANCE COMMENTARY

Scientific Knowledge on the Subject

The pulmonary pathology obtained from infants with chronic lung disease of infancy (CLDI) has been limited and we know little about the development of the lung parenchyma of premature infants.

What This Study Adds to the Field

Our study demonstrates that clinically stable infants and toddlers with chronic lung disease of infancy after very premature birth have reduced pulmonary diffusing capacity, but normal alveolar volume. These physiological findings are consistent with morphometric data suggesting an impairment of alveolar development.

Table 1. DEMOGRAPHICS

Variable	Subjects with CLDI [mean (SD)]	Full-term Subjects [mean (SD)]	*P* Value
Number of subjects	39	61	
Gestational age, wk	26 (1.7)	39 (0.9)	<0.001
Corrected age at test date, mo	11.6 (3.8)	13.4 (6.1)	0.082
Birth weight, kg	0.87 (0.24)	3.45 (0.50)	<0.001
Weight at test date, kg	8.94 (1.74)	9.77 (2.09)	0.041
Length at test date, cm	71.7 (5.6)	74.6 (7.7)	0.028
Weight at test date, *Z*-score	−0.20 (1.22)	0.29 (0.95)	0.027
Length at test date, *Z*-score	−0.90 (1.04)	−0.40 (0.92)	0.013
Hb, g/dl	12.7 (1.16)	12.1 (0.90)	0.003
Mechanical ventilation, d (range)	19 (0–83)		
CPAP, d (range)	18 (0–49)		
Supplemental oxygen, d (range)	82 (33–170)		
Female, n/N, %	21/39 (53.8%)	30/61 (49.2%)	0.649
White, n/N, %	25/39 (64.1%)	34/61 (55.7%)	0.407
Maternal smoking during pregnancy, n/N, %	11/39 (28.2%)	3/61 (4.9%)	0.001

Definition of abbreviations: CLDI = chronic lung disease of infancy; CPAP = continuous positive airway pressure; Hb = hemoglobin.

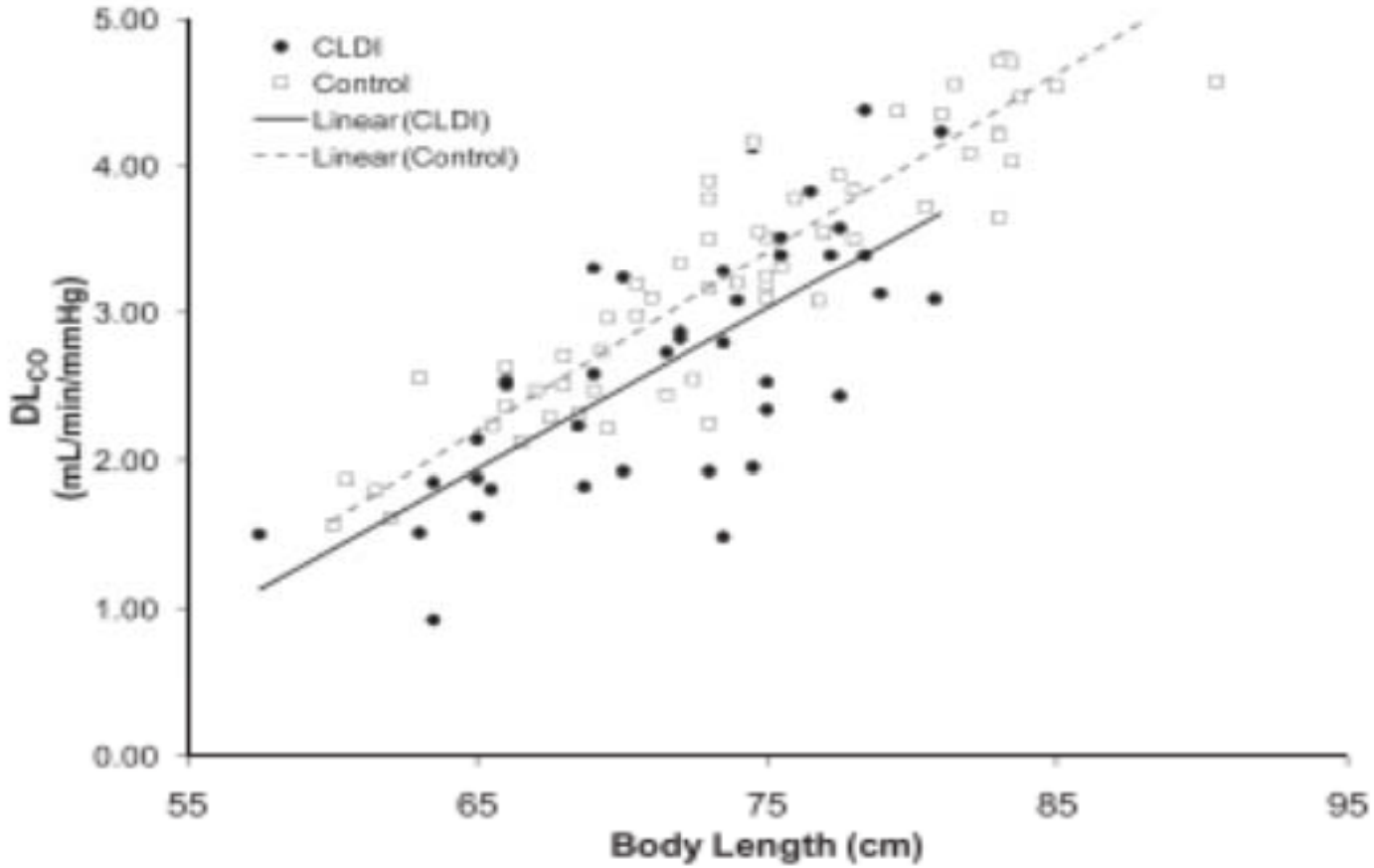


Figure 2. Pulmonary diffusing capacity, D_{LCO} (ml/min/mm Hg), versus body length (cm). Individual data for subjects with chronic lung disease of infancy (CLDI) (*solid circles*) and control subjects (*open squares*) are presented, as well as the linear regressions for each group. D_{LCO} was significantly lower for subjects with CLDI compared with control subjects when adjusted for body length by analysis of covariance ($P = 0.0004$).

Abnormal Lung Function in Adults With Congenital Heart Disease: Prevalence, Relation to Cardiac Anatomy, and Association With Survival

Rafael Alonso-Gonzalez, MD, MSc*; Francesco Borgia, MD*; Gerhard-Paul Diller, MD, MSc, PhD; Ryo Inuzuka, MD; Aleksander Kempny, MD; Ana Martinez-Naharro, MD; Oktay Tutarel, MD; Philip Marino, MD; Kerstin Wustmann, MD; Menelaos Charalambides, MD; Margarida Silva, MD; Lorna Swan, MB, ChB, FRCP, MD; Konstantinos Dimopoulos, MD, MSc, PhD; Michael A. Gatzoulis, MD, PhD

***Background*—**Restrictive lung defects are associated with higher mortality in patients with acquired chronic heart failure. We investigated the prevalence of abnormal lung function, its relation to severity of underlying cardiac defect, its surgical history, and its impact on outcome across the spectrum of adult congenital heart disease.

***Methods and Results*—**A total of 1188 patients with adult congenital heart disease (age, 33.1±13.1 years) undergoing lung function testing between 2000 and 2009 were included. Patients were classified according to the severity of lung dysfunction based on predicted values of forced vital capacity. Lung function was normal in 53% of patients with adult

Table 1. Baseline Characteristics, Surgical History, and Spirometry in Relation to Lung Function

	All patients (n=1188)	In Relation to Lung Function			P*
		Normal (n=628)	Mildly Impaired (n=207)	Moderately to Severely Impaired (n=353)	
Clinical characteristics					
n (%)	100	52.9	17.4	29.7	
Age, y	33.2±13.1 (1188)	33.7±12.8	32.7±14.1	32.7±13.2	0.19/0.28
Male sex, n (%)	53.3 (1188)	55.6	55.4	54.7	0.65/0.73
Height, cm	170.0±10.6 (1188)	171.4±10.6	170.0±10.1	167.4±10.5	0.94/<0.001
BMI, kg/m^2	23.8±4.7 (1188)	24.2±4.7	24.0±4.5	22.9±4.6	0.53/<0.001
Lung function test					
FEV_1, L	2.7±0.9 (1188)	3.1±0.7	2.5±0.6	1.8±0.6	<0.01/<0.01
FEV_1, % of predicted	72.7±18.0 (1188)	85.6±11.2	68.6±6.9	52.1±10.3	<0.01/<0.01
FVC, L	3.0±1.1 (1188)	3.5±0.8	2.8±0.6	2.0±0.6	<0.01/<0.01
FVC, % of predicted	69.7±17.5 (1188)	83.1±10.4	64.8±2.8	48.8±8.8	<0.01/<0.01
FEV_1/FVC ratio	0.89±0.08	0.88±0.07	0.90±0.08	0.91±0.08	<0.01/<0.01
Cardiopulmonary exercise test					
Peak Vo_2, mL·kg^{-1}·min^{-1}	22.8±8.9 (1170)	25.1±9.1	21.6±8.0	19.4±7.8	0.11/0.04
% Predicted peak Vo_2	62.3±27.8 (1170)	74.9±30.4	63.4±21.0	56.0±21.4	0.33/0.17
V_E/Vo_2 slope	36.8±14.9 (1170)	35.1±13.8	36.6±14.1	40.1±16.5	0.44/<0.01

ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; BMI, body mass index; FEV_1, forced expiratory volume in 1 second; FVC, forced vital capacity; and NYHA, New York Heart Association functional class. Data are expressed as mean±SD when appropriate. Age at repair, age at shunt operation, and time from repair are expressed as median (interquartile range). Number of patients available on each variable is given in parentheses.

nts

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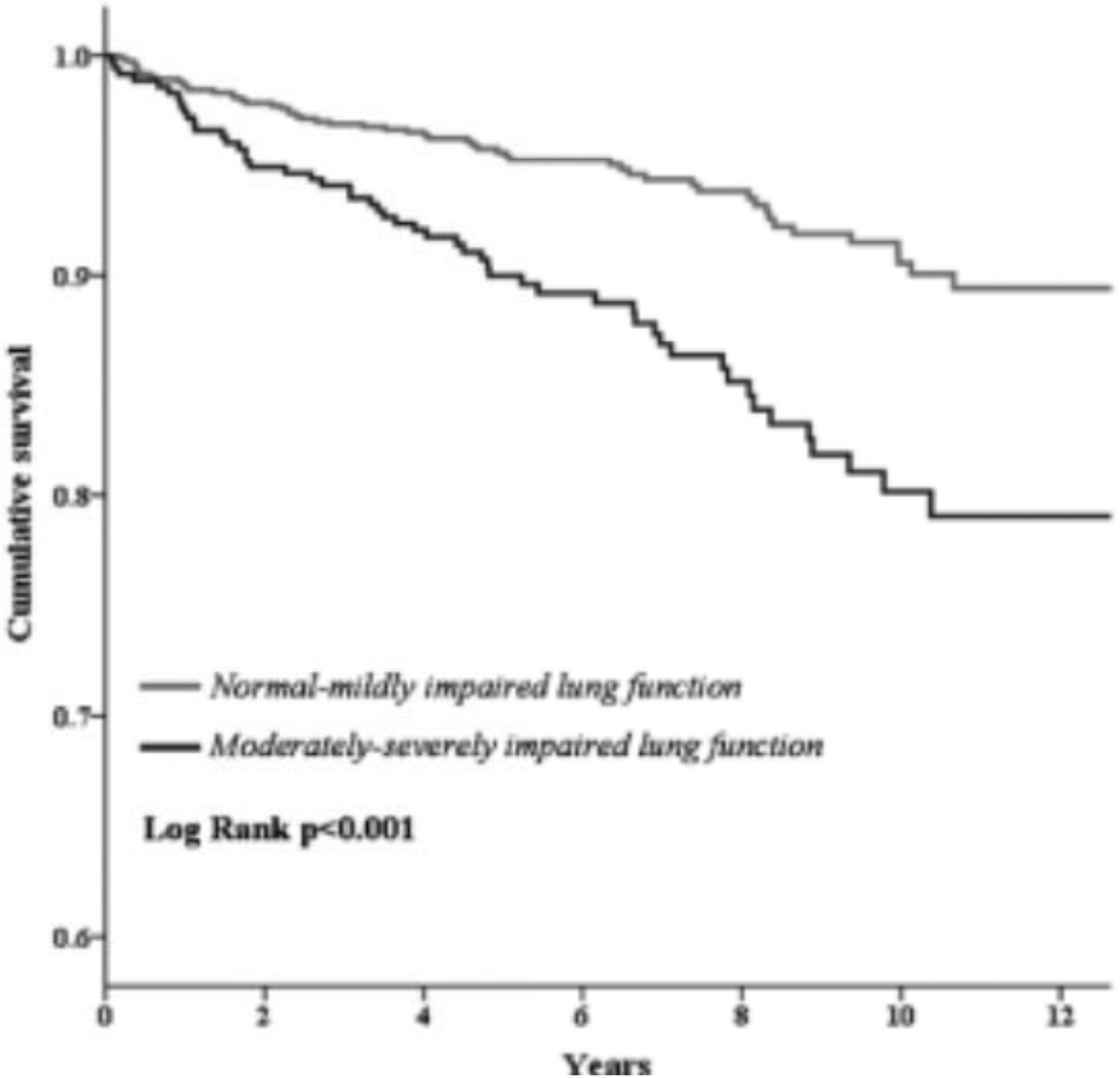

Acta Pædiatr 82: 557–61. 1993

Adenovirus type 7h respiratory infections: a report of 29 cases of acute lower respiratory disease

Patricia Murtagh[1], Cristina Cerqueiro[2], Alicia Halac[1], María Avila[3] and Adriana Kajon[3]

Hospital Nacional de Pediatría "Juan P Garrahan"[1], Hospital de Niños "Ricardo Gutierrez"[2] and Departamento de Microbiología[3], Facultad de Medicina, Universidad de Buenos Aires, Argentina

Murtagh P, Cerqueiro C, Halac A, Avila M, Kajon A. Adenovirus type 7h respiratory infections: a report of 29 cases of acute lower respiratory disease. Acta Pædiatr 1993;82:557–61. Stockholm. ISSN 0803–5253

Twenty-nine cases of pediatric acute lower respiratory disease associated with adenovirus genome type 7h were evaluated retrospectively. They constituted 2.4% of 1233 cases of acute respiratory infections treated in five hospitals in Buenos Aires, between September 1984 and September 1988. Pneumonia and bronchiolitis were the principal diagnoses. The mean age of patients was 8.8 months and 82.7% of the children were less than one year of age. None of the patients had previously been exposed to measles or was immunocompromised. A mixed infection, viral or bacterial, was demonstrated in 8 of the 29 patients. Sixteen children developed a severe pulmonary disease which required intensive care. Ten with a clinical diagnosis of multifocal pneumonia and necrotizing bronchiolitis died. Extrapulmonary manifestations were observed in the most severe cases. Observations suggest a possible high pathogenicity of adenovirus type 7h and emphasize the need for adequate control and case management programs. □ *Acute respiratory infections, adenovirus 7, pneumonia*

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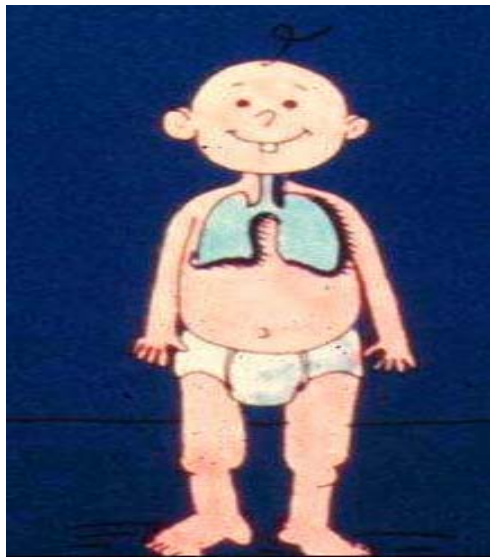
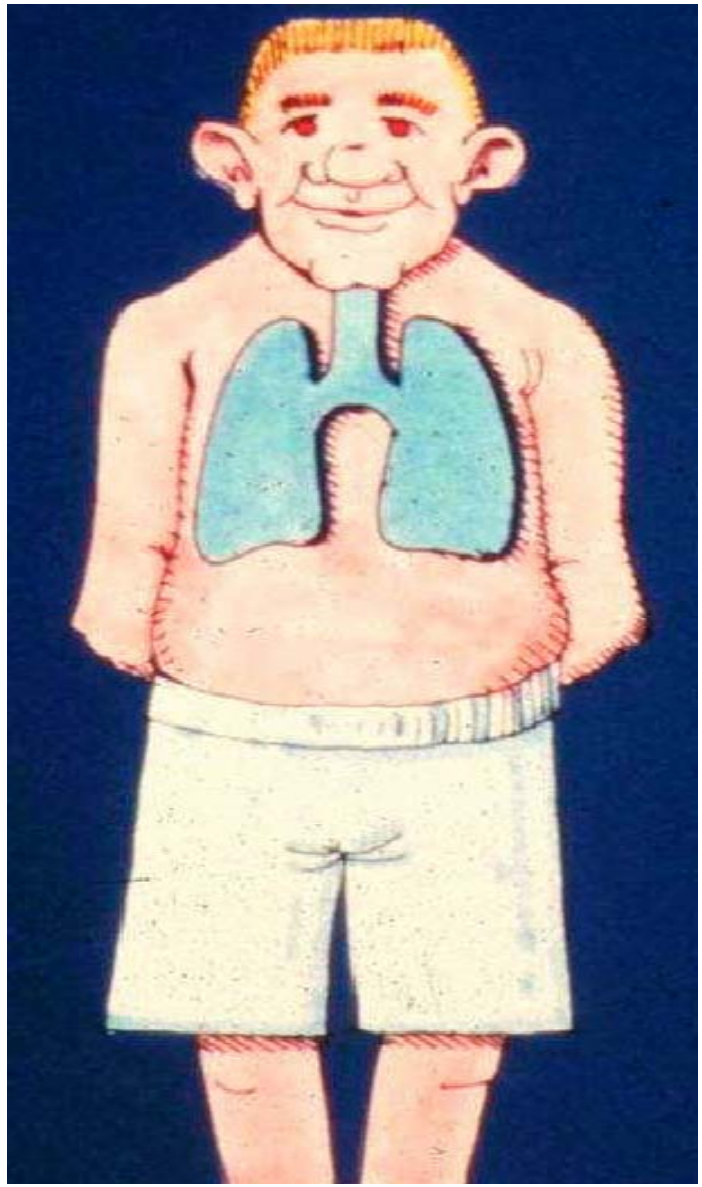
Crecimiento y Desarrollo Pulmonar





Lung function in infants with chronic pulmonary disease after severe adenoviral illness

Alejandro M. Teper, MD, Carlos D. Kofman, MD, Alberto F. Maffey, MD, and Santiago M. Vidaurreta, MD

Objective: To evaluate pulmonary function and bronchodilator responses in young children with chronic pulmonary disease (CPD) after a severe adenoviral lower respiratory tract infection.

Methods: Pulmonary function tests were performed in 13 patients (mean age, 1.32 ± 0.8 years) with CPD and were compared with a control group of 13 healthy infants (mean age, 1.16 ± 0.4 years).

Results: Respiratory rate, peak tidal expiratory flow (PTEF), PTEF/tidal volume, absolute time up to PTEF, time percentage to PTEF, volume percentage for PTEF, and compliance and resistance of the respiratory system were significantly affected in the CPD group. Similarly, maximal flow at functional residual capacity (V′maxFRC) was 56.0 ± 42 mL/s and 373 ± 107 mL/s in the CPD and control groups, respectively (P = .001). No within-group differences with baseline values or between-group differences were noted in response to treatment with ipratropium bromide or albuterol.

chodilators of young children with CPD after a severe adenoviral lower respiratory tract infection.

CPD	Chronic pulmonary disease
PFTs	Pulmonary function tests
PTEF	Peak tidal expiratory flow
SaO_2	Arterial oxygen saturation
TV	Tidal volume
$\dot{V}$maxFRC	Maximal flow at functional residual capacity

Methods

Population

Three hundred seventy of 2513 children admitted to the hospital because

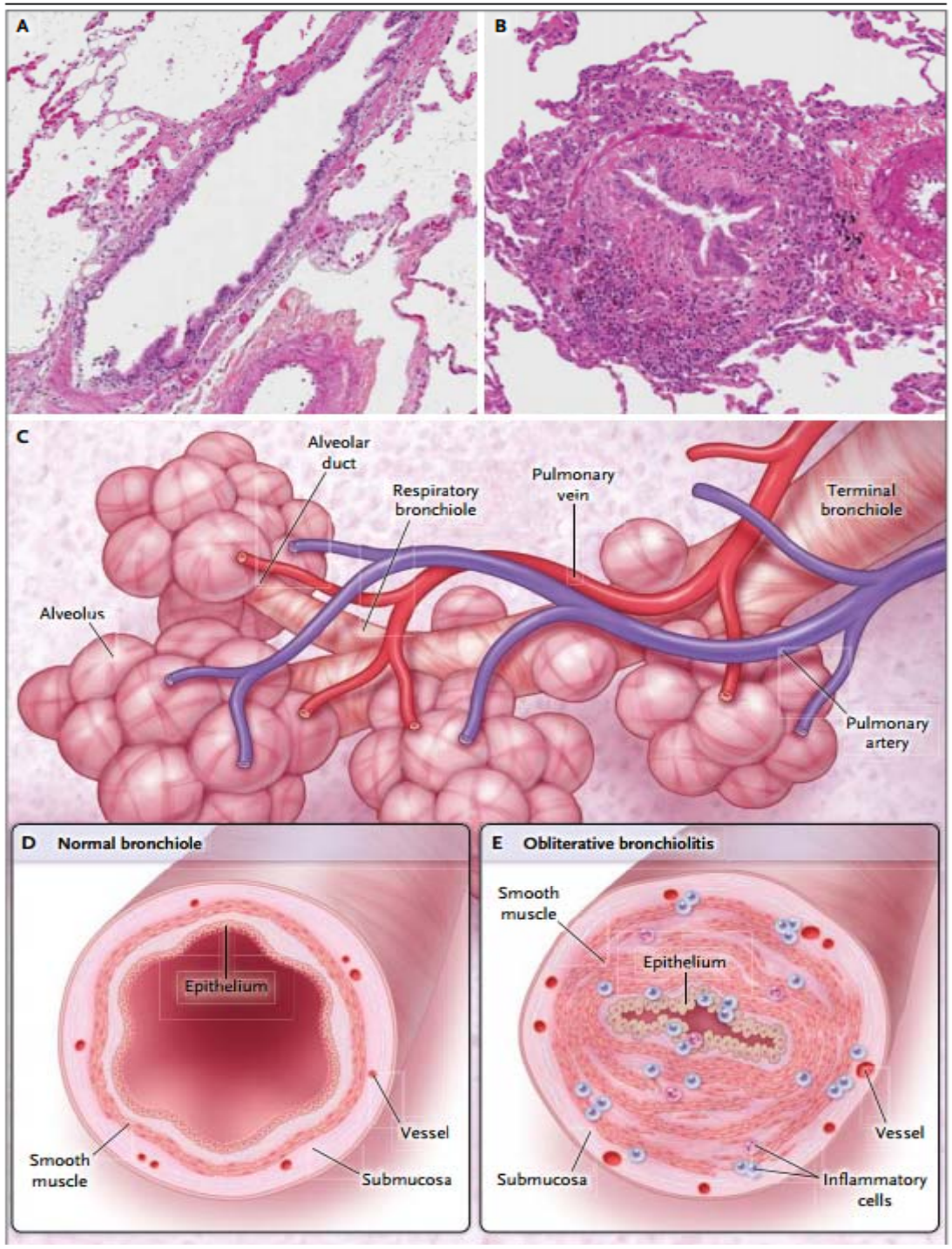
Table I. Demographic and anthropometric characteristics in 13 young children with CPD and 13 control children

	CPD group (n = 13)	Control group (n = 13)
Age (y)	1.32 ± 0.8	1.16 ± 0.4
Sex (M/F)	5/8	9/4
Height (cm)	71.9 ± 6.8	76.2 ± 7.4
Z score for height*	–1.8 ± 1.9	–0.3 ± 0.9
Weight (kg)	8.09 ± 1.9	10.2 ± 2

	CPD	Control	
Vmax FRC (mL/s)	56 ±42 mL/s	373 ± 107 mL/s	P<0,001
Vmax FRC (%)	20% (±9%)	109% (±12%)	

RR	40.7 ± 12	30.1 ± 4	.007
PTEF (mL/s)	146 ± 46	113 ± 25	.03
PTEF/TV	2.20 ± 0.9	1.18 ± 0.2	.001
T-PTEF (s)	0.09 ± 0.04	0.24 ± 0.1	.001
Tme/Te	0.09 ± 0.04	0.28 ± 0.1	.001
%V-PF	0.16 ± 0.05	0.27 ± 0.1	.001
Compliance (mL/cm H_2O/kg)	1.25 ± 0.74	2.07 ± 0.9	.015
Resistance (cm H_2O/mL/s)	0.06 ± 0.03	0.03 ± 0.01	.003

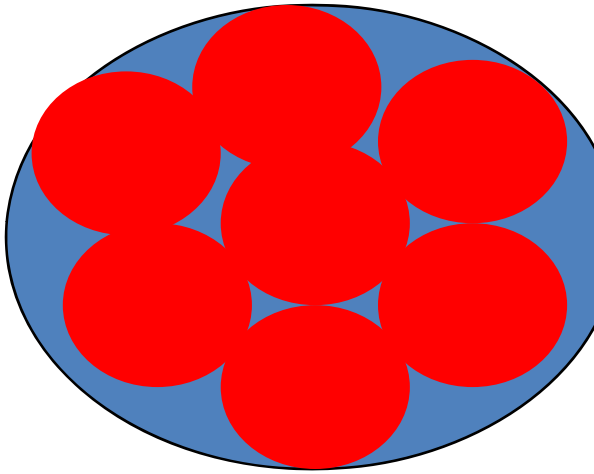
Values are expressed as mean ± SD.
RR, Respiratory rate; *T-PTEF,* absolute time to PTEF; *Tme/Te,* time percentage for PTEF; *%V-PF* volume percentage for PTEF.


A
B
C
Alveolar duct
Respiratory bronchiole
Pulmonary vein
Terminal bronchiole
Alveolus
Pulmonary artery
D Normal bronchiole
Epithelium
Vessel
Smooth muscle
Submucosa
E Obliterative bronchiolitis
Smooth muscle
Epithelium
Vessel
Submucosa
Inflammatory cells

Crecimiento y Desarrollo Pulmonar

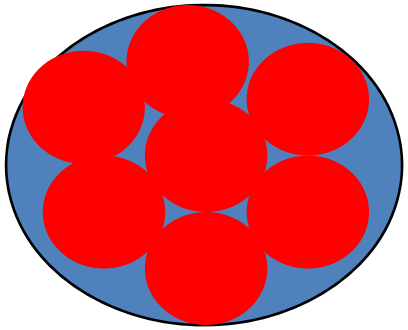
Niños hasta Adultez

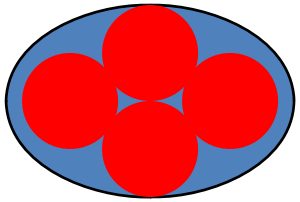
Expansion Alveolar



RN y Lactantes

Aumenta el N° Alveolos





Como llega el pulmón a la edad de 8años

Pediatric Pulmonology 45:1180–1185 (2010)

Postinfectious Bronchiolitis Obliterans in Children:
Clinical and Pulmonary Function Findings

V. Aguerre, MD,* C. Castaños, MD, H. Gonzalez Pena, MD,
M. Grenoville, MD, and P. Murtagh, MD

Summary. Aim: Postinfectious bronchiolitis obliterans (PIBO) is an infrequent yet potentially severe disorder following acute lower pulmonary infection (ALRI) in children. In infants and young children PIBO have been strongly associated with Adenovirus (Ad). The purpose of this study was to analyze the clinical features and pulmonary function findings in children with PIBO. Cases caused by Ad were compared with cases in which no viral agent was identified. Methods: Fifty-eight children with PIBO were prospectively studied. Clinical data and pulmonary function tests (spirometry and plethysmography) were evaluated. Patients were divided in two groups according to the identification of the causal agent. Group 1 (G1): Adenovirus (+) Group 2: No etiologic agent identified. Results: Fifty-eight patients (male/female ratio 3.4:1); median age 8 years; mean age at initial injury 11 months; median time of hospitalization at acute stage of disease 60 days. Spirometry: FVC 68 ± 13%, FEV1 40.5 ± 11%, $FMMF_{25-75\%}$ 16.7 ± 7.5%. Pletysmography: TLC 136 ± 22%, FRC 208 ± 50%, RV 343 ± 102%, RV/TLC 59 ± 10, SGaw 0.05 ± 0.02. When clinical, spirometric and plethysmographic data were compared, no statistically significant difference was found between the two groups. Conclusions: PIBO is an extremely crippling lung disease with significant obstructive pattern in PFT. Both analyzed groups shared similar characteristics in the acute phase of the disease and in the severity of the sequelar pulmonary disease. **Pediatr Pulmonol. 2010; 45:1180–1185.**

TABLE 2—Pulmonary Function Data of all Cases (n = 58) and in G1 and G2

	Total cases, n = 58	G1, n = 22	G2, n = 36	P^1
Spirometry				
FVC (%)[2]	68.75 (13.6)	68.90 (12.75)	68.66 (14.2)	0.95
FEV_1 (%)[2]	40.5 (11.1)	43.6 (9)	38.5 (11.9)	0.06
FEV_1/FVC (%)[3]	56.1 (10.9)	59.9 (7.7)	53.83 (12)	0.04
$FEF_{25-75\%}$ (%)[2]	16.7 (7.5)	18.4 (6.7)	15.6 (7.8)	0.11
Plethysmography				
TLC (%)[2]	136 (21.9)	132.7 (19)	138.1 (23.5)	0.37
FRC (%)[2]	207.7 (49.6)	196.5 (48.5)	214.6 (49.7)	0.18
RV (%)[2]	343.1 (102.1)	319.3 (89.8)	357.7 (107.6)	0.17
RV/TLC (%)[3]	58.6 (10.1)	57 (10.5)	59.6 (9.8)	0.35
Sgaw[3]	0.05 (0.02)	0.06 (0.02)	0.05 (0.02)	0.07

[1] *P* value = comparing G1versus G2.
[2] Percentage of predicted values. Mean (SD).
[3] Absolute values.

Original Article

Pulmonary function in children and adolescents with postinfectious bronchiolitis obliterans*, **

Função pulmonar de crianças e adolescentes com bronquiolite obliterante pós-infecciosa

Rita Mattiello, Javier Mallol, Gilberto Bueno Fischer, Helena Teresinha Mocelin, Belkys Rueda, Edgar Enrique Sarria

J Bras Pneumol. 2010;36(4):453-459

Table 2 - Pulmonary function parameters of the participants, by country.

Parameter[a]	Brazil[b]	Chile[b]	Both countries[b]
	(n = 41)	(n = 36)	(n = 77)
FVC	61.7 (56.9-66.4)	72.5 (68.2-76.8)	66.8 (63.4-70.2)
FEV_1	42.5 (37.6-47.0)	49.7 (44.7-54.8)	45.9 (42.4-49.4)
$FEF_{25-75\%}$	19.9 (16.0-23.8)	23.4 (19.1-27.7)	21.5 (18.6-24.4)
FEV_1/FVC	67.6 (63.1-72.1)	66.8 (62.5-71.1)	67.2 (64.1-70.3)
TLC	116.8 (113.1-120.5)	112.5 (10.8-117.1)	116.8 (113.2-120.5)
ITGV	162.7 (154.0-171.4)	144.5 (134.6-154.3)	162.7 (154.0-171.4)
RV	281.1 (258.6-303.7)	231.0 (203.2-258.7)	281.1 (258.6-303.7)
RV/TLC	236.2 (222.5-250.40)	200.9 (184.7-217.1)	236.2 (222.5-250.0)
sRaw	746.6 (597.5-895.7)	572.8 (431.9-713.6)	665.3 (562.5-768.2)

ITGV: intrathoracic gas volume; and sRaw: specific airway resistance. [a]Values expressed as percentage of the predict value. [b]Values expressed as mean (95% CI).

Como Crece el Pulmón de Un Niño con BO

The Clinical Respiratory Journal ORIGINAL ARTICLE

Dysanaptic growth of lung and airway in children with post-infectious bronchiolitis obliterans

Ricardo A. Mosquera[1], Syed S. Hashmi[2], Susan E. Pacheco[1], Alexandra Reverdin[1], Justyna Chevallier[1] and Giuseppe N. Colasurdo[1]

1 Division of Pulmonary Medicine, Department of Pediatrics, University of Texas Medical School at Houston, Houston, TX, USA
2 Pediatric Research Center, Department of Pediatrics, University of Texas Medical School at Houston, Houston, TX, USA

Abstract

Rationale: Post-infectious bronchiolitis obliterans (PBO) is a rare form of chronic obstructive lung disease associated with small airway fibrosis following a severe insult to the lower respiratory tract. It has been suggested that PBO is a non-progressive disease. However, evidence supporting this statement is limited. In this case series, we sought to determine the changes of pulmonary function tests (PFT) over time in children with PBO.

Key words
bronchiolitis obliterans – dysanaptic growth – immunomodulation – inhaled corticosteroids – pulmonary function test

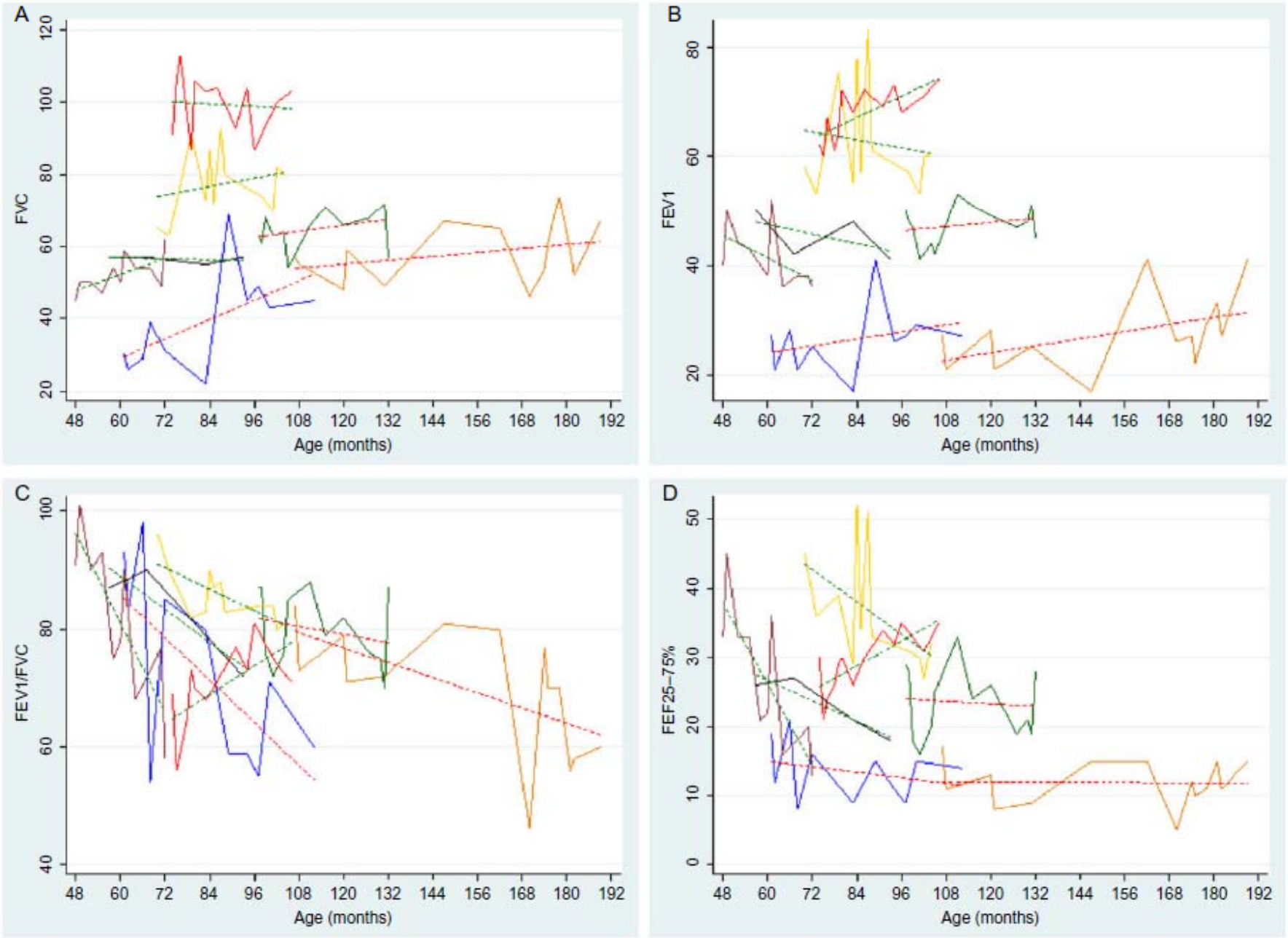
Correspondence
Ricardo A. Mosquera, MD, 6431 Fannin Street, MBS 3.226A, Houston, TX 77030.

Table 2. Baseline and final median PFT values

	PFT values (median)				
	Baseline	End of study	Change per year*	95% CI	*P* value
FVC	57%	62%	1.8%	0.4 to 1.3	0.008
FEV1	50%	41%	0.8%	–0.2 to 1.8	0.112
FEV1/FVC	87%	71%	–2.6%	–3.8 to –1.4	<0.001
FEF25–75%	29%	18%	–0.9%	–1.8 to 0.0	0.060

*Average increase (positive) or decrease (negative) in PFT value for every unit increase in age; statistical model did not include IVIG as a covariate.

PFT, pulmonary function test; IVIG, intravenous immunoglobulin; FVC, forced vital capacity; FEV1, forced expiratory volume in 1 s; FEF, forced expiratory flow; CI, confidence interval.


A
FVC
20
40
60
80
100
120
48 60 72 84 96 108 120 132 144 156 168 180 192
Age (months)
B
FEV1
20
40
60
80
48 60 72 84 96 108 120 132 144 156 168 180 192
Age (months)
C
FEV1/FVC
40
60
80
100
48 60 72 84 96 108 120 132 144 156 168 180 192
Age (months)
D
FEF25–75%
0
10
20
30
40
50
48 60 72 84 96 108 120 132 144 156 168 180 192
Age (months)

CHRONIC HYPOXIA ACCENTUATES DYSANAPTIC LUNG GROWTH

Conrado J. Llapur[1,2,3], Myriam R. Martínez[1,4], Pedro T. Grassino[3,5,] Ana Stok[6], Hector H. Altieri[3,7], Federico Bonilla[8], María Marta Caram[3,9], Natasha M. Krowchuk[10], Miranda Kirby[10], Harvey O. Coxson[10], Robert S. Tepper[11].

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Corresponding author:

Robert S. Tepper MD, PhD

El Infiernillo 3042 masl

Tafi del Valle 2000 masl

Tucuman 440 masl

Casa de Gobierno

Methods

Protocol: The HRCT and the Pulmonary Test were performed in centers placed at low altitude.

- Group 1: 30 Healthy subjects non smokers, without respiratory disease, born, raised and living at middle altitude (Tafí del Valle 2000masl-Tucumán-Argentina) older than 21 years of age.

- Group 2: 30 Healthy subjects non smokers, without respiratory disease, born, raised and living at low altitude (San Miguel de Tucumán 440masl –Tucumán-Argentina).

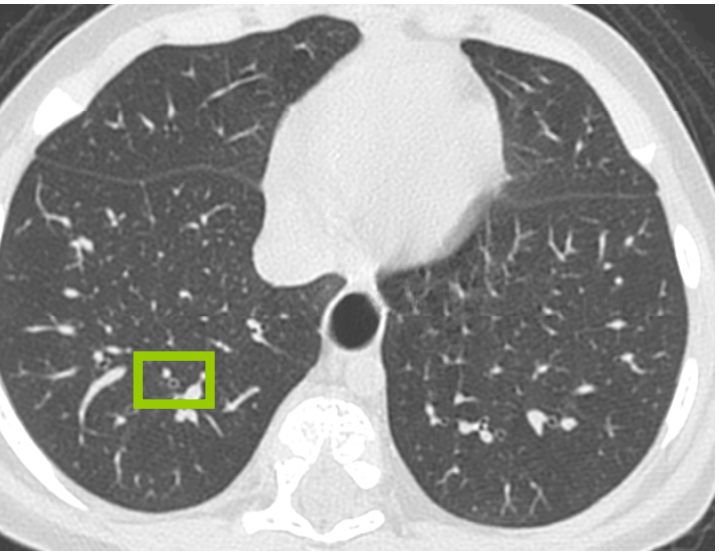
Physiologic Measurments

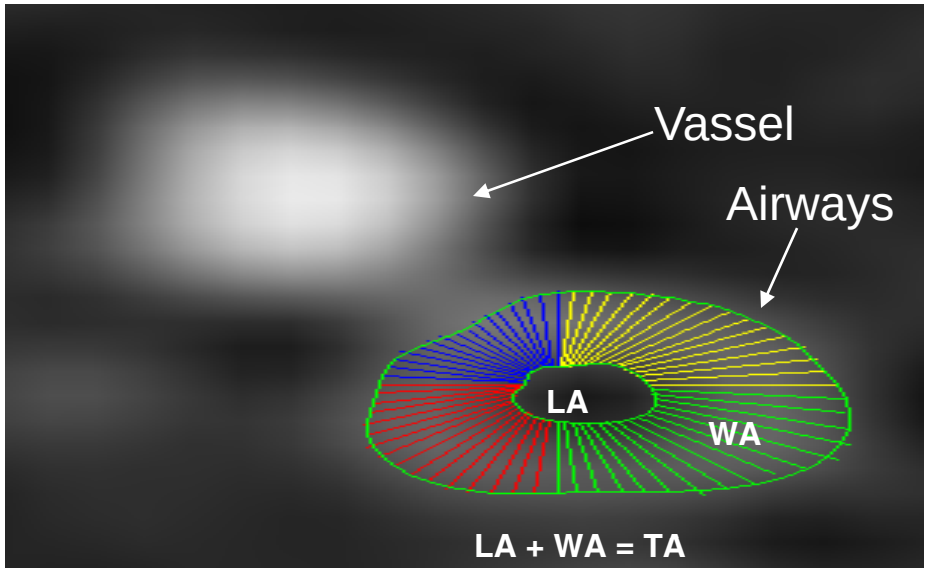
DLCO (adjusted for hemoglobin), and Alveolar Volume (VA) were measured by single breath maneuver according to ATS/ERS standards with an equipment Medgraphics 1085 (Medical Graphic Co, Minnesota, USA).

HRCT Measurments

- 1.25-mm thick HRCT images of the lungs were obtained at full inspiration. Lung measurements were calculated from images obtained every 10mm and analyzed using EmphylxJ software.
- Total lung volume (L), air volume (L), lung mass (grs) and lung density (grs/ml) were measured.
- The 2 groups were compared using ANCOVA adjusting for body length.

Total Airways Area, Lumen Aerea, Wall Area and Lung Tissue Density will be measured from 1.25mm of thick images





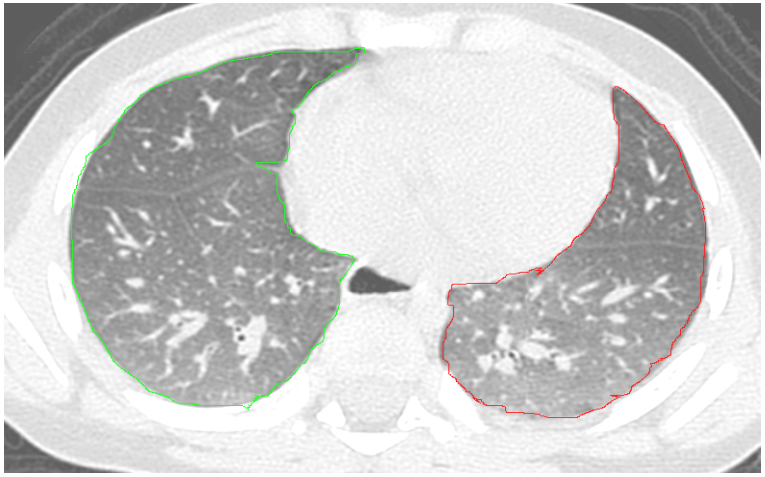



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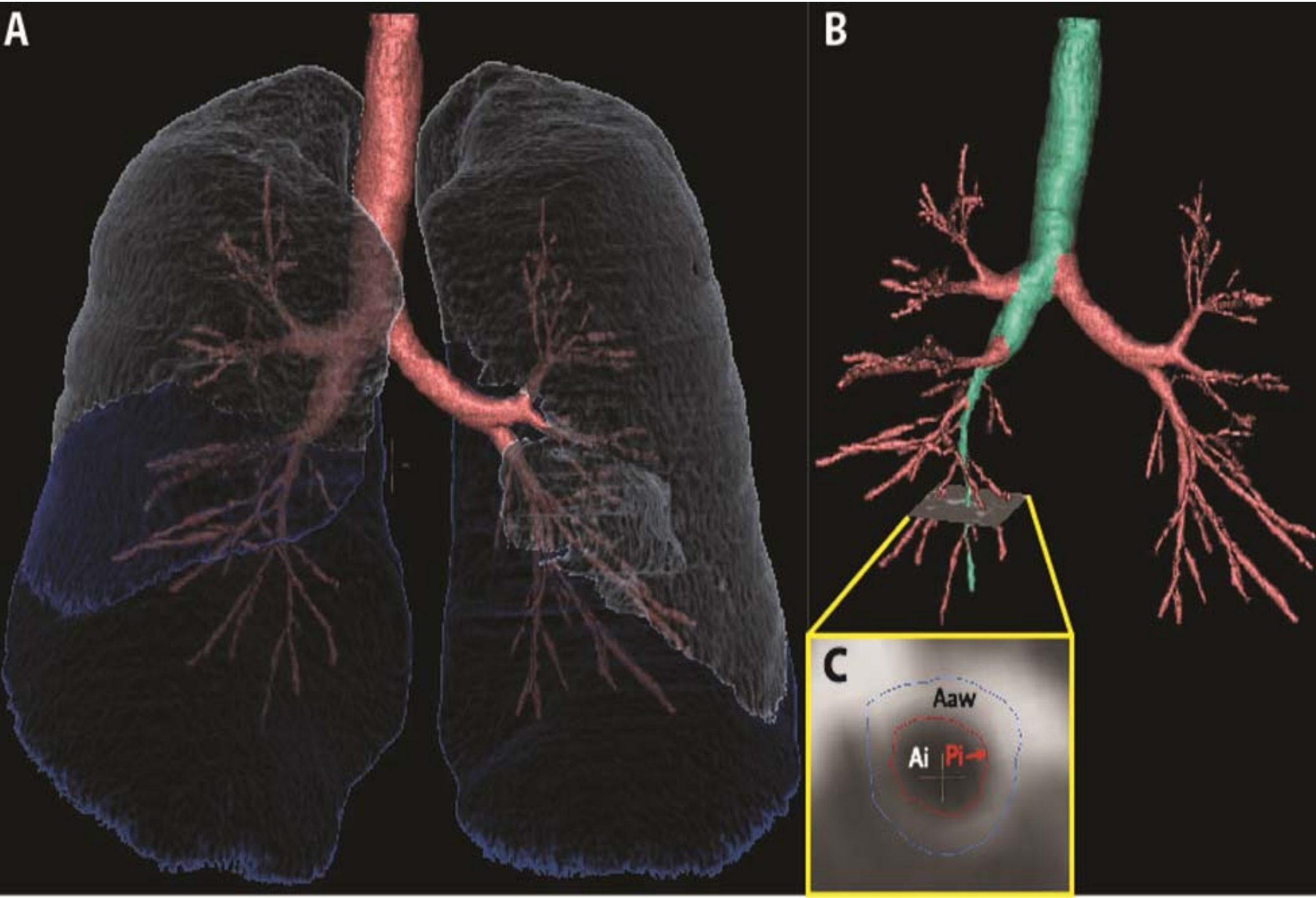
Table 1. Subject Demographic and Pulmonary Function Measurements

	Low Altitude (n=23)	Middle Altitude (n=19)	P-value
Demographics*			
Age, yr. (±SD)	26 (8)	28 (9)	0.40
Female Sex, n (%)	10 (43)	7 (37)	0.76
Weight, kg (±SD)	67 (11)	63 (11)	0.31
Height, cm (±SD)	168 (10)	166 (6)	0.54
Hgb, gm/100ml (±SD)	14.0 (1.0)	15.2 (1.8)	**0.008**
Pulmonary Function*			
FEV_1, L (±SD)	3.68 (0.70)	3.87 (0.70)	**0.03**
FEF_{25}, L (±SD)	7.53 (1.53)	6.84 (2.13)	0.36
FEF_{75}, L (±SD)	2.20 (0.73)	2.13 (0.61)	0.75
FEF_{25-75}, L (±SD)	4.33 (0.99)	4.03 (1.03)	0.52
FVC, L (±SD)	4.21 (0.78)	4.56 (0.92)	**0.002**
FEV_1/FVC, % (±SD)	87 (4)	84 (6)	**0.04**
V_A, L	5.24 (0.98)	5.74 (1.16)	**0.04**
DL_{CO}, ml/min/mmHg (±SD)	26.29 (7.52)	35.26 (6.41)	**0.005**
DL_{CO}/V_A, ml/min/mmHg/L (±SD)	5.10 (1.28)	6.12 (0.80)	**0.03**

Table 2. Multivariate Linear Regression Models for Whole Lung Parenchymal Measurements with Altitude

Parameter*	Low Altitude	Middle Altitude	Standardized Estimate	Std. Error	t Value	P-value
Total Volume, mm^3	5374 (1171)	5820 (1148)	0.22	212.29	2.41	**0.02**
Air Volume, mm^3	4685 (1093)	5077 (1070)	0.22	204.17	2.29	**0.03**
Tissue Volume, mm^3	688 (105)	742 (99)	0.21	19.12	2.33	**0.03**
Mean Lung Density, HU	-860 (23)	-862 (15)	-0.13	5.53	-0.96	0.35

*Adjusted by age, sex, weight and height


A
B
C
Aaw
Ai
Pi

Parameter*	Low Altitude	Middle Altitude	Standardized Estimate	Std. Error	t Value	P-value
Total Airway Count, No.	130 (35)	137 (30)	-0.0009	9.96	-0.01	1.00
Segmental Bronchi						
Ai, mm^2	20.31 (4.61)	19.80 (3.93)	-0.08	1.37	-0.46	0.65
Awa, mm^2	28.21 (4.27)	28.53 (4.06)	0.03	1.25	0.20	0.84
WA%, %	58 (3)	59 (2)	0.20	0.008	1.20	0.24
Subsegmental Bronchi						
Ai, mm^2	10.12 (1.54)	10.81 (2.54)	0.18	0.58	1.31	0.20
Awa, mm^2	18.18 (2.07)	18.87 (2.96)	0.15	0.68	1.08	0.29
WA%, %	64 (2)	64 (3)	-0.12	0.007	-0.75	0.46
Subsubsegmental Bronchi						
Ai, mm^2	7.09 (1.23)	7.60 (1.73)	0.17	0.44	1.16	0.25
Awa, mm^2	14.09 (1.68)	14.85 (2.22)	0.20	0.54	1.39	0.17
WA%, %	67 (2)	66 (2)	-0.05	0.007	-0.30	0.77

CONCLUSION

- HABIENDO NACIDO Y CRECIDO A UNA ALTITUD MEDIA HAY UNA ACENTUADO CRECIMIENTO DISANAPTICO DEL PULMON CON UM MAYOR DESARROLLO DEL PARENQUIMA PULMONAR Y NO DE LAS VIAS AEREAS- ADEMAS EL PARENQUIMA PULMONAR CRECE NO SOLAMENTE AUMENTANDO EL VOLUMEN AEREO SINO EL TEJIDO PULMONAR.

Adaptación a la Hipoxia

- **Hipoxia Ambiental:**

La hipoxia crónica ambiental aumenta el tamaño pukonar desde etapas tempranas de la vida como una forma de compensar la baja presión de oxigeno.

- **Pulmón Prematuro:**

Los prematuros menores de 30 semanas expuestos a condiciones de hipoxia No presentan crecimiento pulmonar compensatorio.

- **Enfermedad Pulmonar Crónica Post Viral:**

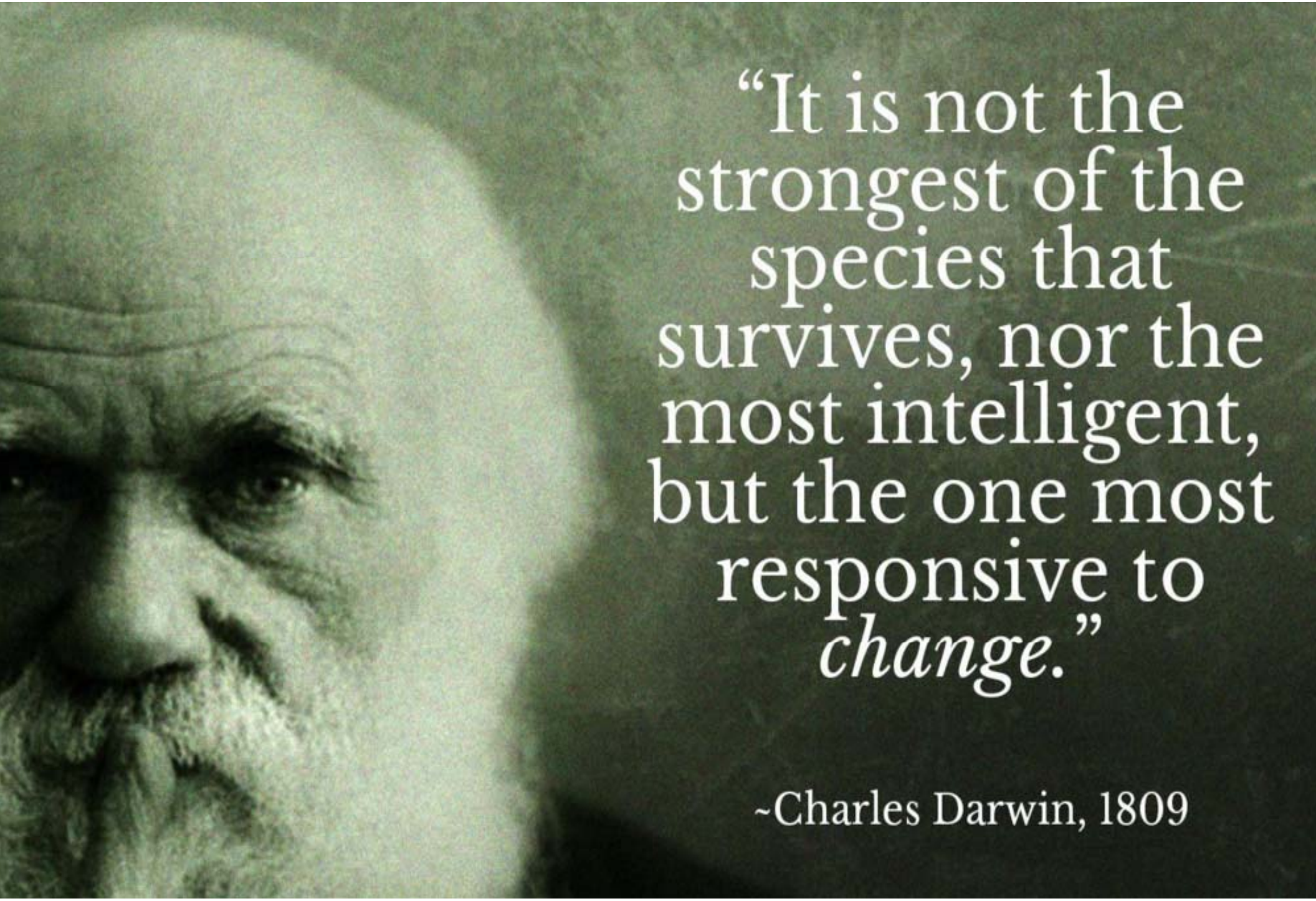
EFR muestra una obstrucción moderada a severa al poco tiempo de la Injuria Inicial y que empeora lentamente con el transcurso del tiempo.

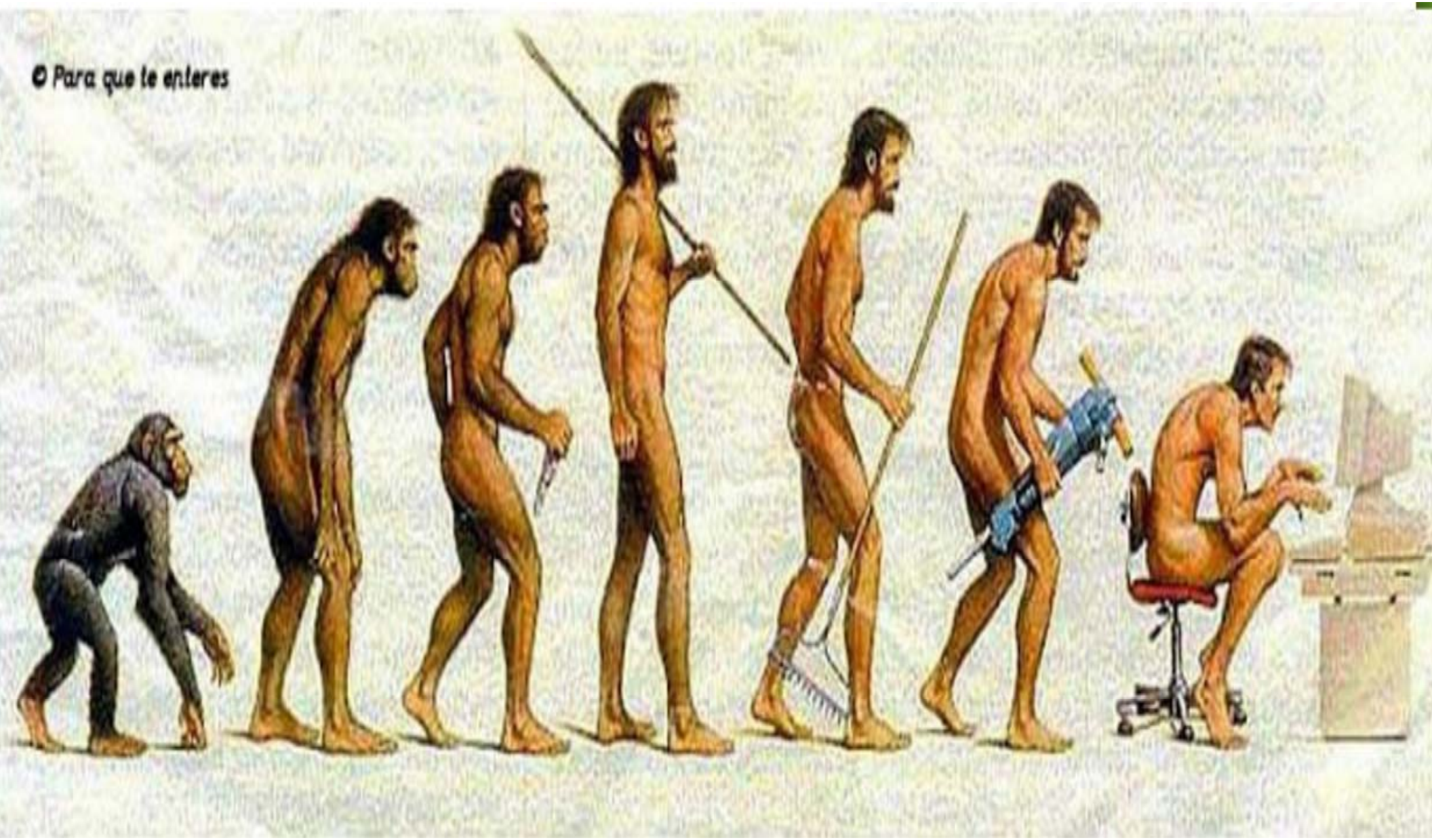
Adaptación a la Hipoxia

- **Hipótesis**

Las injurias sufridas por el pulmón de pacientes que requieren ARM, altas concentraciones de Oxigeno posiblemente no permitan realizar un crecimiento compensador del pulmón.

Se requieren mas estudios de función pulmonar principalmente en pacientes con Cardiopatías Congénitas Cianóticas para evaluar la adaptación a la hipoxia


"It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to *change*."
~Charles Darwin, 1809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20.82

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Para Conrado, para que conforte su entusiasmo de hace muchos años, con afecto

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