

REVOLUTIONIZING MEDICINE

Transforming and Advancing Medical Education

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WHAT IS IT?

Evolutionary medicine, sometimes called Darwinian medicine, applies evolutionary principles (adaptation, natural selection, phylogenetics, and other evolutionary constraints) to our understanding of health and disease.



It can be a comprehensive method to organize medical knowledge that is relatively unconnected today.



48%

of North American medical school deans agree that evolutionary principles are essential for a practicing physician; yet not a single one taught it.

MORE ON EVOLUTIONARY MEDICINE



SMOKE DETECTOR PRINCIPLE

WHERE CAN IT BE APPLIED?



Aging



Reproductive Health



Immune Functioning

including inflammation, infectious diseases, and cancer



Mental Health

WHY IS IT BENEFICIAL?

Understanding evolutionary theory can help us understand why the human body remains vulnerable to diseases.



Natural selection shaped human defensive responses similar to a smoke detector: sensitive to potential fires but prone to frequent false alarms.

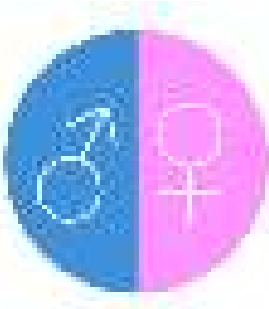
Using this metaphor, physicians can contextualize patient symptoms, instead of immediately trying to suppress them.

THE CORE TENETS

I. EVOLUTIONARY PROCESSES

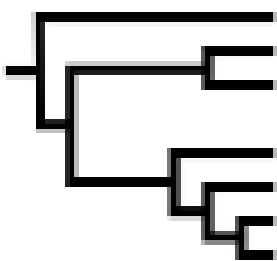
Natural selection, genetic drift, mutations, etc., are essential for understanding traits, health, and diseases. For example,

Sexual Selection



affects traits that can result in different health risks between sexes.

Phylogeny



tracing evolutionary history for species and even pathogens provides insight into health and diseases.

II. EVOLUTIONARY TRADE OFFS

Changes in one trait known to improve fitness can lead to changes in another trait, decreasing fitness. i.e.,



Life History Traits

events such as reproductive lifespan and rate of senescence, shaped by evolution, have implications on our health

III. REASONS FOR VULNERABILITY

Humans remain vulnerable to diseases as selection can change genetics, cells, organisms, and populations.



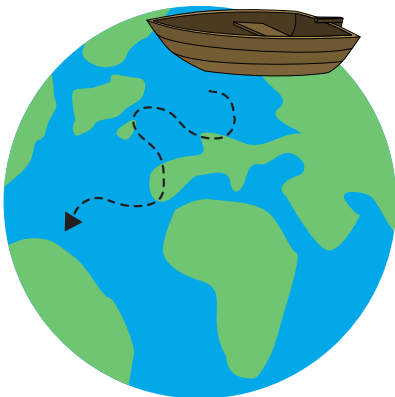
Defenses

coughing, fever, and runny nose are useful to our body protecting itself, serving as natural defense mechanisms.



Mismatch

risk factors for diseases may be different for individuals living in different environments than their ancestors



IV. CULTURE

Cultural practices influence human and pathogen evolution. For example,

Diet



Medication-use



Birthing Practices



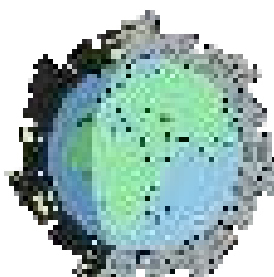
CLINICAL APPLICATIONS

OBESITY

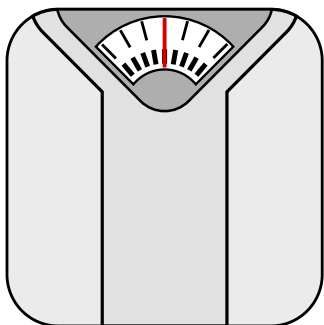
Evolutionary medicine can provide insight on why obesity is on the rise



Past Environment
Appetite regulation evolved to survive periods of famine



Novel Environment
Industrialization led to surplus of food that is obtained by low caloric costs



Rise of obesity
The body has not adapted to these differences in environment

PANIC DISORDER

What may have led to its prevalence today?



Fight or Flight
Triggering this mechanism was needed for survival



Trade off
Fight or flight mechanism is triggered at the wrong time for those with a panic disorder resulting in poorer health

EDUCATIONAL STRATEGIES



Evolutionary Medicine Course

Incorporating evolutionary principles into a course during the preclinical years can greatly benefit medical school students.



Higher more professional staff with a background in evolution

Increasing the number of faculty with research in evolutionary biology encourages more coverage of evolutionary topics.



Changing Clinical Rotations

Including an evolutionary biologist on clinical rotations encourages continual exposure to evolutionary principles

Scared of controversy?

Many medical school deans report hesitation in incorporating evolution in their curriculum due to fears of controversy.

Alternative Solutions

Undergraduate Resources

Make a course in evolution a required medical school prerequisite

AAMC and the MCAT

Starting in 2015, the Association of American Medical Colleges has incorporated more evolutionary biology in the MCAT



CONCLUSION

Understanding of evolutionary theory can be a helpful tool for physicians when they are treating patients. Curriculum changes can help implement this knowledge.



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