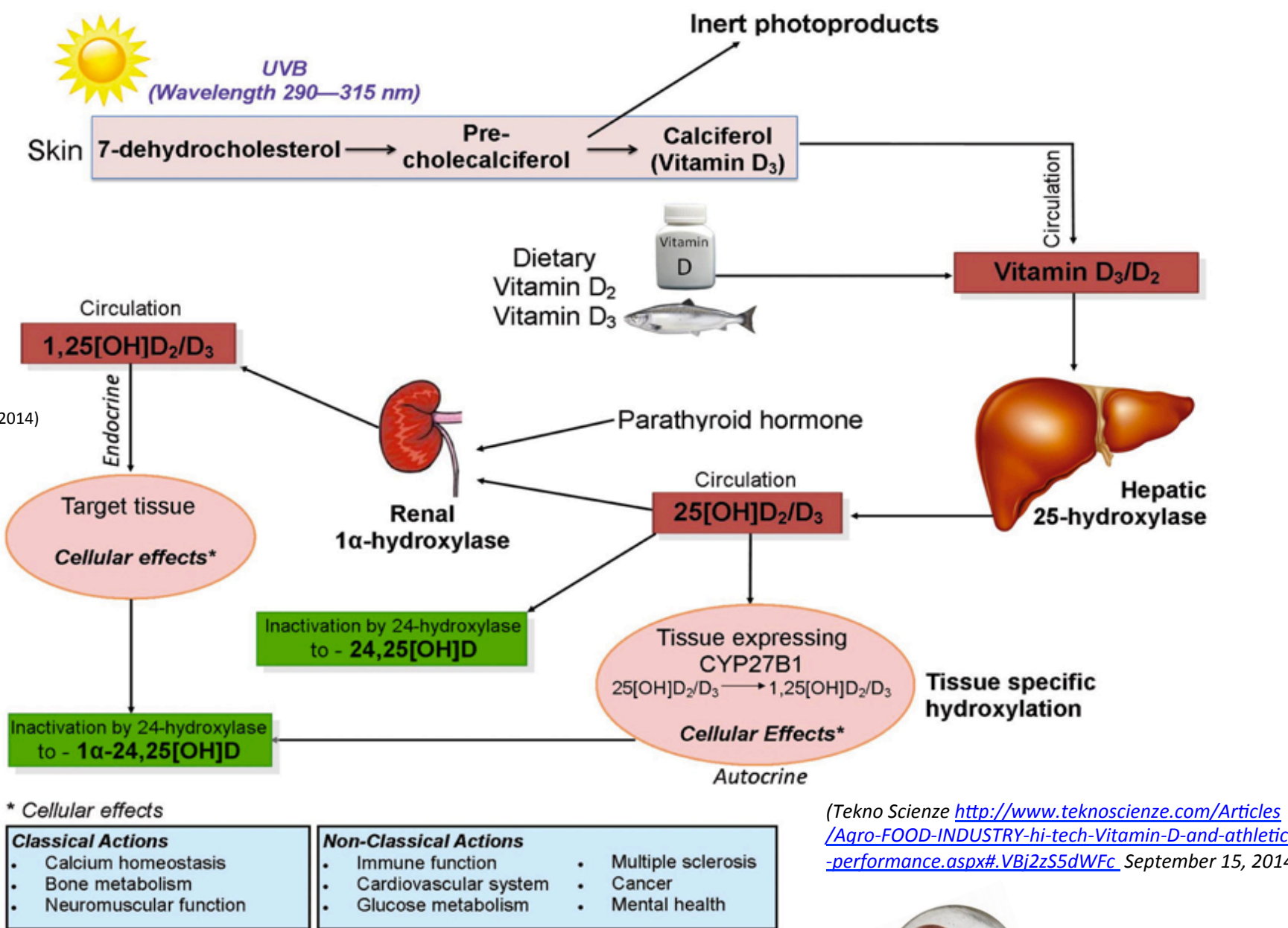
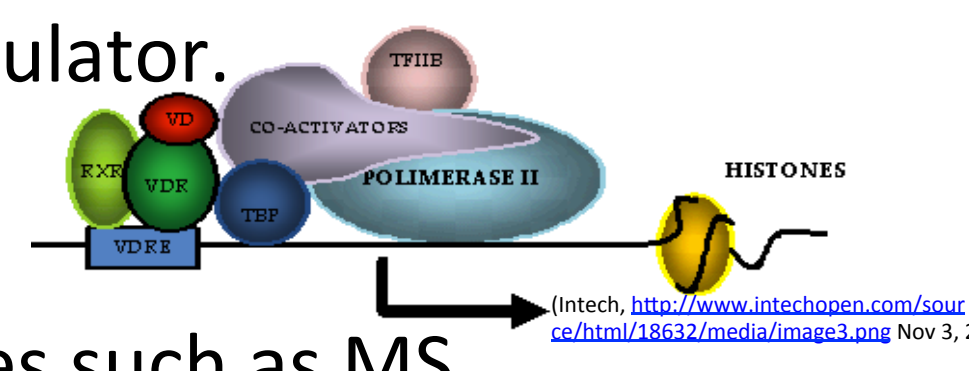


Was mom right all along? Don't be D-ficient

Keshna Sood* ♦ Dr. Mazen Hamadeh ♦
KINE 4120 F 2014 ♦ York University

Why this is important:

Vitamin D₃ (Vit D) is considered a **master regulator**.
 → Influences > 200 genes
 → Binds > 2,776 sites in the genome
 Deficiency correlates to autoimmune diseases such as MS, rheumatoid arthritis, T1D, certain cancers, and even dementia.
 Vitamins ACE are anti-oxidizing agents that serve to neutralize free radicals. Free radicals are reactive molecules that could cause cell damage, neurodegenerative diseases and are associated with increased aging.



Vitamin	Food sources
D	Fish, eggs, liver, mushrooms
A	Orange, ripe yellow fruits, leafy vegetables, carrots, pumpkin, squash, fish, soy milk
E	Many fruits and vegetables, nuts and seeds
C	Many fruits and vegetables, liver

What impacts your [Vit D] level?

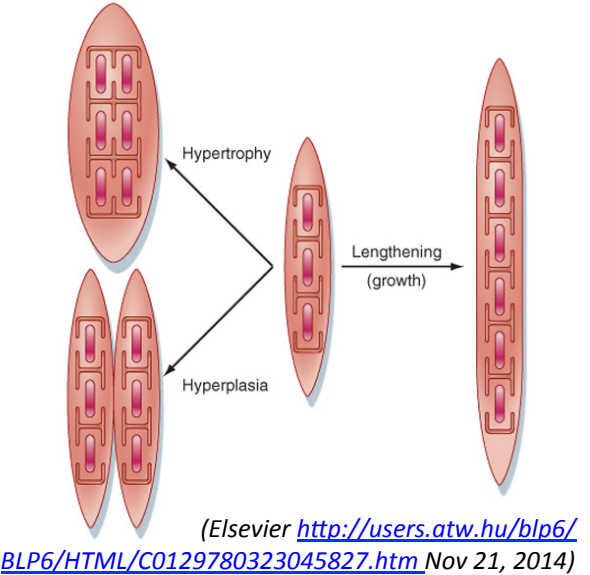
- Time of Sun exposure
- Seasons (Latitude)
- Diet
- Sun Screen
- Age
- Gender
- Obesity
- Ethnicity

African-American people need to be exposed to UV-B for up to 10 X longer than Caucasian individuals of similar age and health to attain similar 7-dehydrocholesterol amounts. (Holick MF, N Engl J Med 2007)

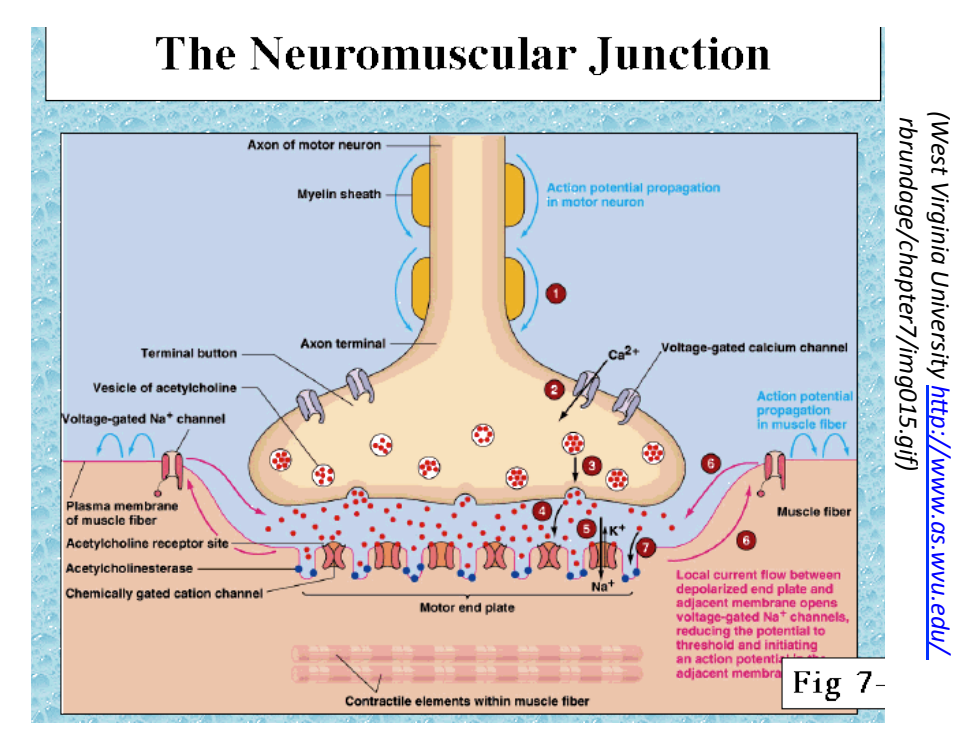
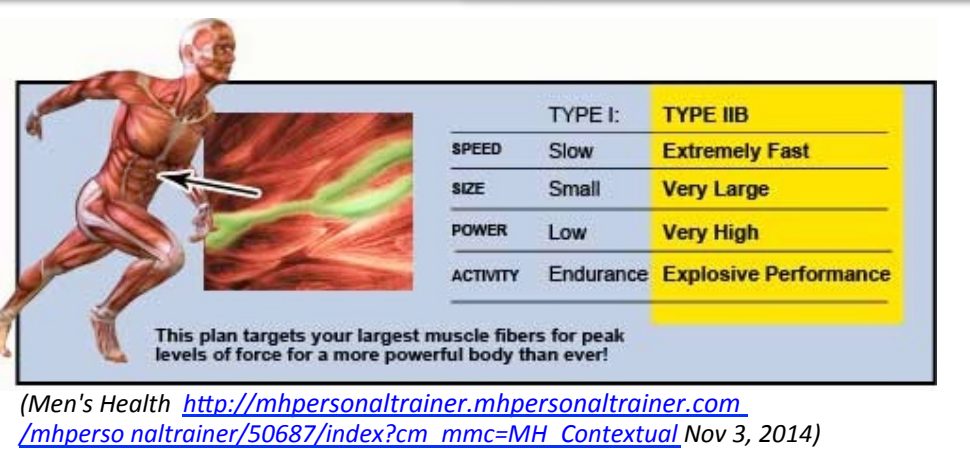
Research Methodology:
 Research was conducted in a **meta-analysis** approach to understand impact of Vitamin D, A, C and E in elderly, athletic and healthy populations. In addition to using Boolean operators to find appropriate literature, review papers were first referred to before individual correlational or randomized controlled trial studies were quantitatively evaluated. Tip: Organize all articles with Mendeley.

Can vitamins A,C,E or D serve as ergogenic aids?

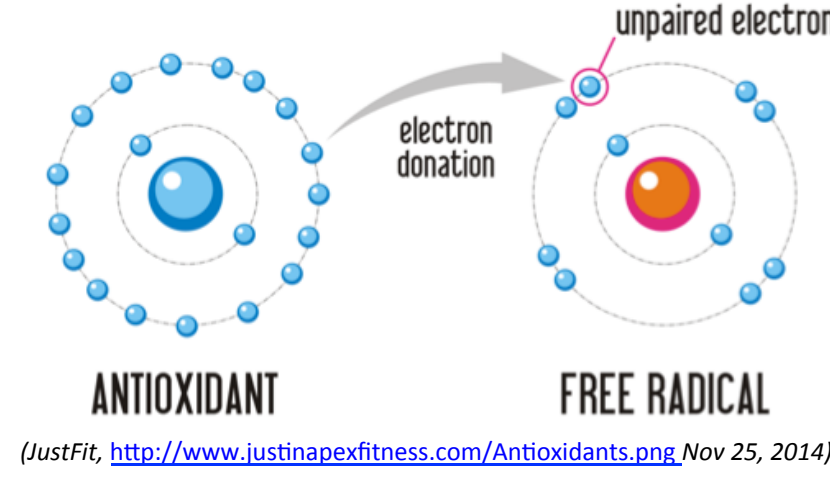
Vitamin D



- Increases size and # of type II muscle fibers (Sato et al, Cerebrovasc Dis 2005)
- Up-regulates notch, IGF-1 pathway (Domingues-Faria et al, Nutr Metab 2014)
- Speeds up recovery: ↑ proliferation; ↓ apoptosis (Stratos et al, Am J Pathol 2013)
- Inhibits myostatin (a proliferation inhibitor) (Luna et al, Mol Ther 2012)
- Increases VDR expression → prevents muscle wasting by helping repair: ↑ dysferlin exp (Han and Campbell, Curr Opin Cell Biol 2008)
- Vitamin D improves cardiovascular fitness (mobilizes Ca²⁺, fat oxidation) (Aoshima et al, Nephrol Dial Transplant 2012)



Vitamin ACE: Antioxidants



Free Radicals = Molecules that are oxidized leading to unpaired electrons
Antioxidants = Prevents oxidation of molecules
Reactive Oxygen Species = Reactive molecules formed from O₂ metabolism
Oxidative Stress = when [ROS] > [Antioxidants]; causes cell damage

Focus	Study	Purpose	Result
Beneficial	Trofin et al. (2014) Sacheck et al. (2003) Naziroglu et al. (2010) Cesari et al. (2004)	Observing either performance outcome OR oxidative stress marker to determine ergogenic effect	- Vit C = lowered plasma MDA - Vit E = protective effects, decreased MDA - Vit E + C taken especially together had beneficial effects on exercise perf.
Not Beneficial	Gey et al. (1970) Gomez-Cabrera et al. (2008) Viitala et al. (2004) Cumming et al. (2014)		- Vit C negative effects on training adaptation in VO ₂ max - Vit E and C had no synergy impacting antioxidant pathways

Focus	Study	Purpose	Result
Elderly and Motor Balance	Bischoff-Ferrari et al. (2006) Pfeifer et al. (2008) Bischoff et al. (2003) Pfeifer et al. (2000) Grant et al. (2005)	Examining ergogenic effect of Vit D to lower the number of falls as a result of increased muscle strength	- Older individuals need ↑ Vit D - Vit D ⁺ : Ca ²⁺ levels increased - Significant ↓ in falls with Vit D
Musculoskeletal Strength	Baker et al. (2012) Close et al. (2013) Goswami et al. (2012) Gupta et al. (2010) Wyon et al. (2013)	Understanding Vit D's effects in athletic and nonathletic groups through resistance training	- Vit D significantly increases muscle strength - Larger performance increases observed in most deficient individuals - Women need more Vit D than men to reap similar benefits
Endurance Exercise	Close et al. (2013) Koundourakis et al. (2014) Carrillo et al. (2012)	Assessing Vit D's impact on maximal O ₂ intakes and endurance components of physical activity	- Vit D significantly increased 10 m sprint and max O ₂ consumption - Vit D strongly correlated with stronger and longer endurance capability

Conclusion:

Vit D has significant positive effects on motor balance, musculoskeletal strength and endurance abilities in both athletic and non-athletic populations. Although recommendations for adequate vitamin D₃ levels are still controversial, individuals living at high latitudes run risk of deficiency and thus are encouraged to supplement with at least 3000 IU daily.

Supplementing with **Vit ACE** to enhance exercise performance has yet to be scientifically supported.

