

MAKING CONNECTIONS:
6TH ANNUAL TEAM LUKE
HOPE FOR MINDS PEDIATRIC
BRAIN INJURY CONFERENCE
AND RESOURCE FAIR

WOODLAWN BAPTIST CHURCH
AUSTIN, TEXAS

NOVEMBER 4-5, 2022

Paul G. Harch, M.D. all rights reserved, copyright 2022

HYPERBARIC OXYGEN
THERAPY IN PEDIATRIC
NEUROLOGY

PAUL G. HARCH, M.D.,
HARCH HYPERBARICS, INC.
NEW ORLEANS, LOUISIANA

CENTRAL MESSAGE OF THIS PRESENTATION:

THE DECISION BY PARENT'S TO
OBTAIN HBOT FOR THEIR SPECIAL
NEEDS NEUROLOGICALLY
AFFECTED CHILD IS A SENSIBLE
RESPONSIBLE DECISION AND
CONSTITUTES EVIDENCE-BASED
MEDICINE.

Paul G. Harch, M.D. all rights reserved, copyright 2022

WHAT IS EVIDENCE-BASED MEDICINE?

- DEFINITION:
- “THE CONSCIENTIOUS, EXPLICIT, AND JUDICIOUS USE OF CURRENT BEST EVIDENCE IN MAKING DECISIONS ABOUT THE CARE OF INDIVIDUAL PATIENTS. THE PRACTICE OF EVIDENCE BASED MEDICINE MEANS INTEGRATING INDIVIDUAL CLINICAL EXPERTISE WITH THE BEST AVAILABLE EXTERNAL CLINICAL EVIDENCE FROM SYSTEMATIC RESEARCH.”¹
- MORE RECENTLY, “THE INTEGRATION OF BEST RESEARCH EVIDENCE WITH CLINICAL EXPERTISE AND PATIENT VALUES.”²

Paul G. Harch, M.D. all rights reserved, copyright 2022

• 1. SACKETT D, ET AL. “EVIDENCE BASED MEDICINE: WHAT IT IS AND WHAT IT ISN'T.” BMJ. 1996; 312 (7023).

• 2. SACKETT D, ET AL. EVIDENCE-BASED MEDICINE: HOW TO PRACTICE AND TEACH EBM (NEW YORK:

WHAT
IS
HYPERBARIC
OXYGEN
THERAPY?

Paul G. Harch, M.D. all rights reserved, copyright 2022

**PHYSIOLOGIC
DEFINITION OF HBOT
A DUAL-COMPONENT DRUG
TREATMENT THAT USES
INCREASED PRESSURE AND
INCREASED OXYGEN TO TREAT
DISEASE PROCESSES**

HBOT IN GLOBAL ISCHEMIA, ANOXIA, AND COMA. CHAPTER 18.
TEXTBOOK OF HYPERBARIC MED., K.K. JAIN (ED.), 1999

Paul G. Harch, M.D. all rights reserved, copyright 2022

**EVERYONE UNDERSTANDS
THAT ALL LIVING ORGANISMS
ARE SENSITIVE TO OXYGEN;
WITHOUT IT THEY WOULDN'T
EXIST**

**BUT,
WHAT ABOUT PRESSURE?**

BAROMETRIC AND HYDROSTATIC PRESSURE

WHAT IS PRESSURE?

SOMETHING WE LIVE WITH, BUT NEVER THINK ABOUT.

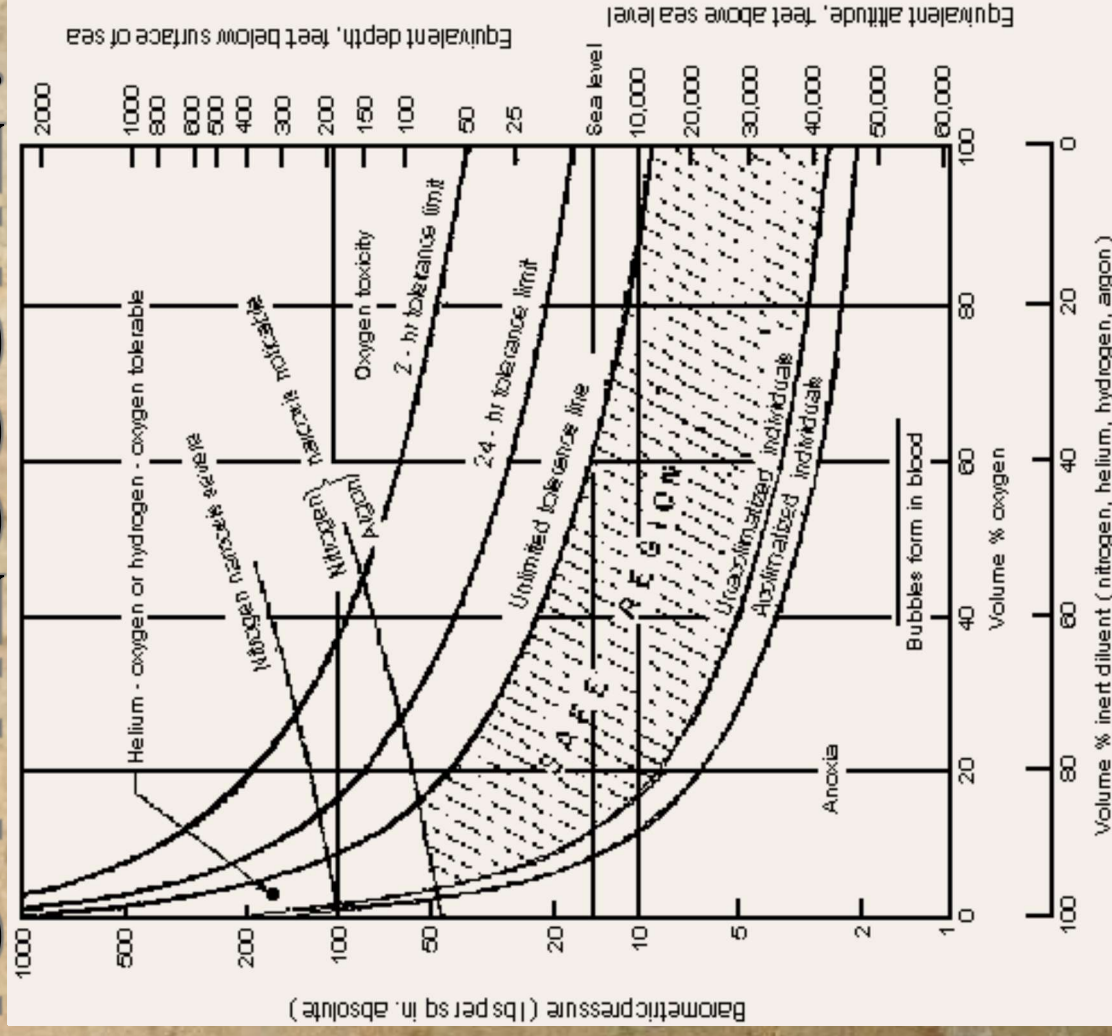
ATMOSPHERIC PRESSURE IS THE WEIGHT OF AIR FROM THE ELEVATION AT WHICH YOU ARE STANDING TO THE BOUNDARY OF THE EARTH'S ATMOSPHERE/OUTER SPACE, 62 MILES ABOUT EARTH, AND HYDROSTATIC PRESSURE IS THE WEIGHT OF SEAWATER AT WHATEVER DEPTH YOU ARE AT BELOW THE SURFACE.

ATMOSPHERIC OR HYDROSTATIC PRESSURE?

Human Pressure
and O₂ Range:

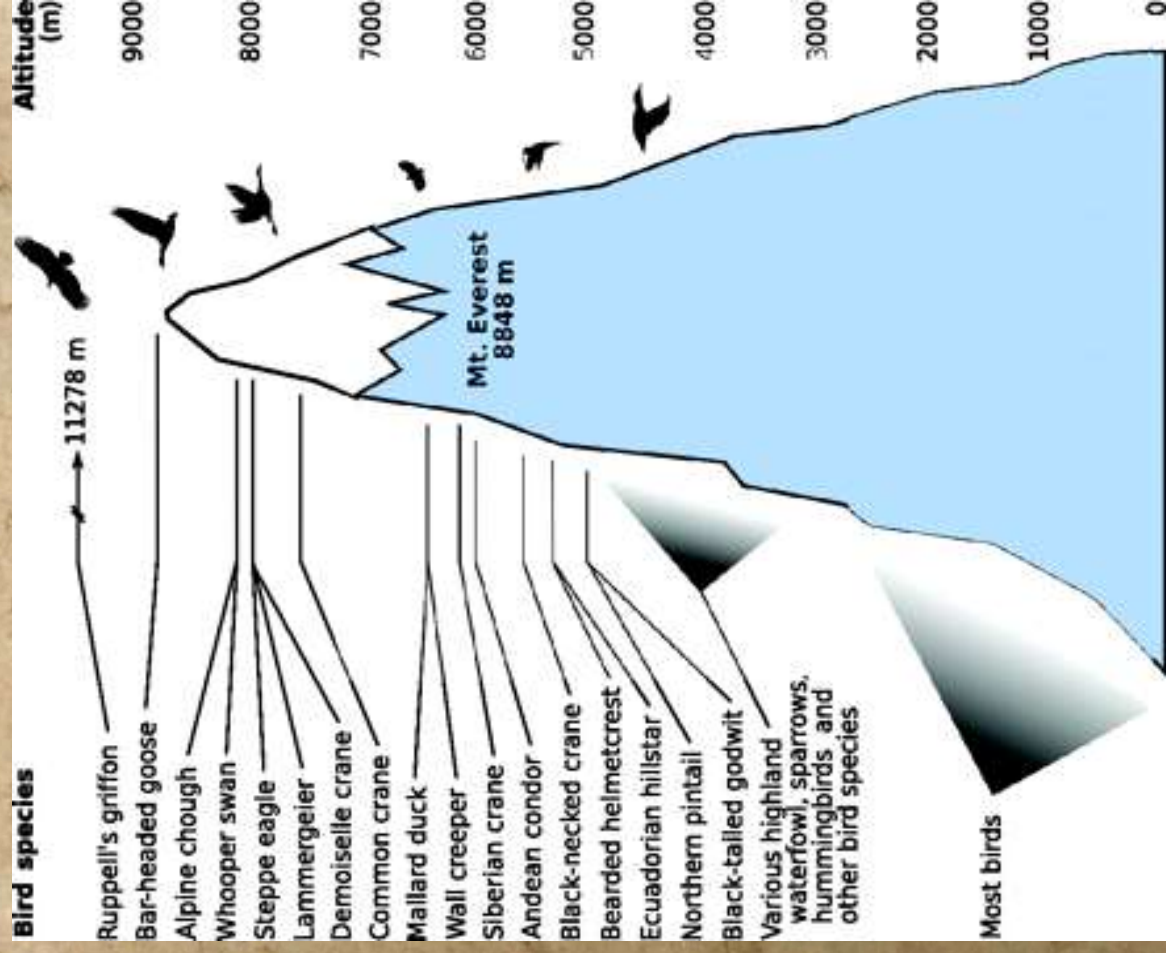
HBOT RX
Range:

60,000 Ft. Altitude



https://www.reddit.com/r/askscience/comments/517nj4/if_we_could_drain_the_ocean_could_we_breathe_or/

BIRD SPECIES AT GREAT ALTITUDE



[HTTP://PEOPLE.](http://people.eku.edu/ritchison/bird)

[EKU.EDU/RITCH](http://people.eku.edu/ritchison/bird)

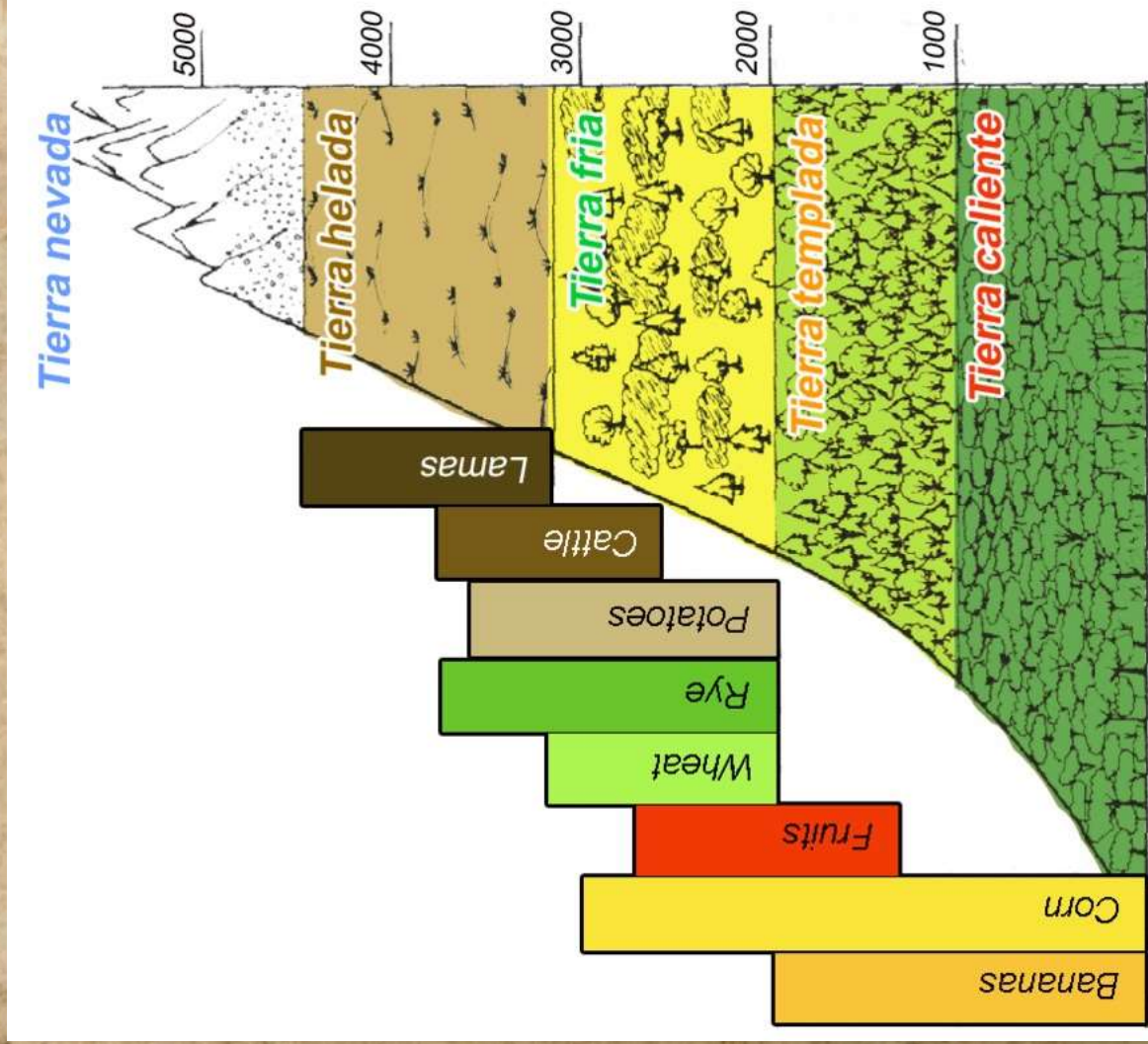
[ISONG/BIRD](http://people.eku.edu/ritchison/bird)

[CIRCULATORY.](http://people.eku.edu/ritchison/bird)

[HTML](http://people.eku.edu/ritchison/bird)

AGRICULTURE AND LIVESTOCK AT LOW ALTITUDE (ANDES)

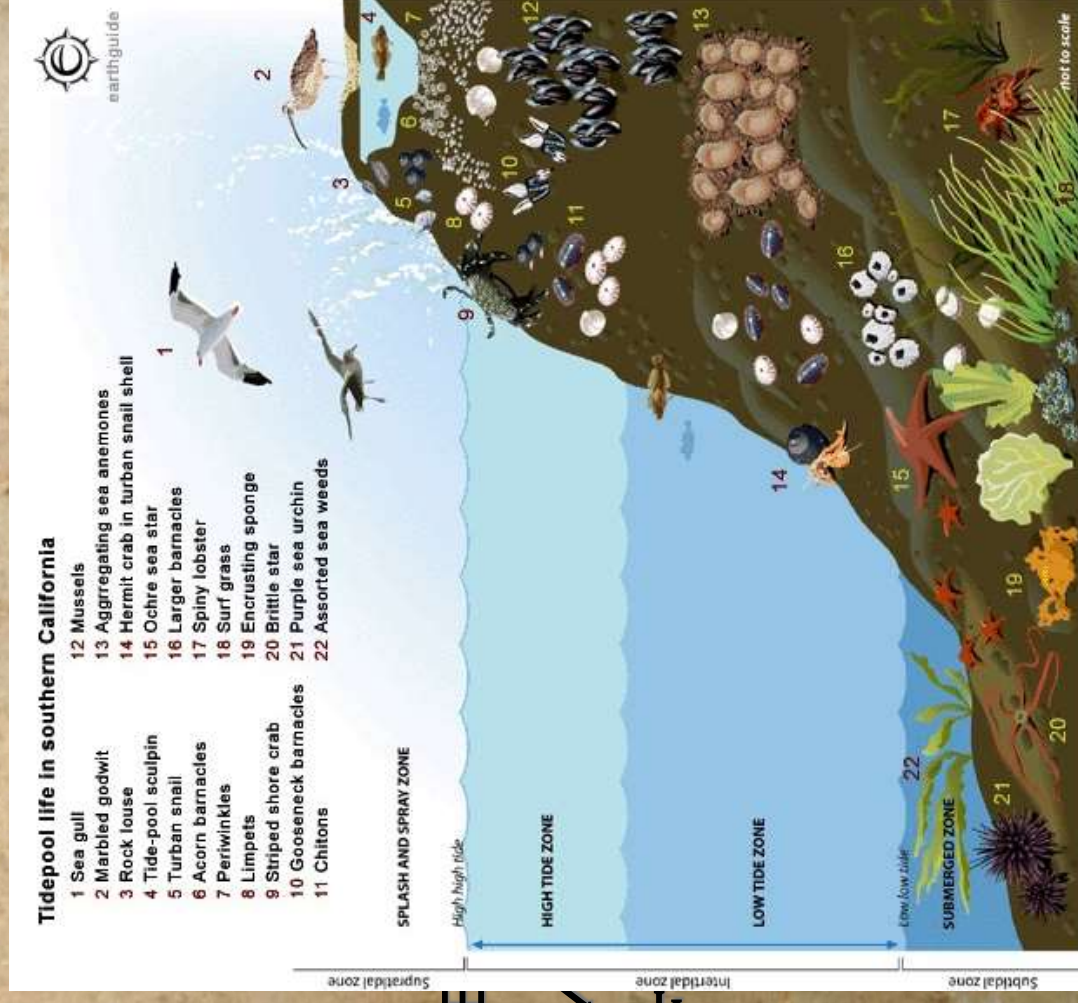
[HTTPS://EN.WIKI
PEDIA.ORG/WIKI
/ALTITUDINAL_
ZONATION](https://en.wikipedia.org/wiki/Altitudinal_zonation)



Paul G. Harch, M.D. all rights reserved, copyright 10/2021

LIVING ORGANISMS AT INCREASED ATMOSPHERIC PRESSURE

HTTP://EARTHGUIDE.
UCSD.EDU/EARTHGUIDE/
IMAGELIBRARY/IMAGES/
TIDEPOOL_ZONES_2.GIF

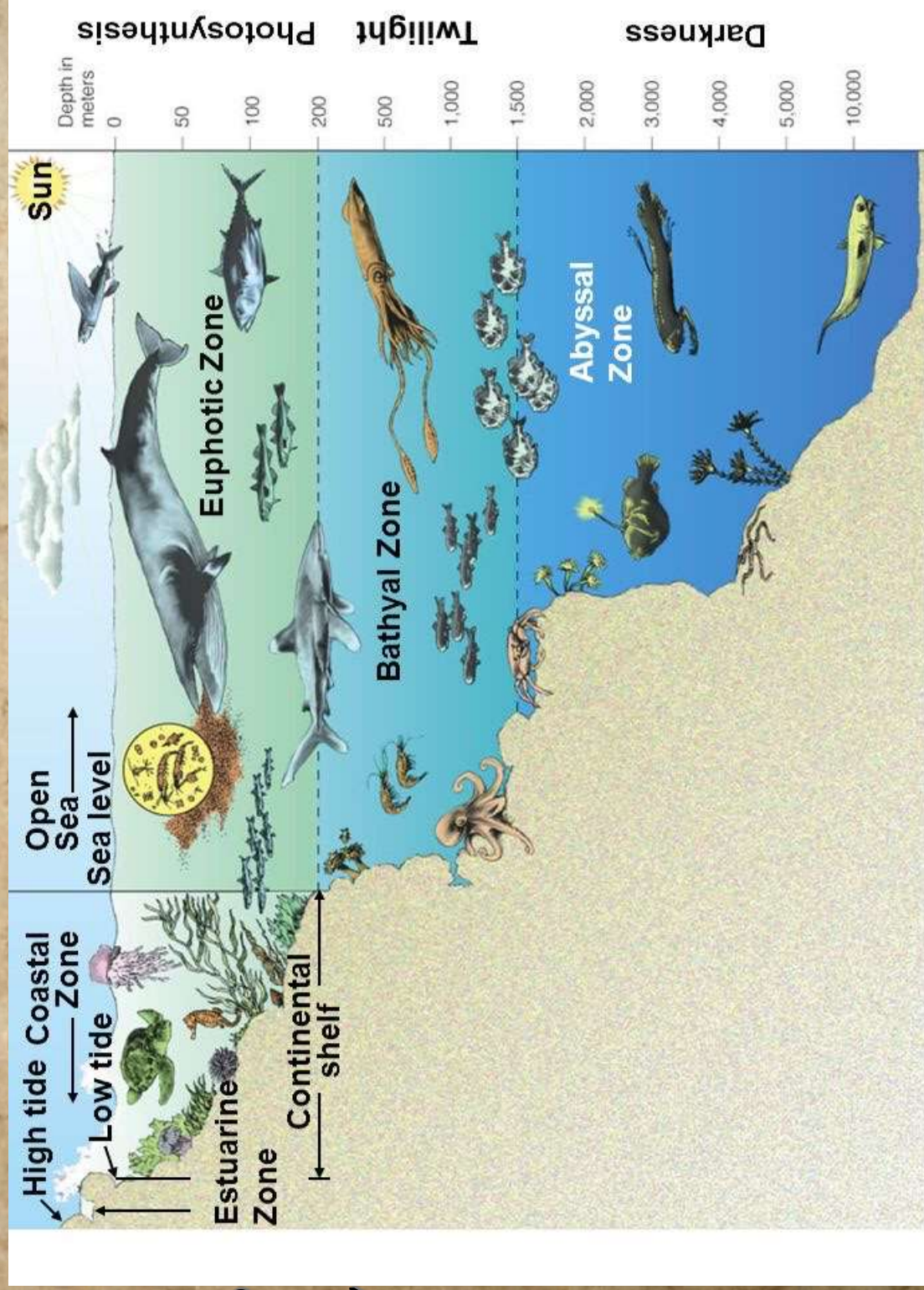


Paul G. Harch, M.D. all rights reserved, copyright 10/2021

SIO Explorations & Earthguide [<http://earthguide.ucsd.edu>]

LIVING CREATURES AT GREAT PRESSURES

[HTTP://SLID
PLAYER.COM
/SLIDE/867
805/](http://slidplayer.com/slide/867805/)

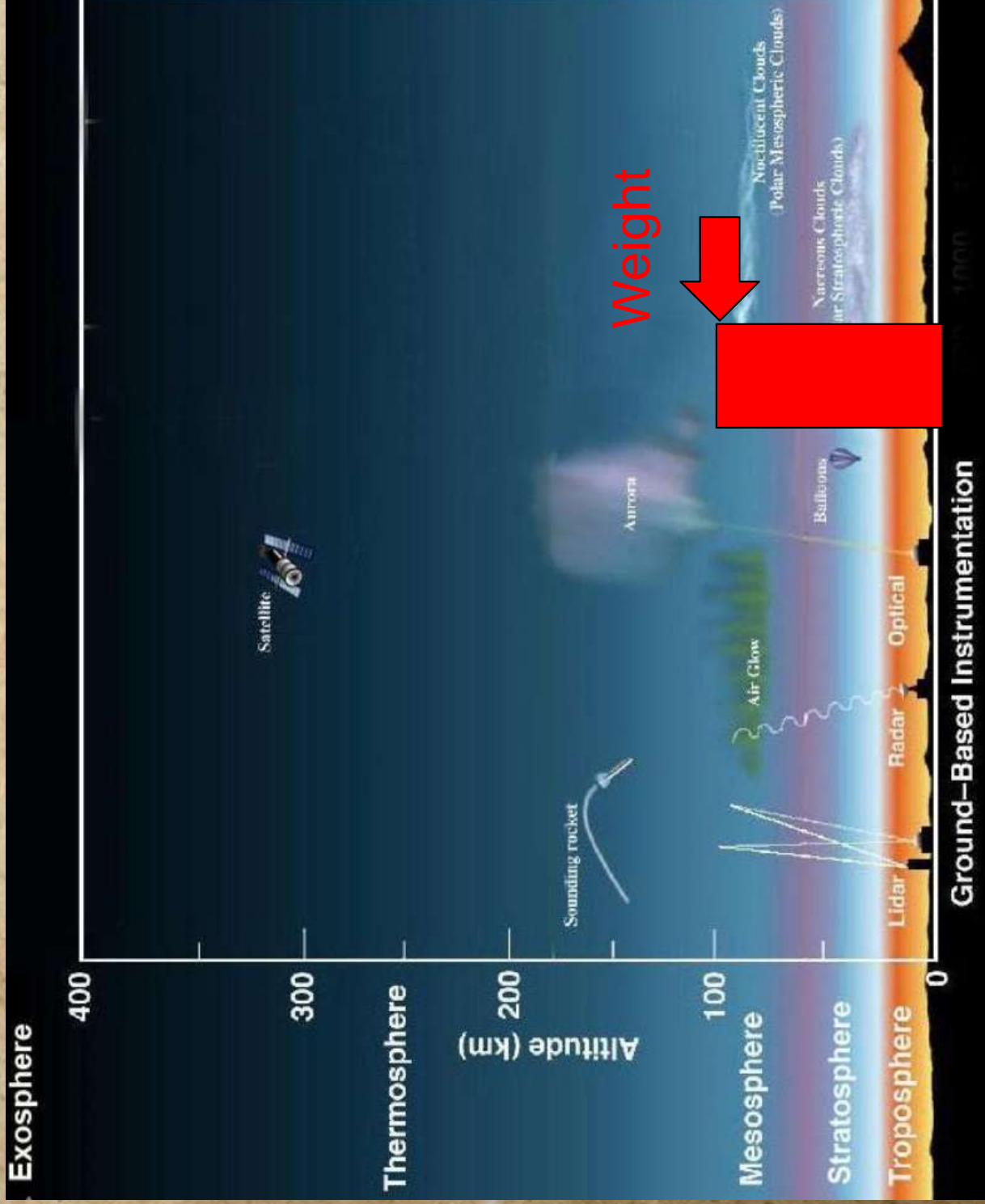


© 2007 Thomson Higher Education

Fig. 6-5, p. 130

Paul G. Harch, M.D.
all rights reserved,
copyright 10/2021

ATMOSPHERIC PRESSURE



HYDROSTATIC PRESSURE



Paul G. Harch, M.D.
all rights reserved,
copyright 10/2021

<https://www.scientificamerican.com/article/the-mariana-trench-is-7-miles-deep-whats-down-there/>

Credit: Getty Images

PRESSURE

To achieve the pressure effects of HBOT you have to expose the entire body to increased pressure.

The only way to do that is in a hyperbaric chamber:



PRESSURE

When we deliver a hyperbaric treatment:

We potentially affecting every chemical reaction in our bodies and
The effect starts the second the chamber door is closed and
pressurization begins.

What else are we affecting?

Over 8,101 of our 19,000 genes

In our 46 chromosomes.

**An effect that is unique in all of
medicine.**

**WHAT IS HBOT?
A TREATMENT THAT TAKES
ADVANTAGE OF ALL LIVING
ORGANISMS' SENSITIVITY TO
PRESSURE AND OXYGEN,**

**TO TREAT
WOUNDS**

Paul G. Harch, M.D. all rights reserved, copyright 2022

WHAT IS A WOUND?

- 1.a:** an injury to the body (as from violence, accident, or surgery) that typically involves laceration or breaking of a membrane (such as the skin) and usually damage to underlying tissues
2. a mental or emotional hurt or blow
3. something resembling a wound in appearance or effect, *especially* : a rift in or blow to a political body or social group

[HTTPS://WWW.MERRIAM-WEBSTER.COM/DICTIONARY/WOUND](https://www.merriam-webster.com/dictionary/wound)

Paul G. Harch, M.D. all rights reserved, copyright 2022

WHAT IS A WOUND?

INTERNAL VS. EXTERNAL WOUNDS



<https://www.makatimed.net.ph/blogs/different-types-of-open-wounds-and-how-to-treat-them/>



<https://godoymedical.net/knife-wounds-patterns/>



Pre- HBOT



Post- HBOT

Paul G. Harch, M.D. all rights reserved, copyright 2022

WHAT IS A WOUND?

INTERNAL VS. EXTERNAL WOUNDS

Broken Bone



<https://www.parisorthopedic.com/how-to-know-if-your-bone-is-broken/>

Stroke

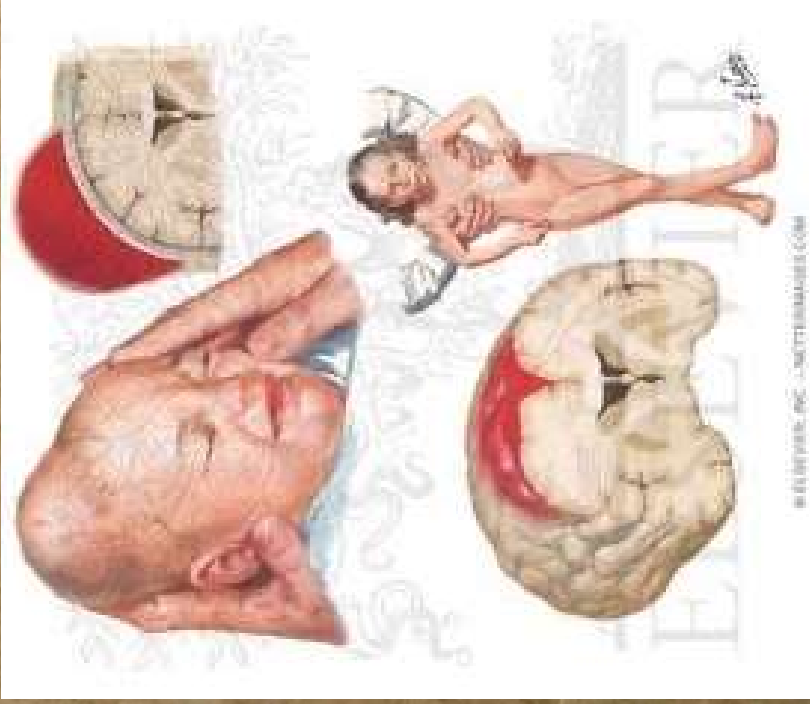


https://www.medicinenet.com/stroke/symptoms_and_treatment/article.htm

WHAT IS A WOUND?

INTERNAL VS. EXTERNAL WOUNDS

Birth Injury



https://www.google.com/search?q=neonatal+brain+injury&ibm=isch&ved=2ahUKEwisxbydr4j7AhVsg2oFHfEDB7l2CegQIABAA&coq=neonatal+brain+injury&gs_lcp=CgNpbWcQARgAMgUIABCABDIHCAAQAAQzQzD0HCAAAQsMQzQz0ECAAAQz0ECCMQJz0ICAAGAAQzQz0M6CAGAELEDEIMBOgsIABCABBCxAxCDAToHCCMQ6gIqJ1D3B1jFOmCjSWgBcAB4AIBSogBmhCSAQIzMpgBAKABAaoBC2d3cy13aXotaW1nsAEKwAEB&scIent=img&ei=r6VeY-yxNuyGqtsP8YeckAs&bih=847&biw=1518#imgrc=NVcg8Z644zNpLM&imgdii=6TFWQBc7q6lC6M



<https://www.howtorelief.com/hypoxic-ischemic-encephalopathy-hie/>

Paul G. Harch, M.D. all rights reserved, copyright 2022

WHAT ARE THE MOST COMMON DISEASES PROCESSES IN WOUNDS?

■ **ISCHEMIA** (ABSENCE OF BLOOD FLOW)

■ **HYPOXIA** (LOW OXYGEN LEVELS)

■ **INFLAMMATION** (IMMUNE SYSTEM

REACTION-WHITE BLOOD CELLS)

WOUND EXAMPLES OF LOW BLOOD FLOW, OXYGEN, AND INFLAMMATION

Stroke

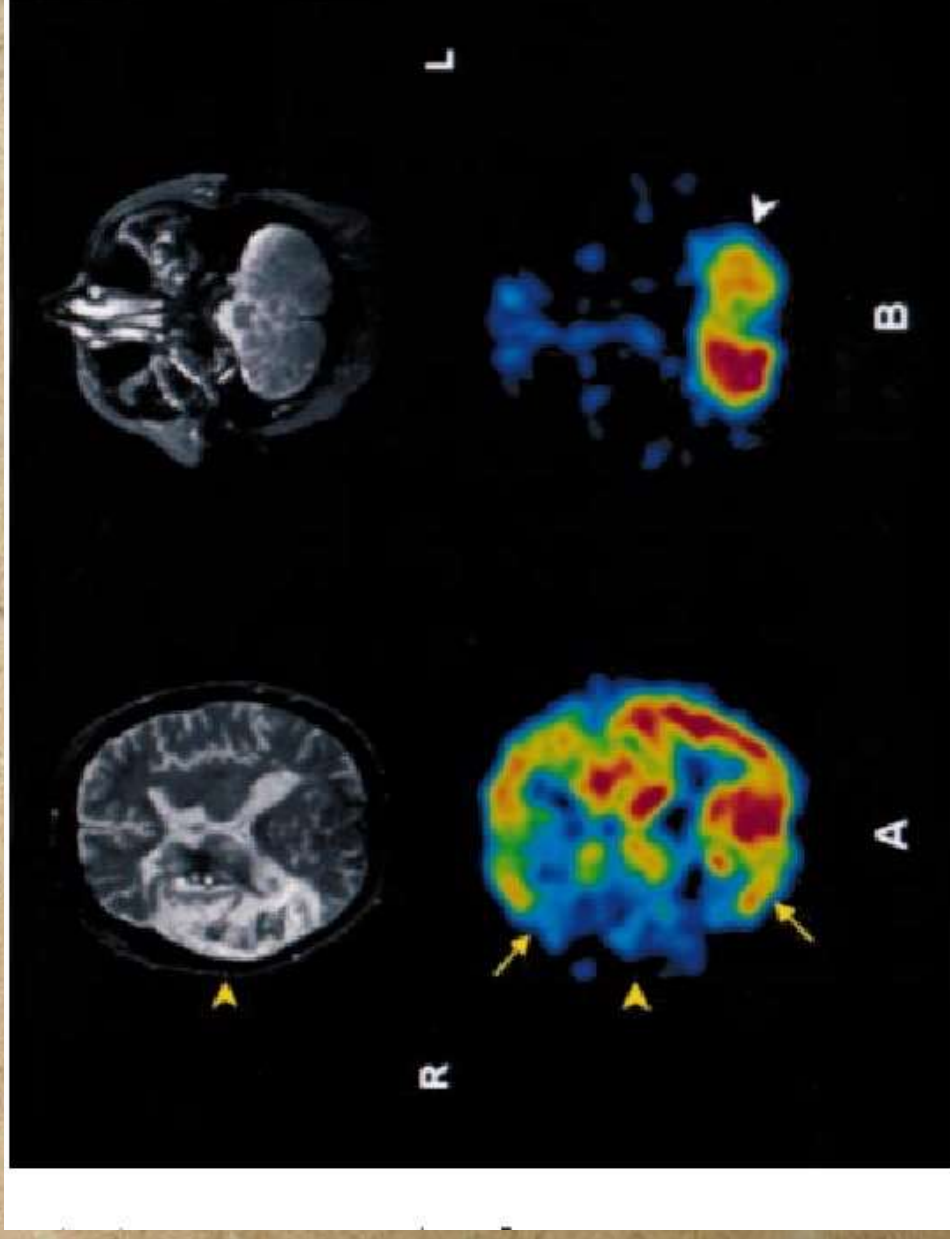


FIGURE 3. MRI (T2-weighted) (top) and ^{99m}Tc -HMPAO

<https://www.semanticscholar.org/paper/Brain-SPECT-in-clinical-practice-Part-1-3A-Catafau/d50f1bba5c3b408cb65ae9f94d83a04addf09b4f>

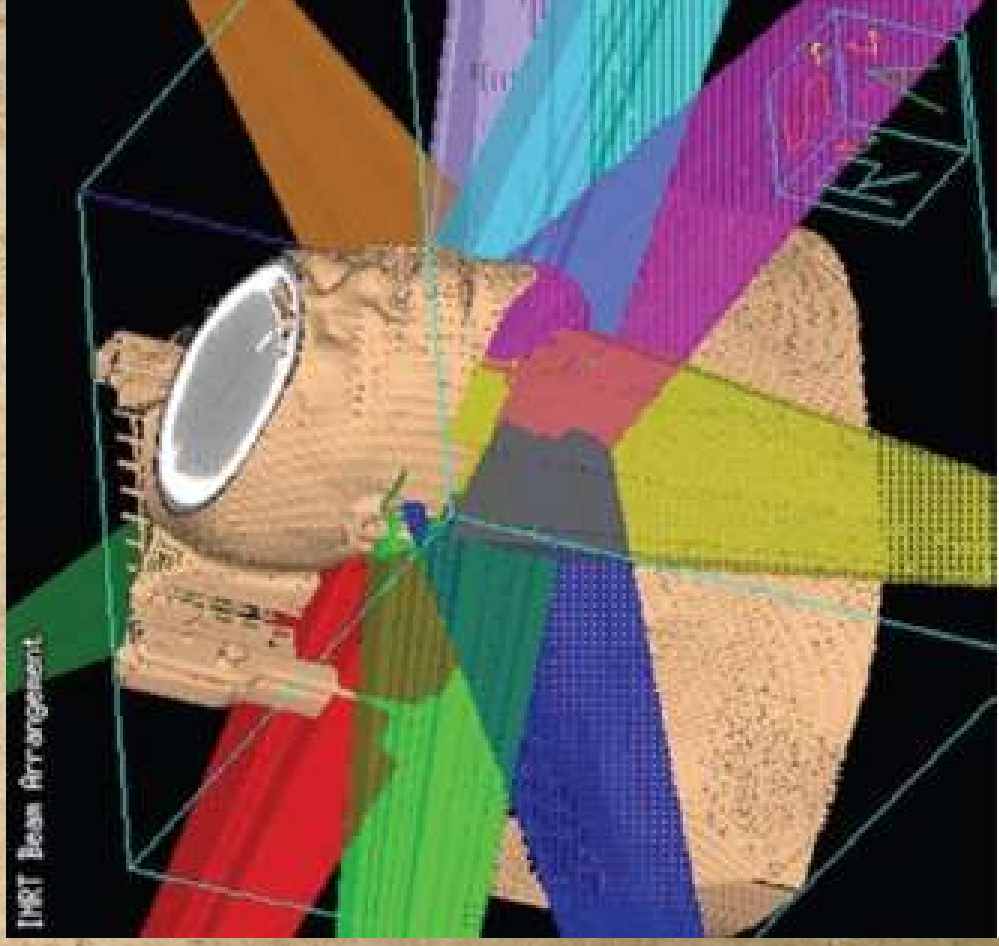
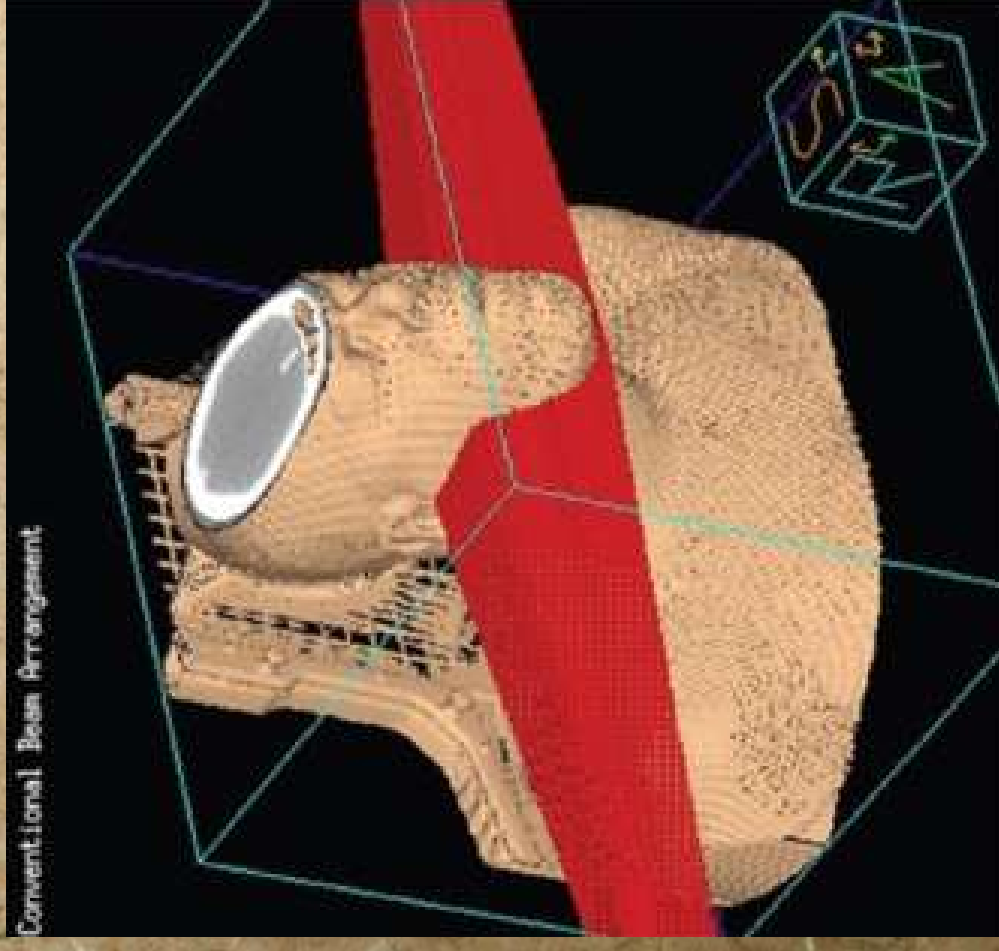
Paul G. Harch, M.D. all rights reserved, copyright 2022

**WOUND EXAMPLES OF LOW
BLOOD FLOW, OXYGEN, AND
INFLAMMATION**

Radiation Injury

Paul G. Harch, M.D. all rights reserved, copyright 2022

Radiation Injury Model of Marx



<https://downloads.hindawi.com/journals/jo/2012/597467.pdf>

Paul G. Harch, M.D. all rights reserved, copyright 2022

Radiation Injury Model of Marx

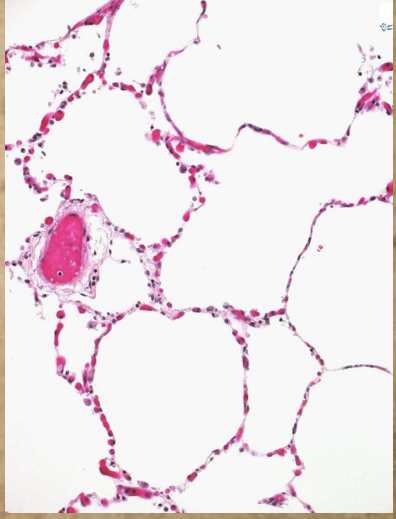


**WOUND EXAMPLES OF LOW
BLOOD FLOW, OXYGEN, AND
INFLAMMATION**

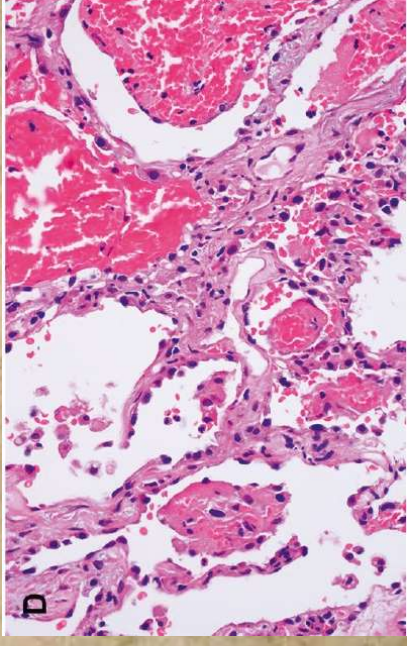
COVID-19

Paul G. Harch, M.D. all rights reserved, copyright 2022

COVID-19: PNEUMONITIS/WOUNDING OF THE LUNGS



**NORMAL
LUNG**



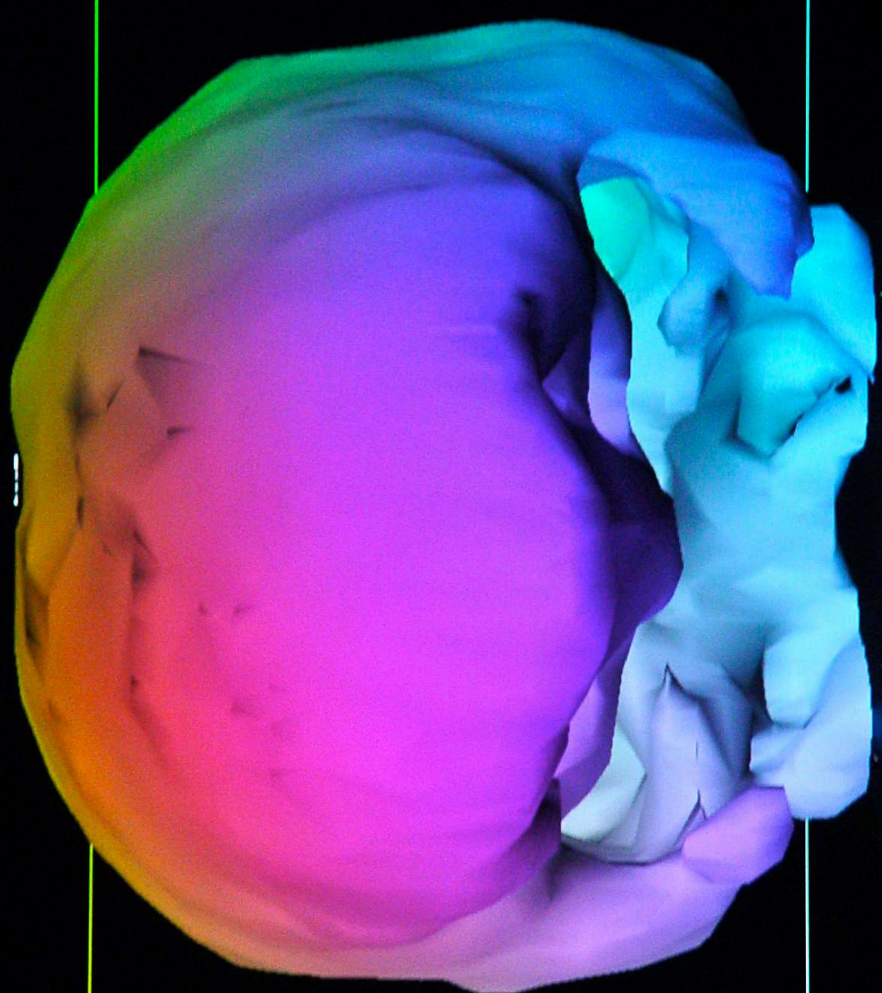
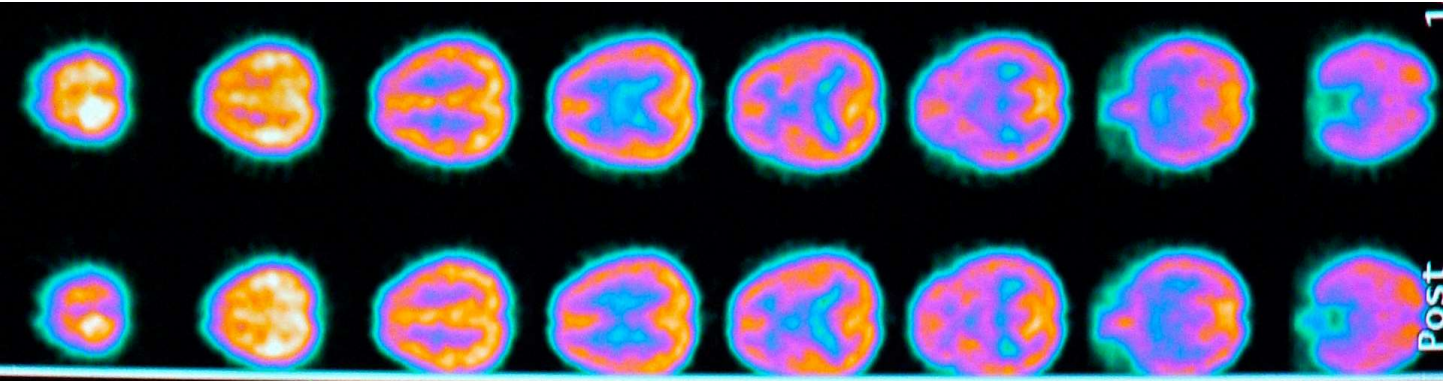
**COVID-19
Lung**



**HOW ABOUT WOUND EXAMPLES
OF LOW BLOOD FLOW, OXYGEN,
AND INFLAMMATION IN
CHILDREN?**

Autism

Paul G. Harch, M.D. all rights reserved, copyright 2022



WOUNDING OF THE CENTRAL NERVOUS SYSTEM RESULTS IN NEUROLOGICAL AND INTELLECTUAL DISABILITY

DEFINITION:

- **NEUROLOGICAL DISABILITY** REFERS TO AN IMPAIRMENT OR LIMITATION DUE TO INJURY OR ILLNESS AFFECTING THE CENTRAL NERVOUS SYSTEM INCLUDING THE BRAIN. DIFFICULTIES ARE EXHIBITED IN ONE OR MORE OF THE FOLLOWING AREAS: THE USE OF **MEMORY**, THE CONTROL AND USE OF **COGNITIVE FUNCTIONING**, **SENSORY AND MOTOR SKILLS**, SPEECH, LANGUAGE, **ORGANIZATIONAL SKILLS**, **INFORMATION PROCESSING**, **AFFECT**, **SOCIAL SKILLS**, **OR BASIC LIFE FUNCTIONS**. EXAMPLES OF NEUROLOGICAL DISABILITIES INCLUDE:

NEUROLOGICAL AND INTELLECTUAL DISABILITY: PEDIATRIC EXAMPLES

- CEREBRAL PALSY
- HYPOXIC-ISCHEMIC ENCEPHALOPATHY
- MUSCULAR DYSTROPHY
- GRAPHIC PRAXIS
- HEAD INJURY
- STROKE
- NEONATAL ASPHYXIA
- TOURETTE'S SYNDROME
- FETAL ALCOHOL SYNDROME
- EPILEPSY
- LEARNING DISABILITY
- ATTENTION DEFICIT DISORDER / ATTENTION DEFICIT
HYPERACTIVITY DISORDER
- AUTISM
- GLOBAL DEVELOPMENTAL DELAY

INTELLECTUAL DISABILITY

DEFINITION

- ACCORDING TO THE NEW DEFINITION BY THE AMERICAN ASSOCIATION ON MENTAL RETARDATION (AAMR), AN INDIVIDUAL IS CONSIDERED TO HAVE AN **INTELLECTUAL DISABILITY** BASED ON THE FOLLOWING THREE CRITERIA: INTELLECTUAL FUNCTIONING LEVEL (IQ) IS BELOW 70-75; SIGNIFICANT LIMITATIONS EXIST IN TWO OR MORE ADAPTIVE SKILL AREAS; AND THE CONDITION MANIFESTS BEFORE THE AGE OF 18.

ADAPTIVE SKILL AREAS ARE THOSE DAILY LIVING SKILLS NEEDED TO LIVE, WORK, AND PLAY IN THE COMMUNITY. THE NEW DEFINITION INCLUDES 10 **ADAPTIVE SKILLS**:
COMMUNICATION, SELF-CARE, HOME LIVING, SOCIAL SKILLS, LEISURE, HEALTH AND SAFETY, SELF-DIRECTION, FUNCTIONAL ACADEMICS, COMMUNITY USE AND WORK.

INTELLECTUAL DISABILITY

- INTELLECTUAL DISABILITIES CAN BE CAUSED BY ANY CONDITION THAT IMPAIRS DEVELOPMENT OF THE BRAIN BEFORE BIRTH, DURING BIRTH, OR IN CHILDHOOD YEARS. SEVERAL HUNDRED CAUSES HAVE BEEN DISCOVERED, BUT IN ONE-THIRD OF THE PEOPLE AFFECTED THE CAUSE REMAINS UNKNOWN. THE THREE MAJOR CAUSES OF INTELLECTUAL DISABILITIES ARE DOWN SYNDROME, FETAL ALCOHOL SYNDROME, AND FRAGILE X SYNDROME. THE CAUSES CAN BE CATEGORIZED AS FOLLOWS:

INTELLECTUAL DISABILITY

- GENETIC CONDITIONS
- PROBLEMS DURING PREGNANCY – USE OF ALCOHOL OR DRUGS BY PREGNANT MOTHERS CAN CAUSE INTELLECTUAL DISABILITIES. FETAL ALCOHOL SYNDROME IS THE LARGEST PREVENTABLE CAUSE OF INTELLECTUAL DISABILITY AND IS ON THE RISE IN THE UNITED STATES. THE RATE OF CHILDREN BORN WITH FETAL ALCOHOL SYNDROME HAS INCREASED FROM 1 PER 10,000 BIRTHS IN 1979 TO 6.7 PER 10,000 BIRTHS IN 1993. MALNUTRITION, RUBELLA, GLANDULAR DISORDERS AND DIABETES, AND MANY OTHER ILLNESSES OF THE MOTHER DURING PREGNANCY MAY RESULT IN A CHILD BEING BORN WITH INTELLECTUAL DISABILITIES. PHYSICAL MALFORMATIONS OF THE BRAIN AND HIV INFECTION ORIGINATING DURING PRENATAL LIFE MAY ALSO RESULT IN INTELLECTUAL DISABILITIES.

INTELLECTUAL DISABILITY

- PROBLEMS AT BIRTH - ALTHOUGH ANY BIRTH CONDITION OF UNUSUAL STRESS MAY INJURE THE INFANT'S BRAIN, PREMATURE AND LOW BIRTH WEIGHT PREDICT SERIOUS PROBLEMS MORE OFTEN THAN ANY OTHER CONDITIONS

INTELLECTUAL DISABILITY

- PROBLEMS AFTER BIRTH - CHILDHOOD DISEASES SUCH AS WHOOPING COUGH, CHICKEN POX, AND MEASLES CAN DAMAGE THE BRAIN, AS CAN ACCIDENTS SUCH AS A BLOW TO THE HEAD OR NEAR DROWNING. MERCURY AND LEAD POISONING CAN CAUSE IRREPARABLE DAMAGE TO THE BRAIN AND NERVOUS SYSTEM.