Telomere Testing

A New Tool for Your Age Management Practice

presented by

Dian Ginsberg, MD, FACOG

Specialty HEALTHCARE and WELLNESS

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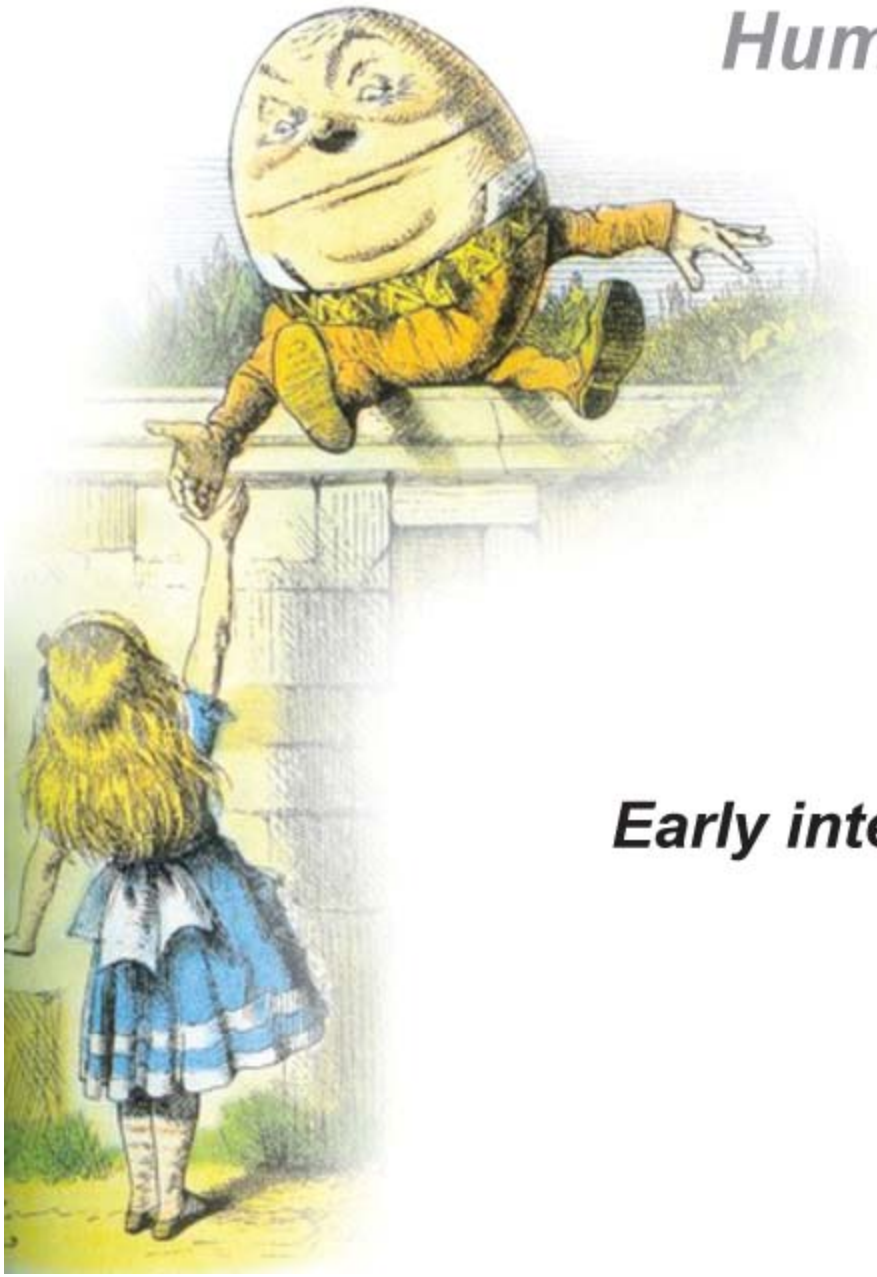
Dian Ginsberg, MD, FACOG

Dr. Dian Ginsberg is the clinical director of Specialty Healthcare and Wellness, and Women's Specialty Healthcare, in Bellaire, Texas. A native New Yorker, Dr. Dian Ginsberg earned her degree in medicine from New York Medical College. She completed her residency in Obstetrics and Gynecology at the Bowman-Gray School of Medicine in North Carolina before Houston's sunny climate brought her to Texas. Dr. Ginsberg provides comprehensive obstetrics and gynecology treatment but has a special interest in menopausal management. Her general focus is wellness throughout all stages of life. Educating and helping women through menopause and bioidentical hormone treatment is one of Dr. Ginsberg's primary passions. Running marathons and children Andy and Doug are her other favorite pursuits. Dr. Ginsberg is a member of the American College of Obstetrics and Gynecology, the Harris County Medical Society and the Texas Medical Association. She is on staff at Memorial Hermann Hospital and Park Plaza Hospital in Houston.



Humpty Dumpty and Preventative Medicine

Early intervention is VERY important!

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Meet my patient J.W.

- 51 year old white male
- Marathon runner
- Stressful job -
  VP at Fortune 500 company
- Earned masters while working
  full time
- Good diet -
  except when entertaining clients
- Travels frequently for work
- Long hours

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Executive Physical Results

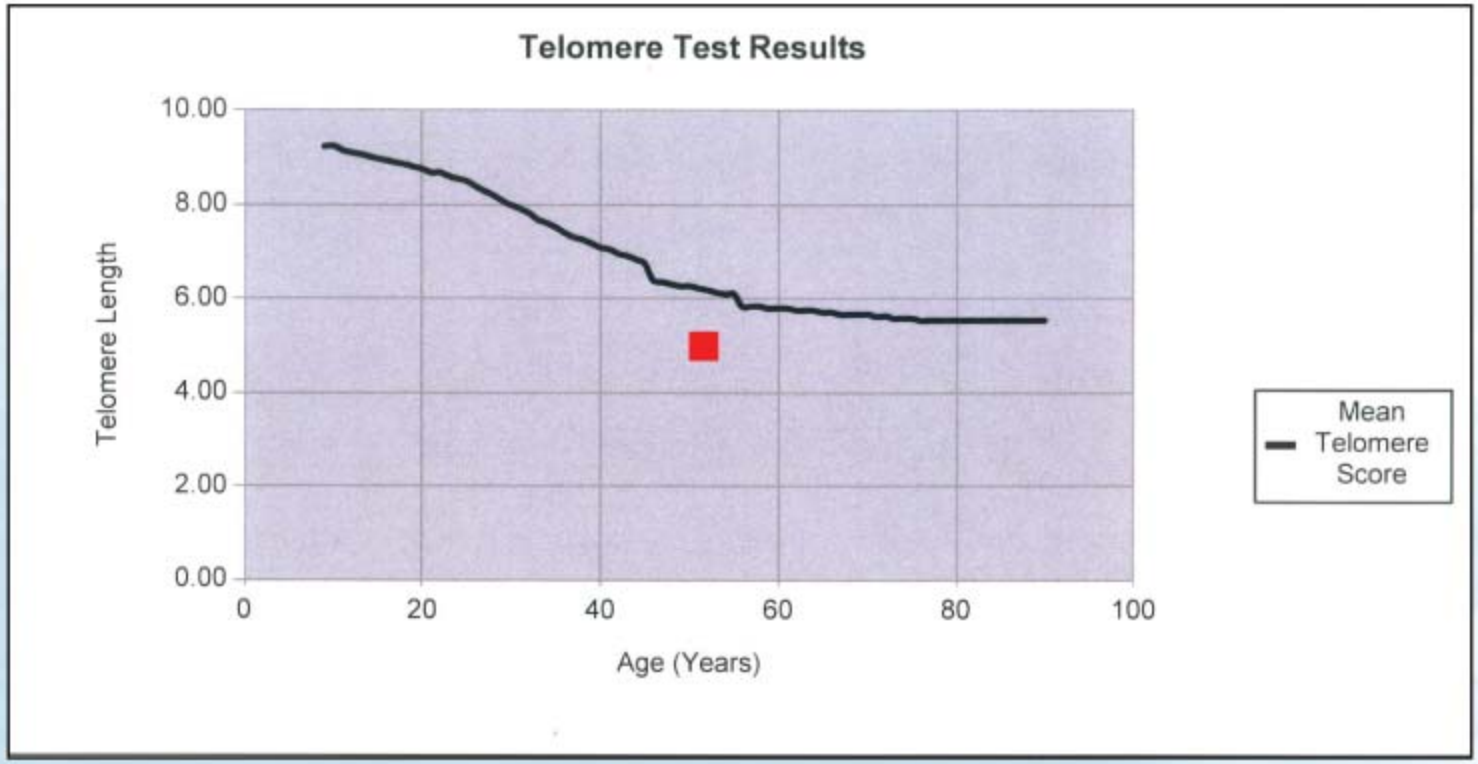
Cholesterol	*230*
HDL	*56*
LDL	*148*
TG	*133*

CBC, Chemistry, EKG, CXR all normal

Carotid doppler - negative

Patient told he is healthy and to return in 1 year

J.W.'s Telomere Test Results



Patient Telomere Score: 5.19 ***Percentile: 7%***

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Highlights

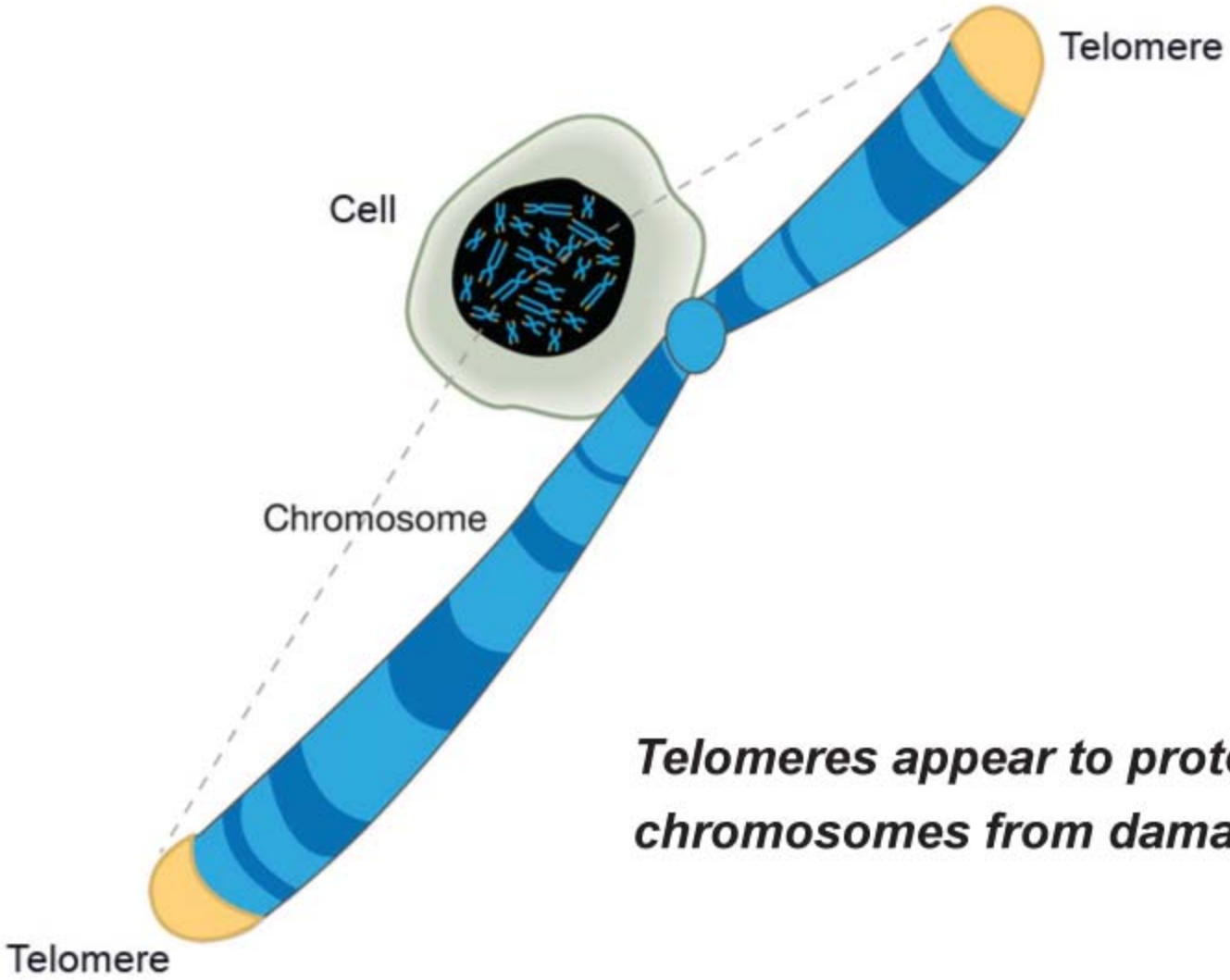
1. History and significance of Telomeres

2. Telomere Length Test

3. Clinical evidence supporting how shortened telomeres lead to disease and premature aging.

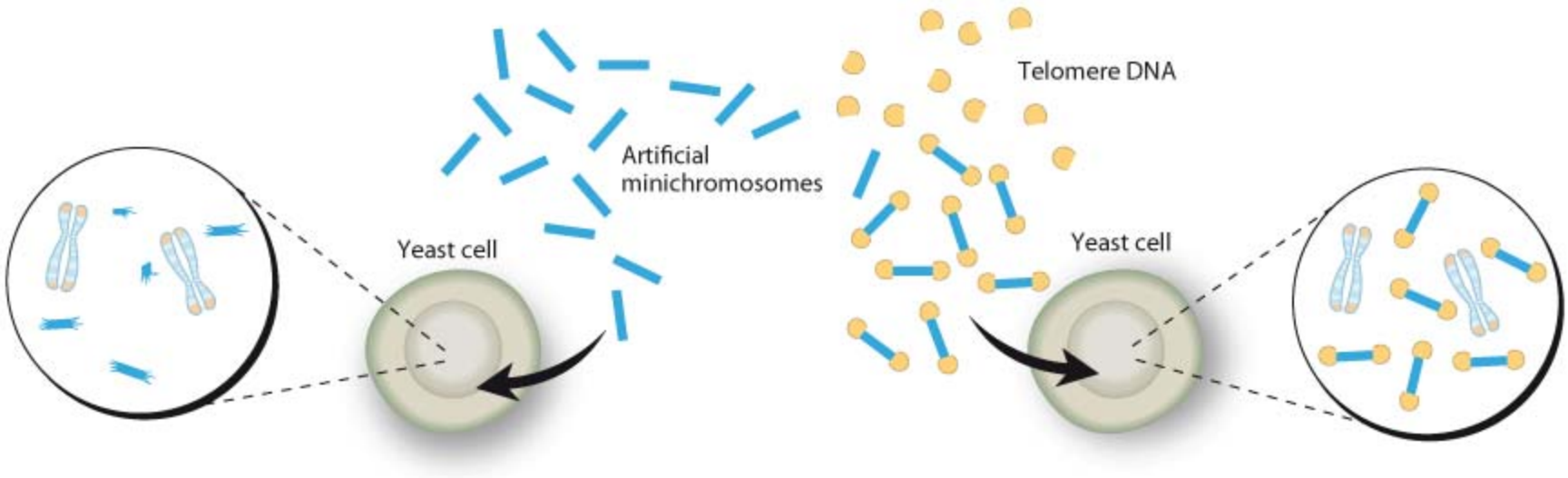
4. Applying results to all your patients - kids, athletes, sick patients and older patients

What is a Telomere?



Telomeres appear to protect the chromosomes from damage.

The Science Behind It's Importance



Chromosomes without telomeres were unprotected and damaged.

Chromosomes with telomere DNA were protected and remained intact.

Nobelförsamlingen
The Nobel Assembly at Karolinska Institutet

PRESS RELEASE 2009-10-05

The Nobel Assembly at Karolinska Institutet has today decided to award

The Nobel Prize in Physiology or Medicine 2009

jointly to

Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak

for the discovery of

"how chromosomes are protected by telomeres and the enzyme telomerase"

What is Telomerase?

Discovered by Greider on Christmas Day 1984

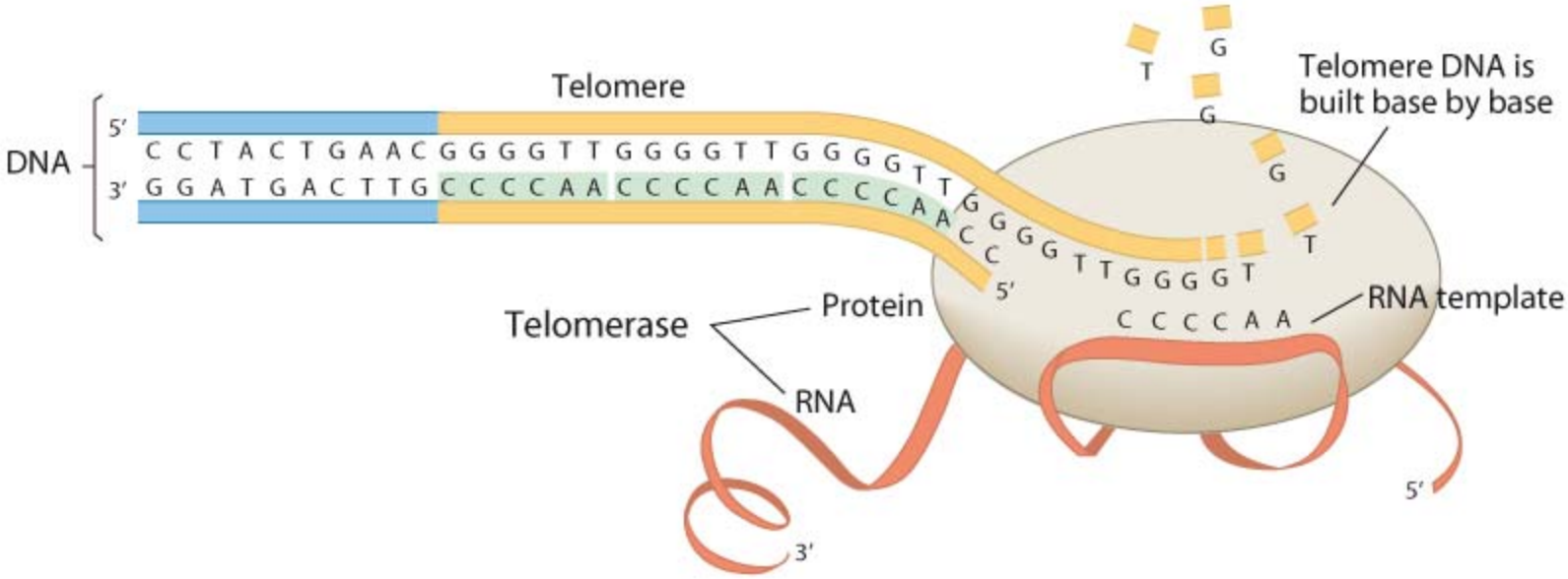
Enzyme activity in a cell extract

- ***Named enzyme Telomerase***
- ***Contains RNA - CCCCAA sequence***
- ***Template when the telomere is built***

Telomerase extends Telomere DNA to preserve the length of the "cap"

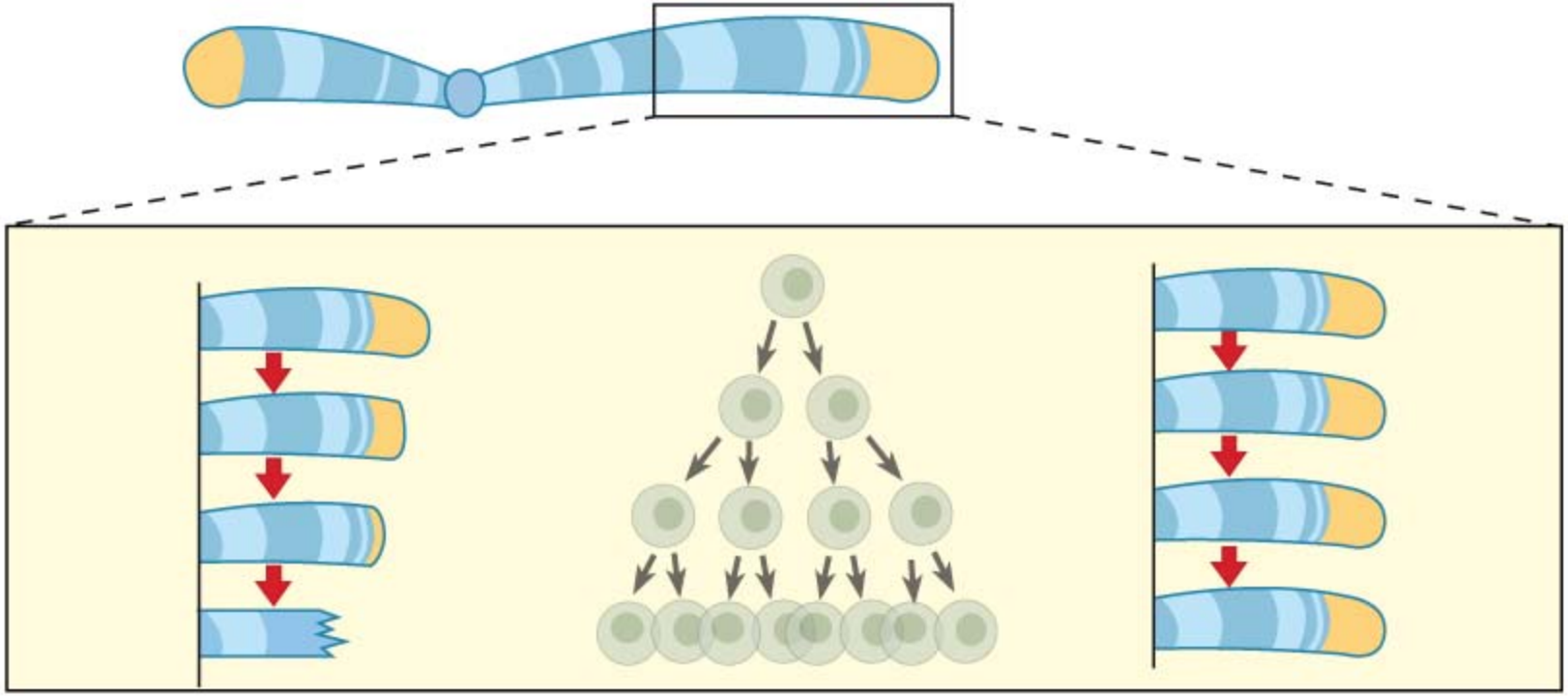
(Cancer cells are loaded with Telomerase)

Telomerase builds telomere DNA



Telomerase operates at the end of the chromosome. It is an enzyme consisting of a protein and an RNA sequence. The RNA serves as a template for synthesizing telomere DNA.

Telomerase



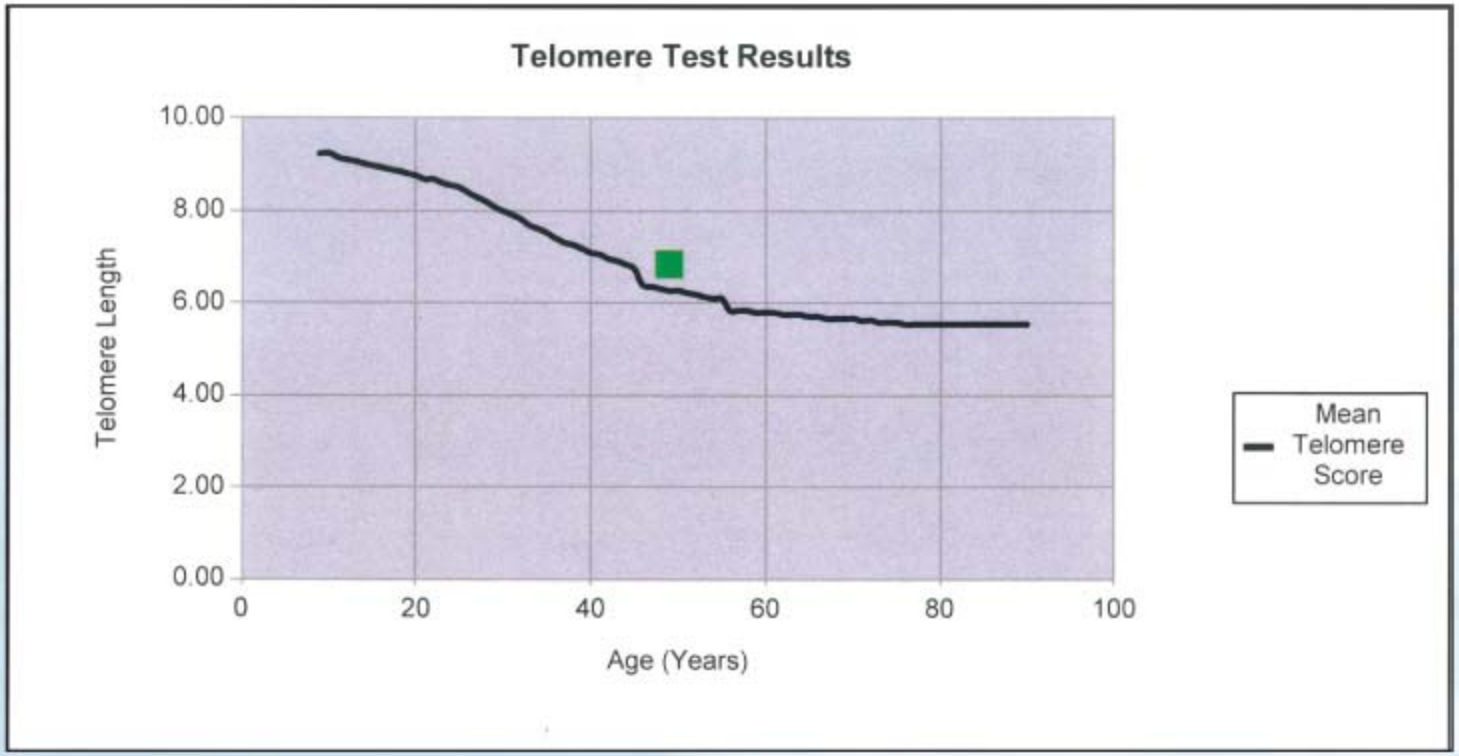
Without Telomerase, telomere DNA is eroded and the chromosome is eventually damaged.

Telomerase maintains the telomere length so the entire chromosome is copied.

Telomere Length Test

- *Uses PCR (Polymerase Chain Reaction) to make large numbers of copies of a DNA segment*
- *From a single blood draw*
- *A flourescent reader in the PCR machine can infer size and quantity of DNA sequence.*

Patient Telomere Score: 6.85 Percentile: 74



The above graph depicts the patient's telomere score compared to the average telomere score for each age group within a random sample population.

A patient telomere score below the line (red box) represents a below average telomere score, and a patients score above the line (green box) represents an above average telomere score.

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Short Telomeres and Aging

Cellular Senescence and aging occurs when cellular DNA is so damaged beyond repair that the cell cannot replicate... and dies.

Sometimes if individual damage cannot be easily repaired, the death of one cell or more may benefit the organism as a whole.

Hayflick Limit

How many times will cells divide before they die?

- ***About 50 - 60 times***
- ***Can be extended about 30%***
- ***Human life can be extended to 125 years***

Applying Telomere Shortening to Clinical Practice

Disease

- Hypertension
- Arterial Stiffness
- CHD / MI
- Aortic Stenosis
- Cancer
- Vascular Dementia
- Increased CRP
- Increased IL6

Arteriosclerosis 2010; 210;262
JAMA 2010 Jul 7; 304(1): 69 - 75
Lancet 2007; 369; 107 - 14
Am J Epidemiol 2007; 165:14

Clinical Findings Linked to Telomere Shortening

- *Oxidized LDL*
- *Smoking*
- *Obesity*
- *Vitamin D deficiency*
- *Sleep deprivation*
- *Lack of proper sleep*
- *Lack of estrogen*
- *Increased homocystene*
- *DM / IR*
- *Oxidative stress*

Who else is at risk?

Those exposed to severe stress

Athletes (extremist)

- ***Marathon runners***
- ***Triatheletes***
- ***Mountain climbers***

Menopausal women

Business men & women

- ***Travel***

Those with questionable autoimmune systems:

- ***Increased IL6***
- ***Increased CRP***

Doctors

- ***Poor sleep***
- ***High daily stress***

How do we counsel our patients?

Change what you can.

Diet

- Lipoprotein Particle Profile
- Nutritional deficiencies
- Caloric restriction
- General food education

Exercise

- Strength training
- Intervals - Peak 8

Lifestyle changes

- Sleep
- Yoga
- Well-spaced, balanced meals

Inflammatory Diet

Causes blood sugar fluctuations

Generates oxidized LDL resulting in poor cholesterol profile

Drains or wastes healthy nutrients

- ***Artificial sweeteners***
- ***Trans fats***
- ***Saturated fats***
- ***Refined carbohydrates***
- ***Fast foods***
- ***Processed foods***

Abstract

J Clin Lipidol 2011 Oct;5(5):338-367.

Clinical utility of inflammatory markers and advanced lipoprotein testing: Advice from an expert panel of lipid specialists.

Michael H. Davidson, Christie M. Ballantyne, Terry A. Jacobson, Vera A. Bittner, Lynne T. Braun, Alan S. Brown, W.Virgil Brown, William C. Cromwell, Ronald B. Goldberg, James M. McKenney, Alan T. Remaley, Allan D. Sniderman, Peter P. Toth, Sotirios Tsimikas, Paul E. Ziajka, Kevin C. Maki, Mary R. Dicklin

Baylor College of Medicine, Houston, TX; University of Alabama at Birmingham, Birmingham, AL; Rush University Medical Center, Chicago, IL; Loyola University Stritch School of Medicine, Maywood, IL; Emory University School of Medicine (Emeritus), Atlanta, GA; Lipoprotein and Metabolic Disorders Institute, Raleigh, NC; Wake Forest University School of Medicine, Winston-Salem, NC; University of Chicago Pritzker School of Medicine, 515 North State Stree, Suite 2700, Chicago, IL; Provident Clinical Research, Glen Ellyn, IL; University of Miami Miller School of Medicine, Miami, FL; Emory University, Atlanta, GA; National Clinical Research, Inc. and Virginia Commonwealth University (Emeritus), Manakin Sabot, VA; National Institutes of Health, National Heart, Lung and Blood Institute, Bethesda, MD; McGill University, Montreal, Quebec, Canada; Sterling Rock Falls Clinic, Ltd, University of Illinois College of Medicine, Peoria, IL; University of California, San Diego, La Jolla, CA; Florida Lipid Institute, Winter Park, FL.

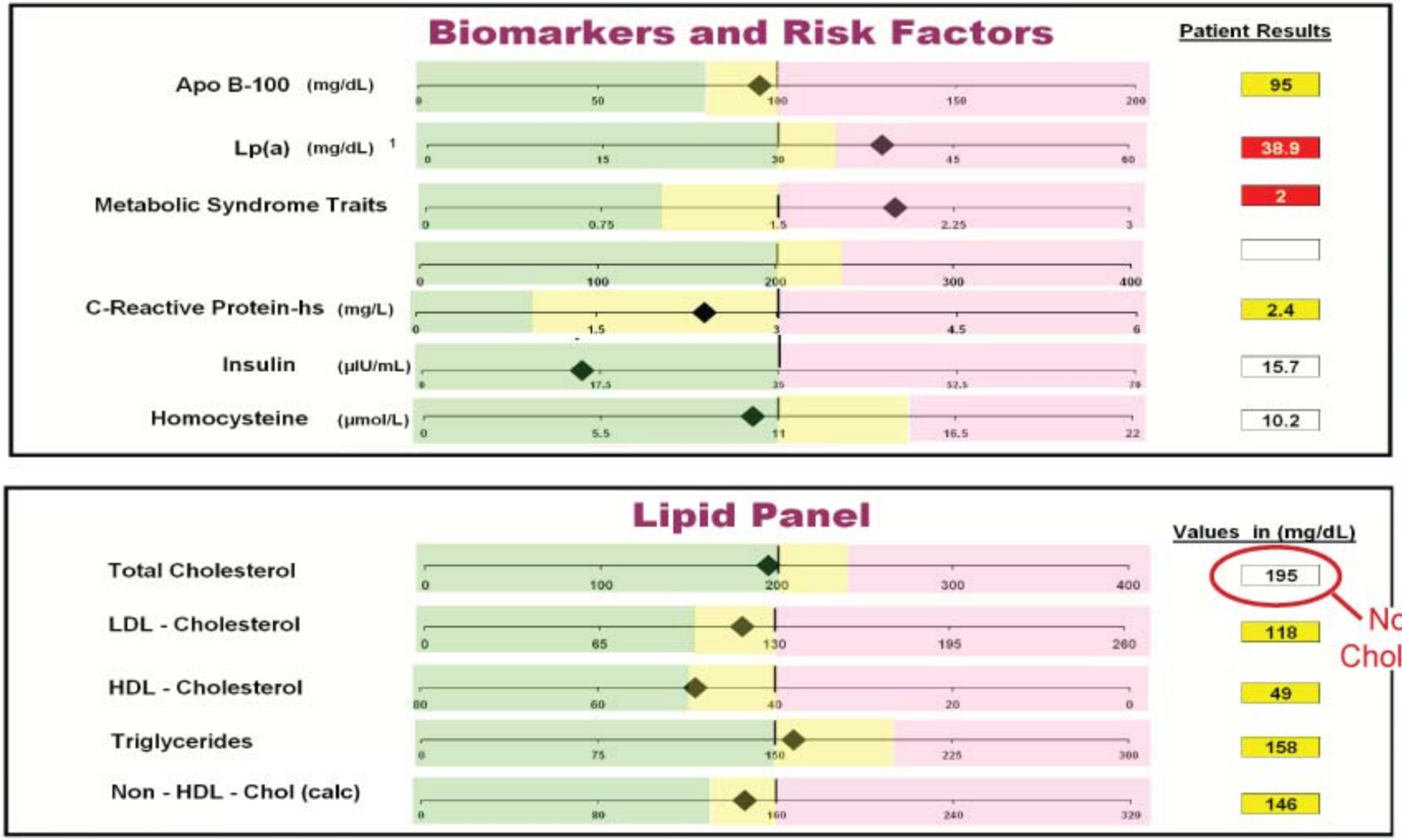
BACKGROUND AND OBJECTIVE: The National Cholesterol Education Program Adult Treatment Panel guidelines have established low-density lipoprotein cholesterol (LDL-C) treatment goals, and secondary non-high-density lipoprotein (HDL)-C treatment goals for persons with hypertriglyceridemia. The use of lipid-lowering therapies, particularly statins, to achieve these goals has reduced cardiovascular disease (CVD) morbidity and mortality; however, significant residual risk for events remains. This, combined with the rising prevalence of obesity, which has shifted the risk profile of the population toward patients in whom LDL-C is less predictive of CVD events (metabolic syndrome, low HDL-C, elevated triglycerides), has increased interest in the clinical use of inflammatory and lipid biomarker assessments. Furthermore, the cost effectiveness of pharmacological intervention for both the initiation of therapy and the intensification of therapy has been enhanced by the availability of a variety of generic statins.

SUMMARY: This report describes the consensus view of an expert panel convened by the National Lipid Association to evaluate the use of selected biomarkers [C-reactive protein, lipoprotein-associated phospholipase A2, apolipoprotein B, LDL particle concentration, lipoprotein (a), and LDL and HDL subfractions] to improve risk assessment, or to adjust therapy. These panel recommendations are intended to provide practical advice to clinicians who wrestle with the challenges of identifying the patients who are most likely to benefit from therapy, or intensification of therapy, to provide the optimum protection from CV risk.

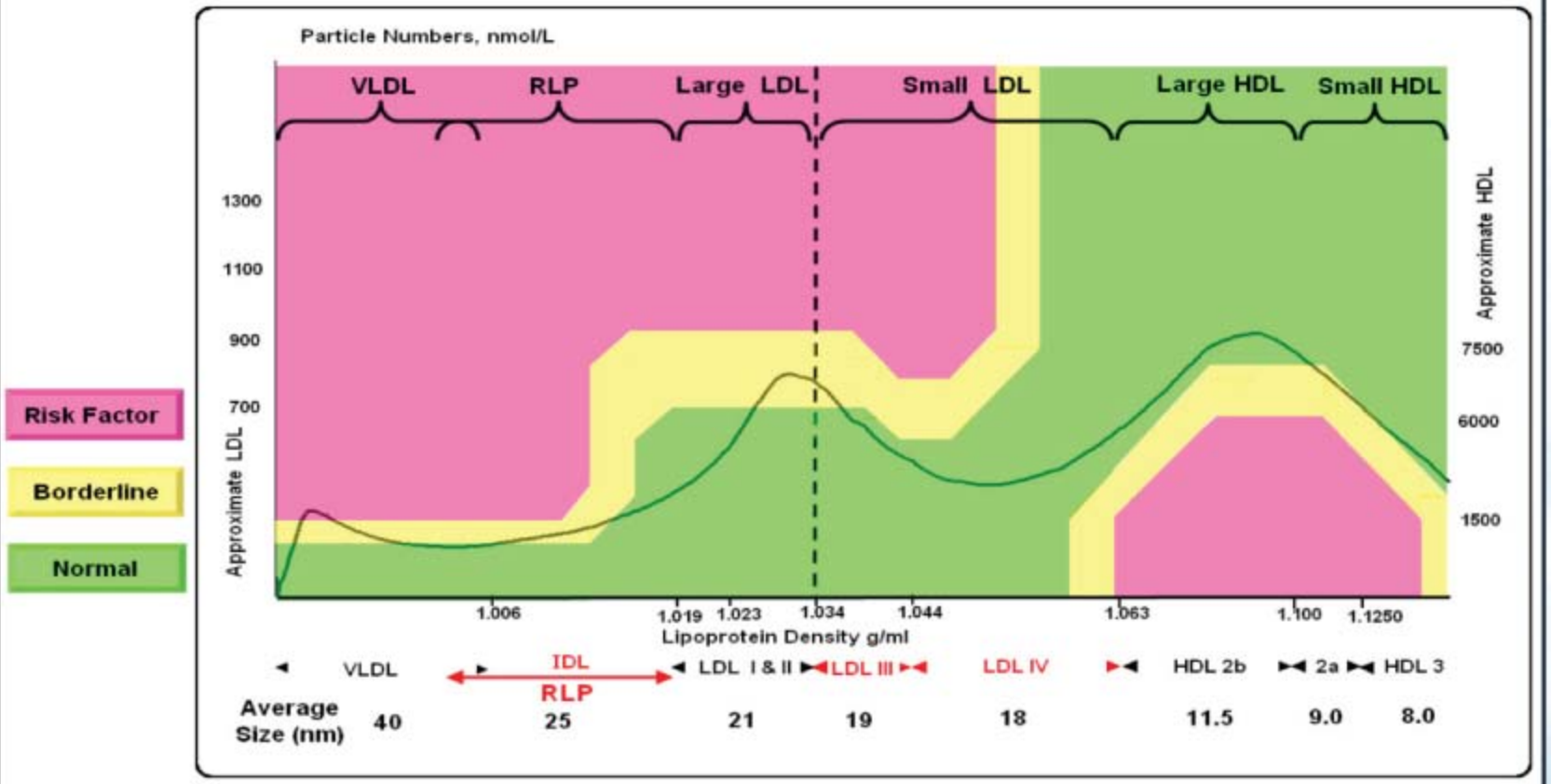
Lipoprotein Particle Profile

"Doctor, my cholesterol is only 210, that's not so bad."

- ***50% of patients with normal cholesterol are at risk for CVD.***
- ***At the microscopic level telomeres are being eroded.***


Biomarkers and Risk Factors
Patient Results
Apo B-100 (mg/dL)
0 50 100 150 200
95
Lp(a) (mg/dL) 1
0 15 30 45 60
38.9
Metabolic Syndrome Traits
0 0.75 1.5 2.25 3
2
0 100 200 300 400
C-Reactive Protein-hs (mg/L)
0 1.5 3 4.5 6
2.4
Insulin (µIU/mL)
0 17.5 35 52.5 70
15.7
Homocysteine (µmol/L)
0 5.5 11 16.5 22
10.2
Lipid Panel
Values in (mg/dL)
Total Cholesterol
0 100 200 300 400
195
LDL - Cholesterol
0 65 130 195 260
118
HDL - Cholesterol
80 60 40 20 0
49
Triglycerides
0 75 150 225 300
158
Non - HDL - Chol (calc)
0 80 160 240 320
146
Normal Cholesterol

Lipoprotein Particle Profile™



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Telomere Choices

Fresh or steamed vegetables

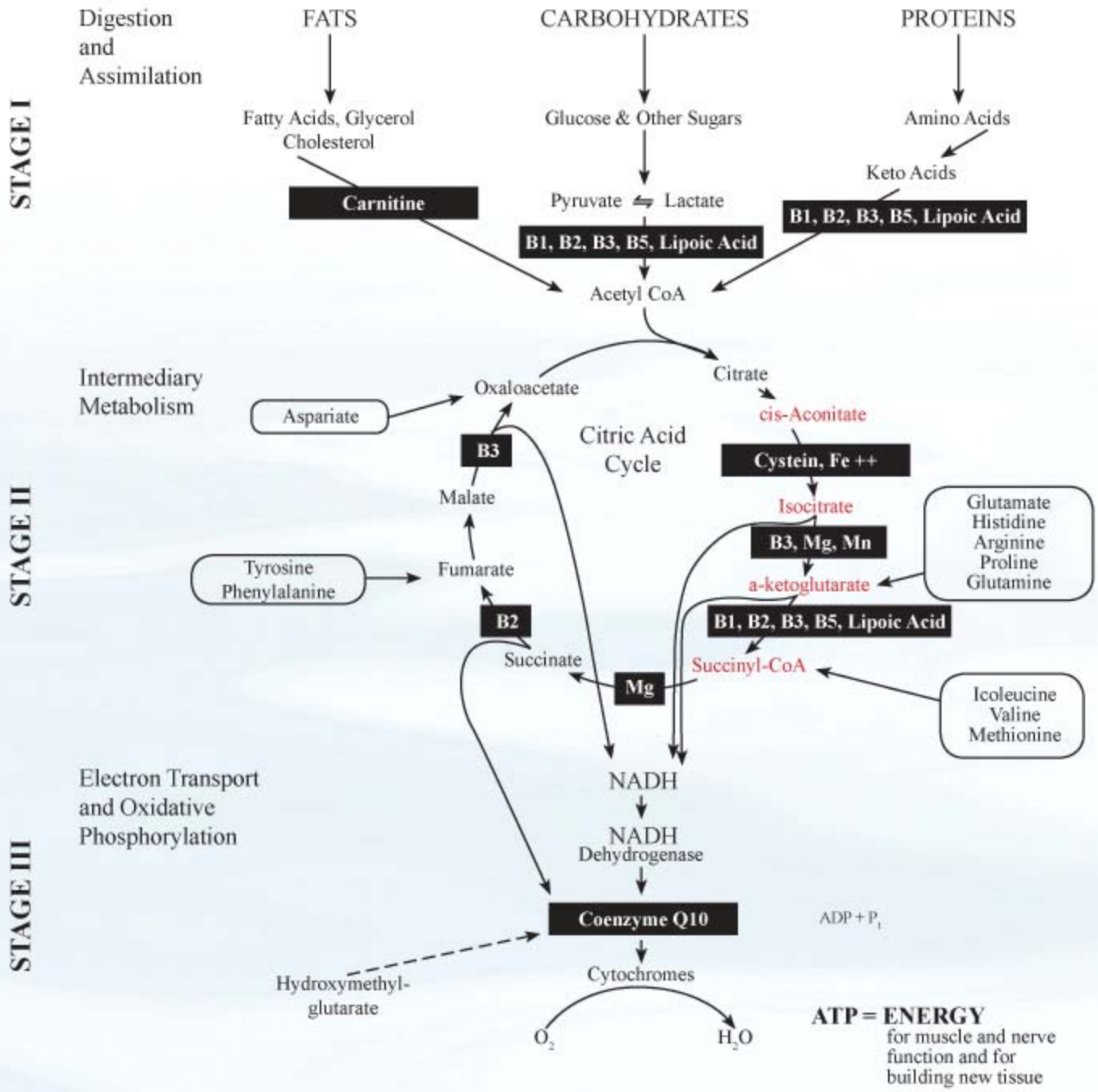
Mix of fruits (complex carbs)

- *apples*
- *pears*
- *plums*
- *strawberries*

Cold water fish

- *salmon*
- *trout*
- *tuna*
- *herring*

Role of Nutrients in Central Energy Pathways



Micronutrient Deficiencies

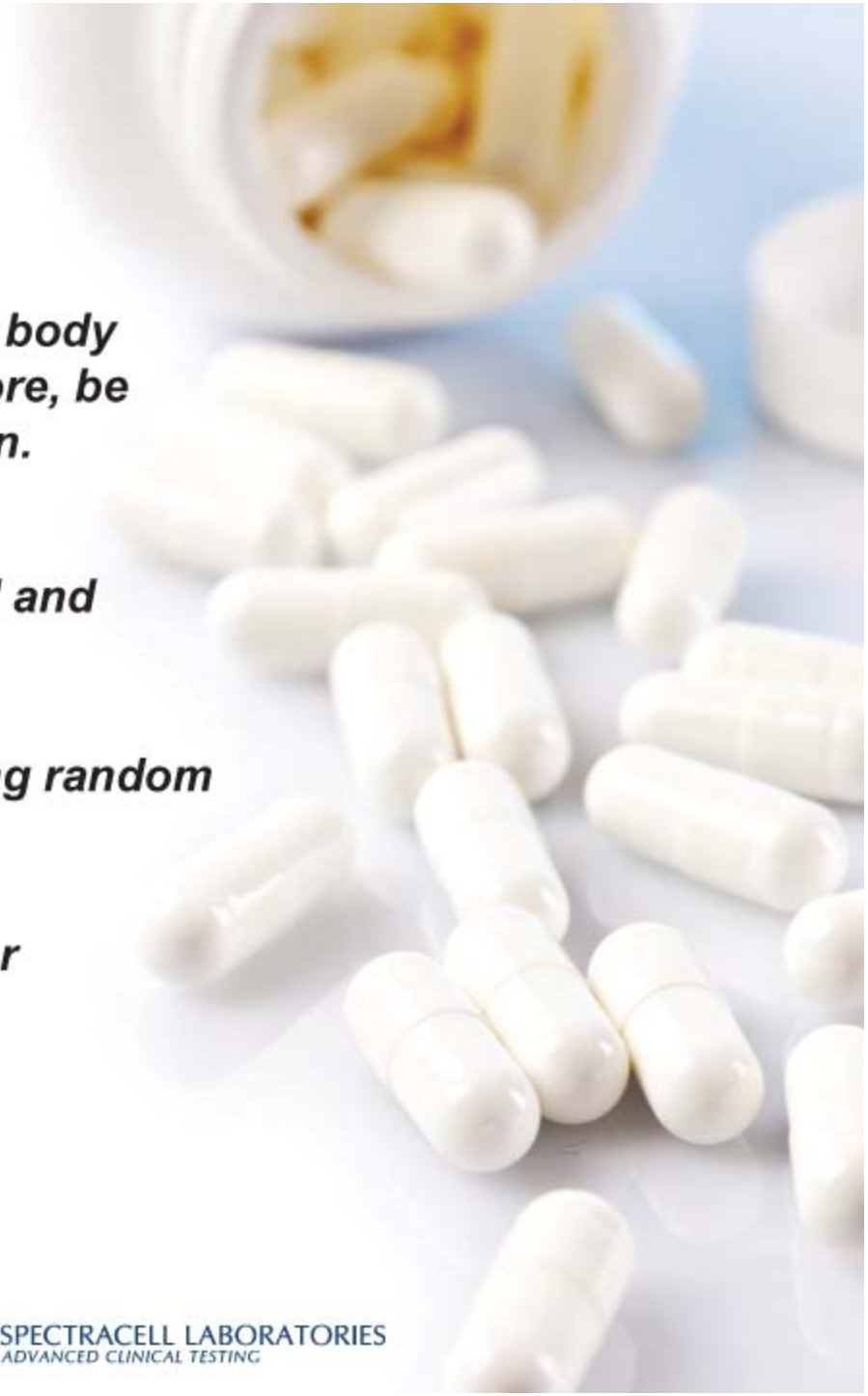
Essential nutrients are nutrients that the body cannot synthesize and that must, therefore, be supplied through diet or supplementation.

If absent the body is constantly stressed and operating at less than optimal levels.

Deficiencies can be made worse by taking random supplements.

Deficiencies can result not just from poor nutrition, but from overuse.

- ***Marathon runners***
- ***Triatheletes***



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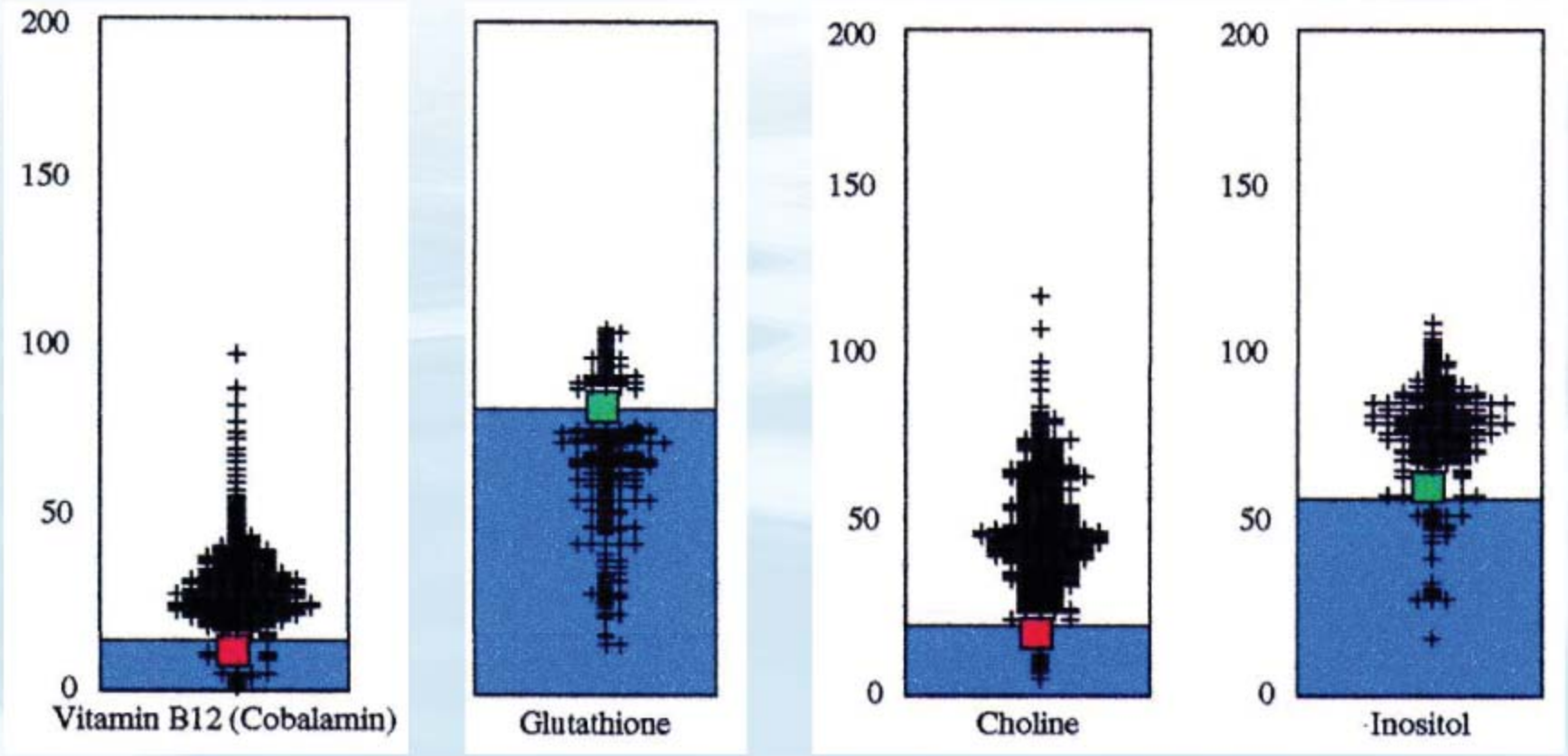
MicroNutrient Testing (Spectracell)



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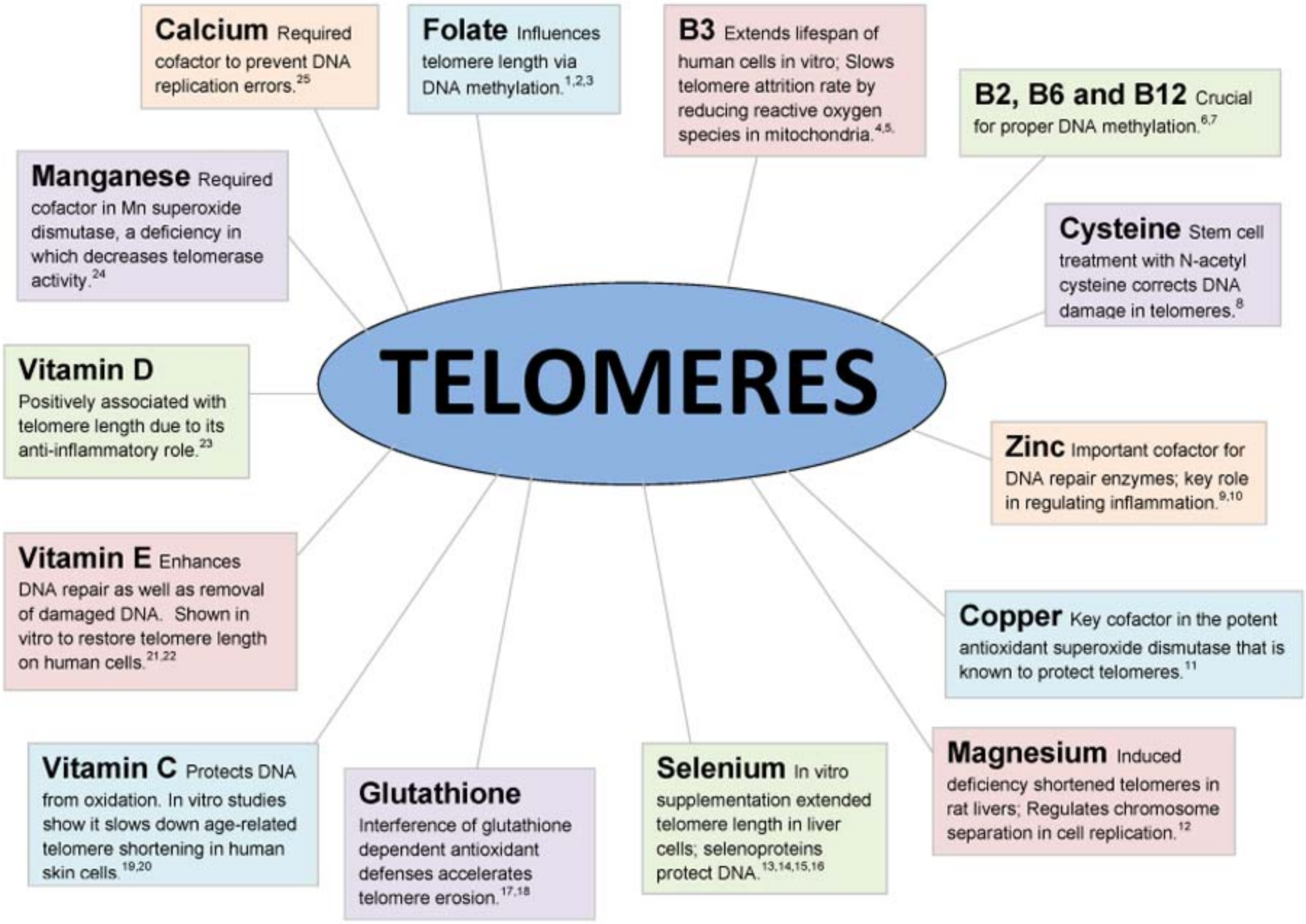


REFERENCES

[1]Fenech M. Nutriomes and nutrient arrays - the key to personalised nutrition for DNA damage prevention and cancer growth control. *Genome Integr* 2010;1:11.

[2]Moores CJ, Fenech M, O'Callaghan NJ. Telomere dynamics: the influence of folate and DNA methylation. *Ann NY Acad Sci* 2011;1229:76-88.

[3]Paul L, Cattaneo M, D'Angelo A et al. Telomere Length in Peripheral Blood Mononuclear Cells is Associated with Folate Status in Men. *J Nutr* 2009;139:1273-1278.

[4]Kang HT, Lee HI, Hwang ES. Nicotinamide extends replicative lifespan of human cells. *Aging Cell* 2006;5:423-436.

[5]Kirkland JB. Niacin and carcinogenesis. *Nutr Cancer* 2003;46:110-118.

[6]Das P, Singal R. DNA methylation and cancer. *J Clin Oncol* 2004;22:4632-4642.

[7]Bull CF, O'Callaghan NJ, Mayrhofer G, Fenech MF. Telomere Length in Lymphocytes of Older South Australian Men May Be Inversely Associated with Plasma Homocysteine. *Rejuvenation Res* 2009;12:341-349.

[8]Gu BW, Fan JM, Bessler M, Mason PJ. Accelerated hematopoietic stem cell aging in a mouse model of dyskeratosis congenita responds to antioxidant treatment. *Aging Cell* 2011;10:338-348.

[9]Sharif R, Thomas P, Zalewski P, Fenech M. The role of zinc in genomic stability. *Mutat Res* 2011; Epub ahead of print.

[10]Cipriano C, Tesei S, Malavolta M et al. Accumulation of cells with short telomeres is associated with impaired zinc homeostasis and inflammation in old hypertensive participants. *J Gerontol A Biol Sci Med Sci* 2009;64:745-751.

[11]Serra V, von Zglinicki T, Lorenz M, Saretzki G. Extracellular superoxide dismutase is a major antioxidant in human fibroblasts and slows telomere shortening. *J Biol Chem* 2003;278:6824-6830.

[12]Martin H, Uring-Lambert B, Adrian M et al. Effects of long-term dietary intake of magnesium on oxidative stress, apoptosis and ageing in rat liver. *Magnes Res* 2008;21:124-130.

[13]Liu Q, Wang H, Hu D et al. Effects of trace elements on the telomere lengths of hepatocytes L-02 and hepatoma cells SMMC-7721. *Biol Trace Elem Res* 2004;100:215-227.

[14]McCann JC, Ames BN. Adaptive dysfunction of selenoproteins from the perspective of the triage theory: why modest selenium deficiency may increase risk of diseases of aging. *FASEB J* 2011;25:1793-1814.

[15]Jackson M, Combs GF Jr. Selenium and anticarcinogenesis: underlying mechanisms. *Curr Opin Clin Nutr Metab Care* 2008;11:718-726.

[16]Schnabel R, Lubos E, Messow C et al. Selenium supplementation improves antioxidant capacity in vitro and in vivo in patients with coronary artery disease The SElenium Therapy in Coronary Artery disease Patients (SETCAP) Study. *Am Heart J* 2008;156:1201.e1-1211.

[17]Kurz D, Decary S, Hong Y et al. Chronic oxidative stress compromises telomere integrity and accelerates the onset of senescence in human endothelial cells. *J Cell Sci* 2004;117:2417-2426.

[18]Watfa G, Dragonas C, Brosche T et al. Study of telomere length and different markers of oxidative stress in patients with Parkinson's disease. *J Nutr Health Aging* 2011;15:277-281.

[19]Furumoto K, Inoue E, Nagao N et al. Age-dependent telomere shortening is slowed down by enrichment of intracellular vitamin C via suppression of oxidative stress. *Life Sci* 1998;63:935-948.

[20]Yokoo S, Furumoto K, Hiyama E, Miwa N. Slow-down of age-dependent telomere shortening is executed in human skin keratinocytes by hormesis-like-effects of trace hydrogen peroxide or by anti-oxidative effects of pro-vitamin C in common concurrently with reduction of intracellular oxidative stress. *J Cell Biochem* 2004;93:588-597.

[21]Makpol S, Durani L, Chua K et al. Tocotrienol-rich fraction prevents cell cycle arrest and elongates telomere length in senescent human diploid fibroblasts. *J Biomed Biotechnol* 2011;506171.

[22]Tanaka Y, Moritoh Y, Miwa N. Age-dependent telomere-shortening is repressed by phosphorylated alpha-tocopherol together with cellular longevity and intracellular oxidative-stress reduction in human brain microvascular endotheliocytes. *J Cell Biochem* 2007;102:689-703.

[23]Richards J, Valdes A, Gardner J et al. Higher serum vitamin D concentrations are associated with longer leukocyte telomere length in women. *Am J Clin Nutr* 2007;86:1420-1425.

[24]Makino N, Maeda T, Oyama J et al. Antioxidant therapy attenuates myocardial telomerase activity reduction in superoxide dismutase-deficient mice. *J Mol Cell Cardiol* 2011;50:670-677.

[25]Chandra S. Subcellular imaging of RNA distribution and DNA replication in single mammalian cells with SIMS: the localization of heat shock induced RNA in relation to the distribution of intranuclear bound calcium. *J Microsc* 2008;232:27-35.

For additional references, go to http://www.spectracell.com/online-library-telomere-abstracts/

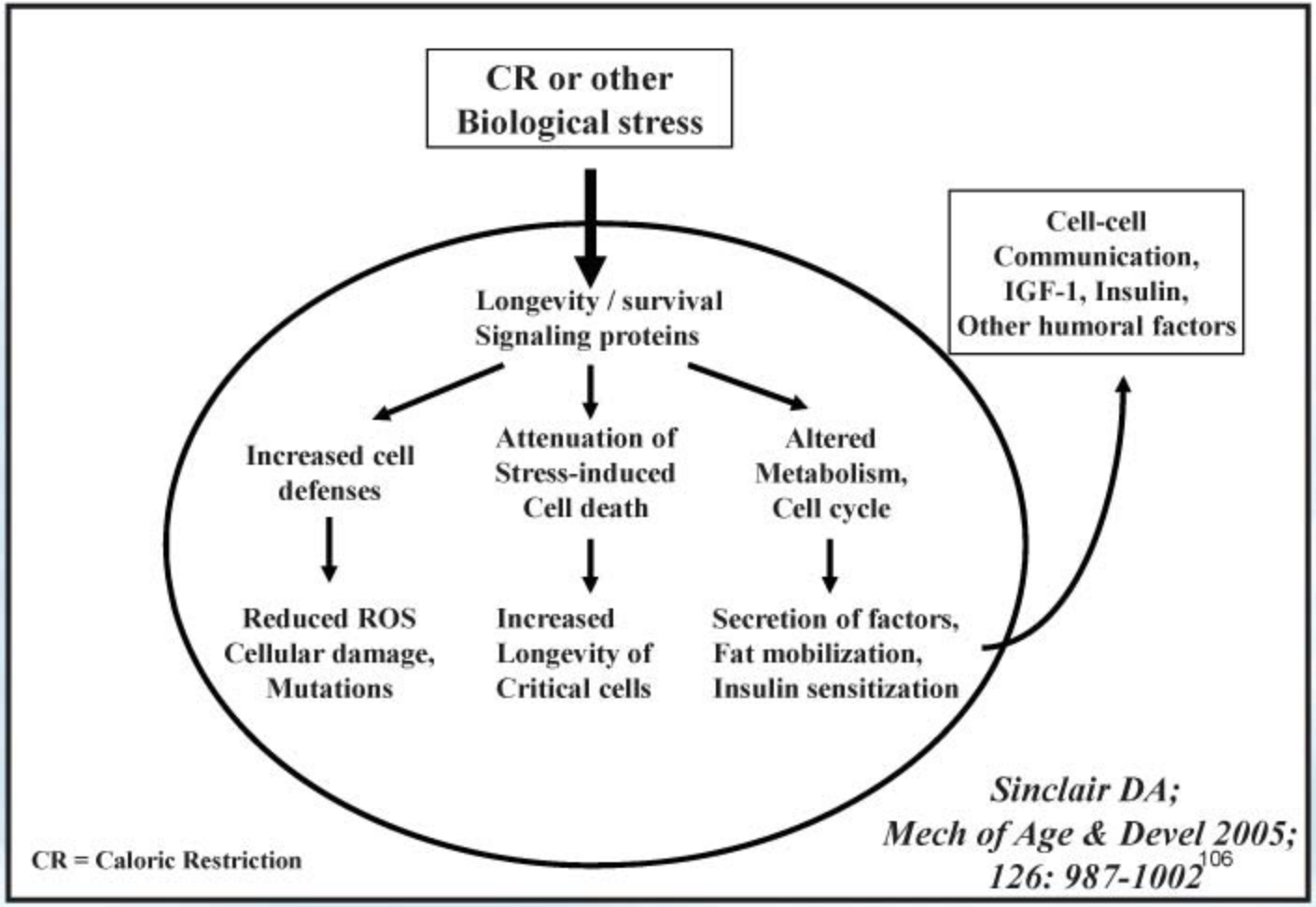
Telomeres and Caloric Restriction

Caloric Restriction is the most effective and reproducable manipulation to:

- ***extend longevity***
- ***keep animals healthy and fit***
- ***minimize diseases***

Am J of Clin Nut, 2003, Vol, 76, No 3, 361 - 369
Science 2009, Vol 325, No. 5937, 201 - 204

The Hormesis Hypothesis of CR



Telomere Friendly Exercise

Take antioxidants 30 minutes before exercise to reduce oxidative stress

Resistance exercise before aerobic exercise

Intervals

- ***Joe Mercola's Peak 8***
- ***Enables everyone to do effective exercise in their own way in a short time.***

Lifestyle

- ***12 hour fast: 6 pm - 6 am***
- ***Frequent meals to reduce hyperglycemia and hypertriglycemia***
- ***Antioxidants prior to bigger meals***
- ***Meditation, yoga, stretching to unwind***

Aging now starts as young as 9 - 11.

THE WALL STREET JOURNAL.

NOVEMBER 11, 2011, 4:59 PM ET

Kids and Cholesterol: New Guidelines Recommend Testing 9-to-11-Year-Olds

HEALTH INDUSTRY / NOVEMBER 12, 2011

Panel Urges Cholesterol Testing for Kids

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Conclusion

Being proactive now really pays off down the road.

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Commonly asked questions

1. **Will I receive a copy of the presentation slides?**

YES

2. **Is the presentation being recorded?**

YES

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