
Kaufmann
Protocol

WHY WE AGE AND HOW TO STOP IT

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The Body as a Factory

- Company Operating Manual
- Energy source
- Pathways…Assembly lines
- Quality Control
- Security systems
- Work Force
- Waste Management

Analogy Applied to cells

• Company operating manual	DNA
• Energy Source	Mitochondria
• Pathways	Pathways: AMPKinase, sirtuins, mTOR
• Quality control	DNA and Protein repair mechanisms
• Security	Immune system
• Workforce	Individual cell requirements
• Waste Management	AGE's, lipofuscin

Tenet 1: DNA

- Epigenetics
    - DNA and Histones

  methylation/ phosphates/ acetyl groups

- Telomeres and telomerase

Tenet 2: Energy…..Mitochondria

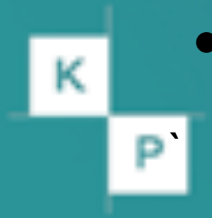
- The Powerhouse of the cell
- Different numbers in different cell types
- Deficient in NAD over time
- Free Radicals become toxic to the organelle
  Decline in endogenous scavengers over time; SOD, catalase, glutathione, etc

Tenet 3: Pathways

- Based on Caloric Restriction
- Discovered
  - Sirtuins
  - AMP Kinase
  - mTor

Sirtuins

- Silent Information Regulator gene
- Discovered in 2000
- Yeast that had additional copy of SIRT1, lived 30% longer
- NAD dependent genes and enzymes that sense environmental and nutritional stressors
- 7 mammalian sirtuins



Sirtuins

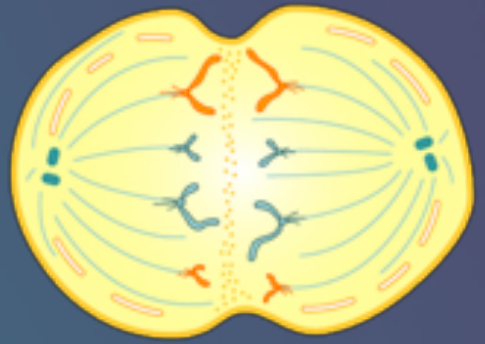
- Seven mammalian sirtuins

- SIRT 1:

  Located in the nucleus

  - **Circadian rhythm regulation**
  - Mitochondrial DNA transcription
  - Oxidative stress
  - **Inflammatory pathways (NF-kB)**
  - Sarcopenia

Sirtuin families



SIRT2:

- Located in the cytoplasm and nucleus
- Mitosis
- Known to affect histones @H4K16

SIRT3:

- Located in mitochondria
- Orchestrates mitochondrial function
  - Increases production of **superoxide dismutase**
  - Apoptosis (getting rid of useless dead cells)
  - Effects **brown fat expression**
  - Known to affect histones @ H3K9, H3K56

SIRT4:

Located in the mitochondria

TCA or Krebs cycle

SIRT5:

Located in the mitochondria

Uric Acid cycle

SIRT6:

Located in the nucleus

Controls inflammation through effects on NF-kB

Telomeric preservation

Prevents diet-induced obesity

DNA repair

Affects Histones H3K9, H3K56

SIRT7:

Located in the nucleus

Controls nucleolar maintenance during cellular stress

Sirtuins

- Decline with age
- NAD dependent…and NAD declines with age
- Artificially activate sirtuin gene family

Are there SIRT activators? Of course

AMP Kinase

- Adenosine Monophosphate-activated Protein Kinase
- Known as the **Metabolic Master Switch**
    - **Promotes catabolic mechanisms** that **generate ATP,** while simultaneously inhibiting **anabolic** systems that require ATP.
- Loss of AMP Kinase?
    - Decrease in autophagy, Increasing oxidative stress , Increasing inflammation, Increasing fat deposition, Hyperglycemia

mTOR: mechanistic target of Rapamycin

- mTOR is a serine/threonine protein kinase
- Senses the environment and promotes **anabolic processes** …its essential to the biosynthesis of proteins and lipids
- Get hyper-functioning of cells…contributes to high blood pressure, osteoporosis and hypercoagulability
- Pathway becomes obsolescent
- Blocking mTOR been shown to increase longevity…Rapamycin

Rapamycin

- First inhibitor of the mTOR complex 1

- Cancer treatment
  Renal cell CA, neuroendocrine tumors, some breast cancers, some leukemias, and lymphomas.

- Potent immunosuppressant after kidney transplant

- Drug-eluting cardiovascular stents

Rapamycin- the positives

- Delay in stem cell loss
- Delay in cognitive decline
- Delayed heart failure
- Delayed liver degeneration
- Less tendon stiffening
- Less decline in physical activity
- Some aspects of cancer prevention

Rapamycin- the negatives

Side effects with doses from immune suppression:

- Immunosuppression
- Edema
- Mouth ulcers
- Alopecia
- Testicular dysfunction
- Issues with Fertility

Even smaller doses

- Hippocampal neurons...memory
- Sarcopenia

Tenet 4: Quality Control

- DNA: Four primary repair mechanisms
- Proteins: Four primary repair mechanisms
- Autophagy

DNA repair

- Single strand break: 5 - 10,000 per cell, per day
- Double strand breaks: 10 per cell, per day
- Errors in substitutions, deletions, strand crossing and linking
- Inclusively up to 10^5 DNA errors per cell/ per day

Tenet 5: Security systems

Immune system and Inflammatory cascade

Three main issues central to aging

- The body gets put in a chronic state of inflammation
- Infection risk rises
- Increase in cancers, especially in cells that originate from bone marrow.

Chronic Inflammation

"The aging process is a **chronic smoldering oxidative and inflammatory stress** that leads to the **damage of cellular components,** including proteins, lipids, and DNA, contributing to the age-related decline of physiological functions." (Szarc 2015)

Inflammaging

Factors highly correlated to aging:
Interleukin-1, Interleukin-6, Interleukin-18, C-reactive protein (CRP), Tumor Necrosis Factor-alpha (TNF-a), serum Amyloid, Soluble vascular cell adhesion molecule-1 (sVCAM-1), and Monocyte chemoattractant protein-1(MCP-1).

Infection Risk

- Less robust cell production from **declining stem cells**
- Less efficacious macrophages, killer cells, and B cells
- Less response to vaccines with age

Tenet 6: Work Force

- Individual employees……Translates into individual cells

- Several determinants require needs
  - Cell life length
  - Mobility...circulate vs stationary

- Fast turnover cells require
  - Optimized stem cells
    - High nutrient availability

- Long lived cells require optimized niche and nutrient delivery

Tenet 7: Waste Management

- Glucose precipitates AGEs and rAGEs
- Autophagy creates Lipofuscin
- Oxygen causes Free Radical formation

Advanced Glycation End products

- Result of Glucose and oxidative stress
- Non-Enzymatic, multi-step reaction
- Creates AGEs, ALEs, or DNA-AGEs

Do?

- Create inflammatory response
- Sticks to almost everything made of collagen/ structural integrity
- Lose protein or DNA function

Lipofuscin

- Byproduct of cellular recycling in the lysosomes
- Accumulations accurately age crustaceans
- Cause space occupying issues in long lived cells
- Prevents lysosomes from efficient recycling
- Get negative spiral of cell

Summation of Aging

- Company operating manual…DNA
- Energy Source…Mitochondria
- Pathways…Aging pathways, i.e. AMP Kinase, sirtuins, mTOR
- Quality control…DNA and Protein repair mechanisms
- Security…Immune system
- WorkForce…Individual cell requirements
- Waste Management…AGE’s, lipofuscin

your total 59	tenet 1	tenet 2	tenet 3	tenet 4	tenet 5	tenet 6	tenet 7
	DNA Alterations	Mitochondrial Failure	Aging Pathways	Quality Control	Immune System Failue	Individual Cell Needs	Waste Management
Molecular Agent	-	-	-	-	-	-	-
Astaxanthin	0	3	0	0	2	0	0
Carnosine	0	3	0	0	0	0	3
EGCG	2	2	1	2	1	1	2
Metacurcumin	2	3	1	0	3	0	3
Nicotinamide Riboside	0	3	3	3	0	0	0
Pterostilbene/Resveratrol	2	3	3	3	2	2	1
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
	6	17	8	8	8	3	9

Protocol Chart

A Few of my Favorite Things

Astaxanthin	0.3.0.0.2.0.0
Carnosine	0.3.0.0.0.0.3
Metformin	3.1.3.2.2.2.3
Curcumin	2.3.1.0.3.0.3
Chebulic Acid	0.2.0.0.2.1.3
Cistanche Deserticola	1.2.0.1.3.2.0
Ecklonia Cava	0.2.2.2.2.2.1

Astaxanthin

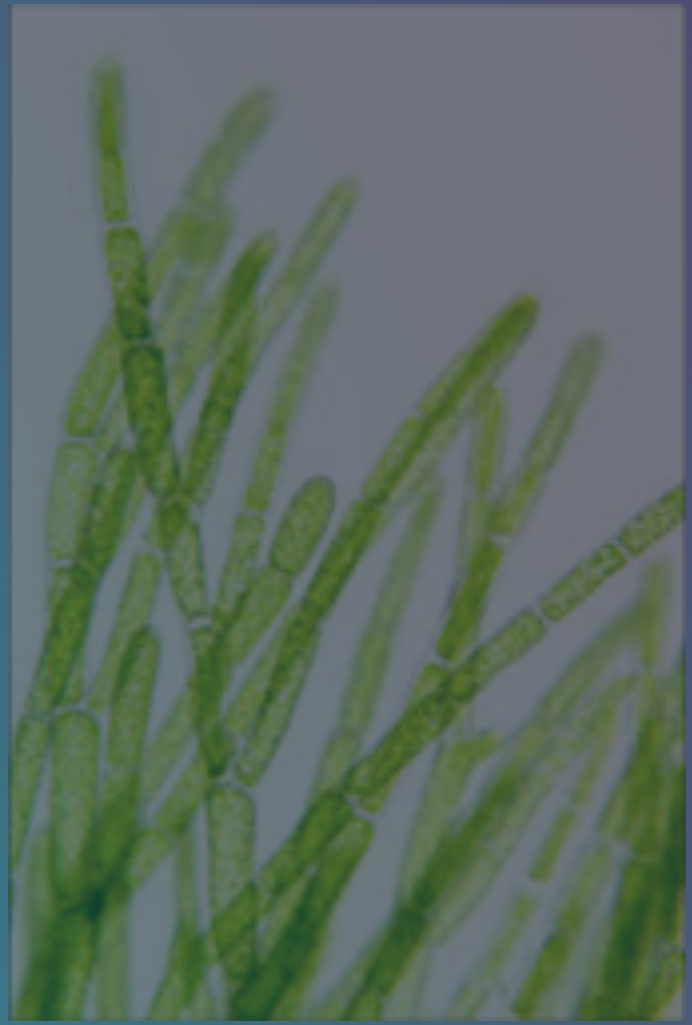
0.3.0.0.2.0.0

(Kaufmann Rating Number)

xanthophyll carotenoid
3,3’-dihydroxy-beta,beta-carotene-4,4’-dione

Astaxanthin

- Substance made by a unicellular biflagellate, Haematococcus pluvialis, under stressful conditions
- Xanthophyll carotinoid
- Extremely red
- Responsible for most red found in and around water...salmon, crabs, lobster, roseate spoonbills



Astaxanthin
0.3.0.0.2.0.0

Tenet #2: Mitochondria

Powerful free radical scavenger and anti-oxidant

“It is well worth mentioning that astaxanthin can act as a safeguard against oxidative damage through various mechanisms, by **quenching of singlet oxygen**, **scavenging of radicals**, inhibiting lipid preoccupation, and **regulating gene expression** related to oxidative stress.” (Wu 2015)

Stimulates production of the endogenous antioxidant enzymes: catalase, superoxide dismutase, and peroxidase.

Astaxanthin
0.3.0.0.2.0.0

Tenet# 5 Security/ Immune system

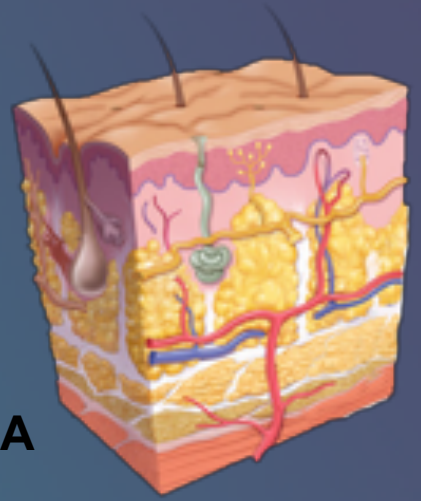
Reduces activation of NF-Kb, which then suppresses the production of IL-1B, IL-6 and TNF-a

Inhibits cyclooxygenase 2 (COX-2), prostaglandin E2, and C-Reactive Protein (CRP)

Astaxanthin Vision

In 2009, Japanese researchers administered 6 mg of astaxanthin daily to **middle aged people** (46-65) for **one** month. Remarkably, **60% of the subjects had visual improvements**, especially in the categories of “difficulty to see near objects,” “eye strain” and “blurred vision.” (Yuan and Kajita 2009)

Astaxanthin
Skin



In human cell lines, especially skin fibroblasts and melanocytes, astaxanthin was shown to **reduce DNA damage** that was precipitated by UVA radiation.

In human skin studies:
Topical astaxanthin demonstrated **improvements in crows feet, age spot size, elasticity, skin texture, and the moisture content of corneocytes.**

Astaxanthin Fitness

Prevents exercise related increases in Free Radicals

Decreases DNA and protein damage with exertion

Increases exercise capacity

Carnosine

0.3.0.0.0.0.3

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L-histidine and B-alanine dipeptide

Carnosine

0.3.0.0.0.0.3

- Present in all muscle
- Identified in 1900 by a Russian scientist, V.S. Gulewitch
- The amino acids come from our diet
- Amount on the body varies with age and gender
- Men have more than women
- Youth have more than the aged

Cool experiment

Senescent human fibroblast cells were put into a bath of carnosine

Very quickly, the old cells exhibited a rejuvenated appearance. But they didn't just look younger, they acted younger….the **senescent cells reverted to juvenile phenotypes**.

- If the carnosine was removed, the cells quickly became old again.
- If the carnosine was reintroduced, the transformation recurred.
- The **cells in carnosine lived longer AND better**
- Carnosine cells meanwhile had a **25% increase** in the ability to keep dividing.

Carnosine
0.3.0.0.0.0.3

Tenet #2 Mitochondria

Reduces oxidative damage

Improves endogenous antioxidants

Restores depleted levels of glutathione

Increases the basal levels of superoxide dismutase

Carnosine
0.3.0.0.0.0.3

Tenet #7 Waste management

Blocks AGE formation

May actually reverse AGE formation; acts as a transglycating agent

“Carnosine was found to be effective already in the **first step of AGE formation** as well as by reversing glycated protein through a **transglycation** mechanism.” (Boldyrev 2013)

Hearing
Protects hearing from loud noises

Vision
Prevents presbyopia and cataract formation (via carnosine eye drops)

Skin
Improves quality of skin

Metformin

3.1.3.2.2.2.3

KRN

Glucophage

Metformin
3.1.3.2.2.2.3

Why the interest in Metformin?

2014 study: Type II Diabetics on Sulfuronureas or Metformin VS non-diabetics

Retrospective Study of 150,000 people

Those on metformin had **higher survivability**

For patients in 70's...mortality reduced by 15%

What is it?

Originally from French Lilac, used in Medieval europe for s/s diabetes

Officially discovered 1922

Prescription med in France since 1957

US since 1995

Metformin
3.1.3.2.2.2.3

Tenet #1 DNA alterations

Epigenetic modular; it induces genome-wide DNA methylation

Modulates the activity of S-adenosylhomocystein hydrolase

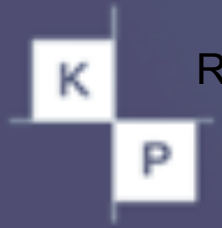
Increases genomic stability

Stimulates telomeric length

Tenet #2 Mitochondria

Activates endogenous antioxidants: heme-oxygenate-1, glutamate cysteine ligase, glutathione S-transferase, glutathione peroxidase, SOD, catalase, sulfiredoxin and thioredoxin.

Works through the **Nrf2-ARE pathway** (nuclear factor-like 2 - Antioxidant Response Elements)



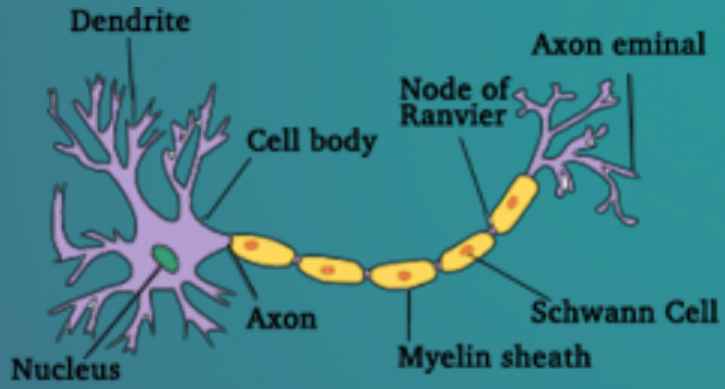
Tenet #3 Pathways

AMP KInase activator

Depresses mTOR pathway

Tenet #4 Quality control

Increases DNA repair efficacy



Tenet # 5 Security/Immune system

Blocks the activity of the transcription factor nuclear factor-kB

Inhibits the differentiation of monocytes to macrophages

Tenet #6 Individual cell health

Boosts the formation of new nerve cells.

"Metformin, an FDA-approved diabetes drug, promotes proliferation, self-renewal, and differentiation of adult neural precursors." (Fatt 2015)

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Metformin
3.1.3.2.2.2.3

Tenet #7 Waste management

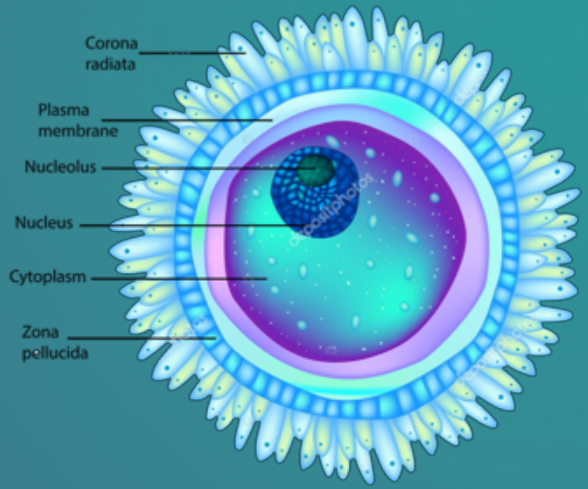
Reduces blood glucose
Reduces AGE formation
Slows lipofuscin accumulation

Side effects:

GI upset, transient diarrhea, abdominal pain, cramps and excess gas
Worst case scenario: Lactic acidosis. 3 cases / 100,000 patient years.

The drug blocks the metabolism of a few vitamins
Long term risk of Sarcopenia

Metformin
3.1.3.2.2.2.3



- Cancer Reduction
  In diabetics: cancer reduction by 30 to 50%

  Decreased risk of pancreatic, colon, hepatocellular carcinoma

- Delayed Menopause
  (at least in Mice)

- Polycystic ovarian disease: Improves ovulation, improves cyclic nature, reduces androgens

- Alters Gut Microbiota
  Selects out for”skinny people” bacteria

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Curcumin

2.3.1.0.3.0.3

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Diferuloylmethane

Curcumin
2.3.1.0.3.0.3

Vedic India four thousand years ago...spice and religious ceremonies

Arrived in China somewhere near 700 AD

East Africa by 800 AD

Praised by **Avicenna** aka Abu Ali al Husain Ebn Abdullah Ebn Sina Persian Physician (980-1037)

Smuggled to Europe by Marco Polo circa 1280

Curcumin
2.3.1.0.3.0.
3

Polyphenol

One of the active molecules from the spice turmeric

Roots or the rhizomes of *Curcuma longa*
a herbaceous, perennial plant belongs in the ginger family, *Zingiberaceae.*

Curcumin constitutes only 3 to 5%
of the turmeric

Curcumin
2.3.1.0.3.0.
3

Tenet #1 DNA alterations

Affects histone acetylation
Represses the addition of an acetyl group onto histone proteins
Inhibits p300/CREB-specific acetyl transferase

Tenet #2 Mitochondria

Strong Free radical scavenger & Antioxidant
Inhibits lipid peroxidation

Enhances production of endogenous antioxidants; catalase, superoxide dismutase (SOD), glutathione peroxidase (GPx), glutathione reductase (-GR), heme oxygenase-1 (OH-1), and glutathione-S-transferase (GST)

Curcumin

2.3.1.0.3.0.

3 **Tenet #3: Pathways**

Activates AMP Kinase

Tenet #5 Security/ Immune system

Blocks NF-kb, TNF-a

Modulates multiple cell signaling molecules; pro-inflammatory cytokines, cyclooxygenase-2 (COX-2), STAT3, CRP, GSH

Inhibits gene expression for RAGE production…less inflammatory factors released

Tenet #7 Waste management

Decreases lipofusion accumulation in brain cells

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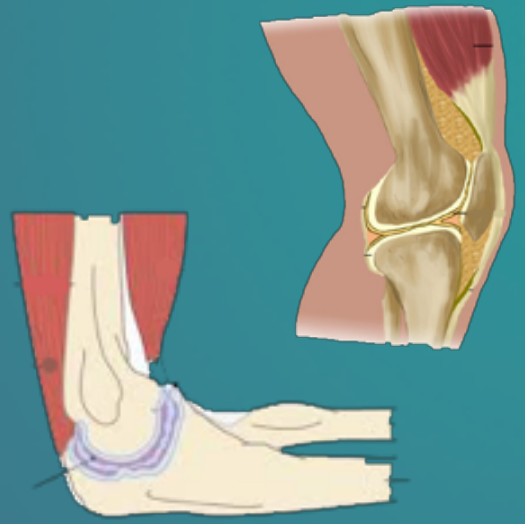
Curcumin
2.3.1.0.3.0.3



- Anti inflammatory
  - Both oral and topical
  - Rheumatoid arthritis, osteoarthritis
  - standard aches and pains
- Reduces cancer risk

At the molecular level, inhibition of NF-kB, Akt/PI3K, and MAPK pathways and enhancement of p53 are among the most important anticancer alterations induced by curcumin. Momtazi, Amir Abbas, et al. 2016

- Improves metabolic syndrome
- Antimicrobial
  - Anti bacterial, anti viral, anti fungal, anti malarial
- Decreases stress and anxiety, mood and improved working memory

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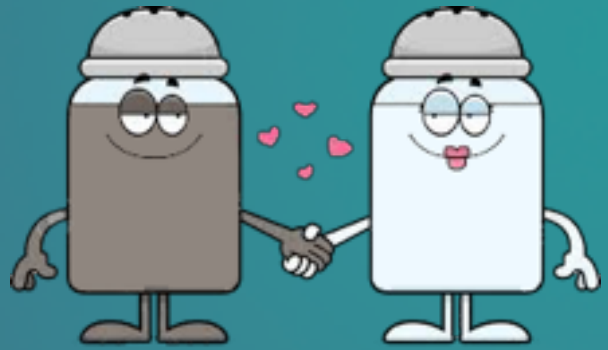
Curcumin
2.3.1.0.3.0.3

Drawbacks



Bioavailability

Poor absorption, half life standard formulation 2.6 hours

Add black pepper...inhibits particular liver enzymes

20 mg peperidine with 2 gm curcumin increased bioavailability 20 fold
Half life 2.2 hours

Innumerable formulations since…

Side effects: diarrhea, headache, yellow stools

Chebulic Acid

0.2.0.0.2.1.3

KRN

Chebulic Acid
0.2.0.0.2.1.3

Chinese medicine, Tibetan medicine, and in Ayurvedic medicinal traditions.

From South Asia, India, Nepal, Southern China, Malaysia, and Vietnam.

Derived from the dried fruit of a plant *Terminalia Chebula,*
Also containing: gallic acid, elegiac acid and innumerable other substances.

The medicinal agent:
The King of Medicines…Tibet
In the Aruvedic tradition, it is **Haritaki.**

In Hindi it is Harad or Harade.
Arabian… Haleelaz
Farsi…Haleel

Chebulic Acid
0.2.0.0.2.1.3

Frequently used in a triad with *Emblica officinalis* and *Terminal belerica, and* referred to as Triphala.

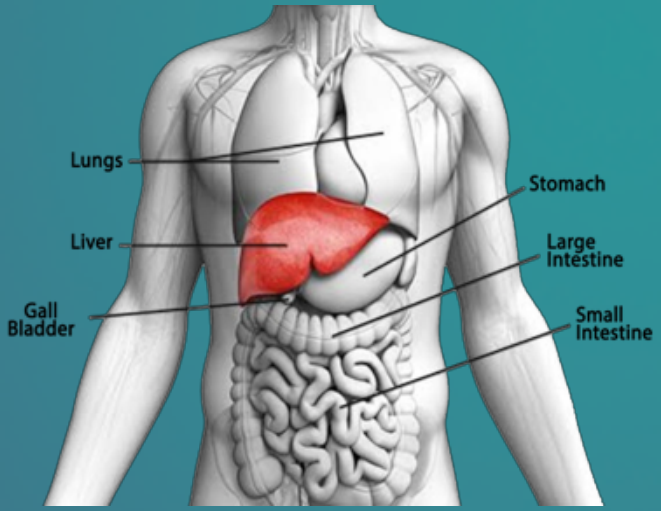
The same three components in Tibetan medicine is called the “Three fruit” or Bras Bu.

Padma Hepaten: A more modern formula of the three components from Switzerland.

64% of Padma Hepaten is chebulic acid, (200 mg per tablet.)

*“…. an **antioxidant,** antimicrobial, **anti-diabetic**, hepato-protective, **anti-inflammatory**, anti-mutagenic, anti-proliferative, radio-protective, cardio-protective, anti-arthritic, anti-caries, gastrointestinal mobility and wound healing activity.* *(Bag 2013)*

Chebulic Acid
0.2.0.0.2.1.3



Tenet # 2 Mitochondria

Potent antioxidant
Increases endogenous superoxide dismutase
Inhibits lipid peroxidation

Tenet # 5 Security

Decreases inflammatory markers, esp TNF-a, IL-6, MMP-3, COX-2

Tenet # 6 Individual Cell health

Demonstrated to protect liver cells

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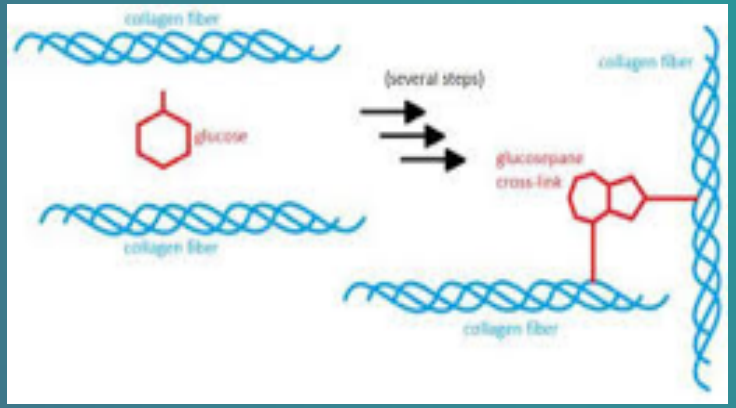
Chebulic Acid
0.2.0.0.2.1.3



Tenet # 7 Waste Management

Hypoglycemic agent

Blocks formation of AGEs. **Some evidence that it can even break AGEs.**
(This is crucial)

“Our present in vitro studies showed that CA is a more potent inhibitor cross-linking and breaker of collagen cross-linking than the control compounds, such as AG and ALT-711.” *(Lee)*

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Study with diabetic rats. (Kim, Hong 2011)

Chebulic acid administration reduced the levels of blood glucose and serum lipids

Decreased the advanced glycation end products (AGEs) distribution in the testis seminiferous tubules.

Hypothesized that high dose chebulic acid has “merit to be a potent candidate to control glycemic and diabetic complications.”

...Chebulic acid reduced AGE production and cross linking in test tubes as shown in the previous study, but also in a rodent-diabetic model. Does it work on people?

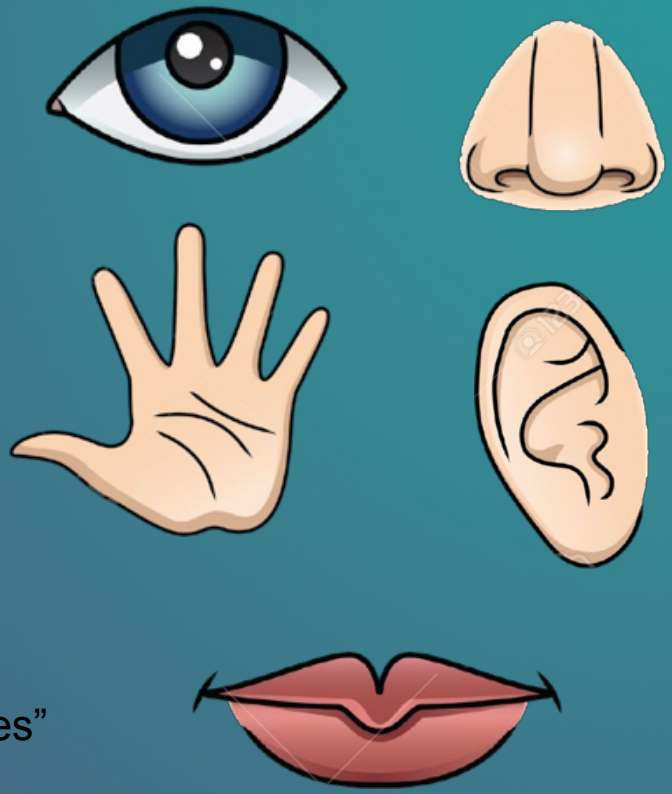
Hypothesized that to reach the same effect, for a 60 kg person, they would need **1440 mg/day.** Is this feasible?

Haritaki: 500 mg of plant ? chebulic acid

Haritaki holidays….

Chebulic Acid
0.2.0.0.2.1.3

- Antibacterial
- Anti-viral: CMV, some flu strains
- Reduces Gastric Ulcers
- Reduces histamine release
- Can use as toothpaste
- “Promotes the receiving power of the five senses”



Cistanche Deserticola

1.2.0.1.3.2.0

KRN

Cistanche Deserticola
1.2.0.1.3.2.0

Holoparasitic plant

It has no chlorophyll...

gets its nutrients and water from other plants.

Native to China and Inner Mongolia, where it is collected in the spring.

First recorded use during the Eastern Han Dynasty, about 2,000 yrs ago

Strengthens Yin, and boost Qi.

In China: tonic for the kidneys, infertility, forgetfulness, hearing loss and chronic constipation

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Cistanche Deserticola 1.2.0.1.3.2.0

Tenet #1 DNA

Increased telomerase activity (as measured in heart and brain tissue) in aging mice model

Tenet # 2 Mitochondria

Nine compounds identified with significant free radical scavenging activities

Increased activity of SOD in serum and brain of aged mice

Cistanche deserticola 1.2.0.1.3.2.0

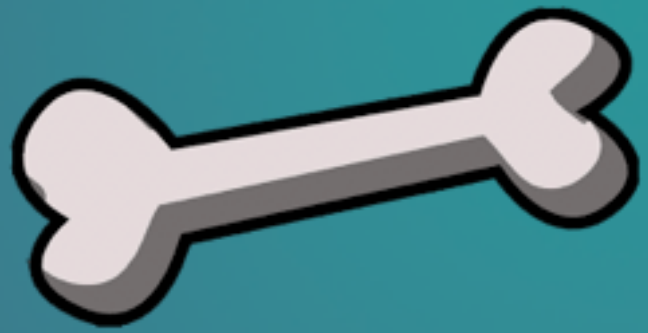
Tenet # 4 Quality Control

Cisanoside B: Fast repair of DNA damage

Tenet # 5 Security/ Immune system

Immuno-stimulant
Increases in naive T and natural killer cells
Inhibits NF-KB
Increases phagocytic activity of peritoneal macrophages in mice

Cistanche Deserticola 1.2.0.1.3.2.0



Tenet #6 Individual cell health

Improved Bone health

Culture: “C. deserticola extract has been proven to **promote the bone formation of cultured osteoblasts** through increasing alkaline phosphatase, bone morphogenic protein (BMP)-2, osteopontin (OPN) mRNA expression and bone mineralization in vitro.” (Wang 2012)

In post-menopausal mice: 12 weeks of treatment…” exhibited significant anti-osteoporitic effects on OVX mice, evidenced by enhanced bone strength, bone mineral density, and improved trabecular bone microarchitecture.” thought to be mediated in part by NF-KB inactivation (Xu 2017)

Cistanche deserticola 1.2.0.1.3.2.0

- Anti depressant

- Improves Learning and Memory

*CHE **increased neuronal cell differentiation, neurite length, and synapse formation** in the mouse hippocampus. CHE significantly **enhanced learning and memory,** as demonstrated by passive avoidance test and novel object recognition test.* Choi 2011

- Weight loss

- Anti-fatigue

*ECD appeared to **enhance the swimming capacity** of mice by decreasing muscle damage, delaying the accumulation of lactic acid and by improving the energy storage.* Cai 2010

Possible side effects:
nausea and vomiting, abdominal pain, and dizziness.

Ecklonia Cava

0.2.2.2.2.2.1

KRN

Ecklonia Cava
0.2.2.2.2.2.1

Folk medicine from the coastal waters of Korea and Japan

Edible, brown seaweed

Commercially available as Seapolynol

Rich in vitamins, minerals, dietary fibres, proteins, polysaccharides and various functional polyphenols

For our purposes, *E. cava* has been identified as a producer of **carotenoids, fucoidans and phlorotannins**

Ecklonia Cava
0.2.2.2.2.2.1

"*Ecklonia cava* Kjellman is an edible seaweed, which has been recognized as a rich source of bioactive derivatives mainly, **phlorotannins**. These phlorotannins exhibit various beneficial biological activities such as **antioxidant**, anticancer, **antidiabetic**, anti-human immunodeficiency virus, antihypertensive, **matrix metalloproteinase enzyme inhibition, hyaluronidase enzyme inhibition**, radioprotective, and antiallergic activities."
(2010 Wijesekara)

Ecklonia Cava
0.2.2.2.2.2.1

Tenet #2: Mitochondria

Strong radical scavenging activity

Tenet #3: Pathways

Activates AMP Kinase, SIRT 1

Dieckol inhibits adipogenesis by activating the AMPK pathway

Tenet #4: Quality Control

Upregulates DNA repair mechanisms

"Taken together, these data indicate that by **activating the DNA repair system**, triphlorethol-A exerts protective effects against DNA base damage induced by oxidative stress."

Ki Cheon Kim 2014

Ecklonia Cava
0.2.2.2.2.2.1

Tenet #5: Security/ Immune system

Inhibition of NF-kB, TNF-α, IL-6, and IL-1β, COX-2, iNOS
Decreases MMP-1 expression
Inhibits histamine release

Tenet #6: Individual cell health

Increased osteoblastogenesis……increases bone formation
Suppresses fat formation

Tenet #7: Waste Management

Decreases postprandial glucose levels in humans and mice

Ecklonia Cava
0.2.2.2.2.2.1

- Skin Protection

  MMP-2 and MMP-9 Inhibition
  Inhibits hyaluronidase
  Inhibits melanogenesis

- Hair growth

These results suggest that *E. cava* containing dioxinodehydroeckol promotes hair growth through stimulation of DPCs and ORS cells. Bak and Ahn 2013

Ecklonia Cava
0.2.2.2.2.2.1

Weight loss

- Decreases BMI & Body fat ratio
- Decreases Waist circumference
- Decreases Total cholesterol & low-density (LDL) cholesterol
- Improves atherogenic index (AI)
  - (after 12 weeks as compared to placebo) (Shin 2011)

"SN **activated AMP-activated protein** kinase-α (AMPKα), an energy sensor, to suppress acetyl-coA carboxylase (ACC), **inhibiting lipid synthesis.** Our study suggests that SN may be an edible agent that can play a positive role in prevention of metabolic disorders. (Shin 2011)

The most effective dose was determined at 360 mg. Safe Up to 1500 mg/day

	DNA Alterations	Mitochondria	Aging Pathways	Quality Control	The Security system	Individual Cell Needs	Waste Management	Total points
Aloe Vera	1	3	0	0	3	2	1	10
Alpha Lipoic Acid	2	3	1	0	2	2	1	11
Andrographolide	1	2	0	1	3	1	1	9
Apigenin	2	1	0	1	2	0	0	6
Astaxanthin	0	3	0	0	2	0	0	5
Astragalus	3	0	0	0	2	1	0	6
Carnosine	0	3	0	0	0	0	3	6
Chebulic Acid	0	2	0	0	2	1	3	8
Cistanche Deserticola	1	2	0	1	3	2	0	9
Curcumin	2	3	1	0	3	0	3	12
Delphinidin	1	3	0	1	2	0	0	7
Ecklonia Cava	0	2	2	2	2	2	1	11
EGCG	2	2	1	2	1	1	2	11
Ellagic Acid	1	2	2	0	2	0	1	8
Melatonin	2	2	1	2	2	2	0	11
Metformin	3	1	3	2	2	2	3	16
Nicotinamide Riboside	0	3	3	3	0	0	0	9
Naringenin	1	2	1	2	2	3	0	11
Polypodium	0	2	0	3	2	0	0	7
Pyridoxamine	0	0	0	0	0	0	3	3
Quercetin	0	3	1	2	2	2	0	10
Resveratrol/Ptero	2	3	3	3	2	2	1	16
Rosmarinic Acid/ LB	0	3	0	1	2	0	3	9
Sulfaphorane	3	2	0	1	0	2	0	8
Yerba Mate	0	2	2	2	2	0	2	10

your total 59	tenet 1	tenet 2	tenet 3	tenet 4	tenet 5	tenet 6	tenet 7
	DNA Alterations	Mitochondrial Failure	Aging Pathways	Quality Control	Immune System Failue	Individual Cell Needs	Waste Management
Molecular Agent	-	-	-	-	-	-	-
Astaxanthin	0	3	0	0	2	0	0
Carnosine	0	3	0	0	0	0	3
EGCG	2	2	1	2	1	1	2
Metacurcumin	2	3	1	0	3	0	3
Nicotinamide Riboside	0	3	3	3	0	0	0
Pterostilbene/Resveratrol	2	3	3	3	2	2	1
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
	6	17	8	8	8	3	9

K

P

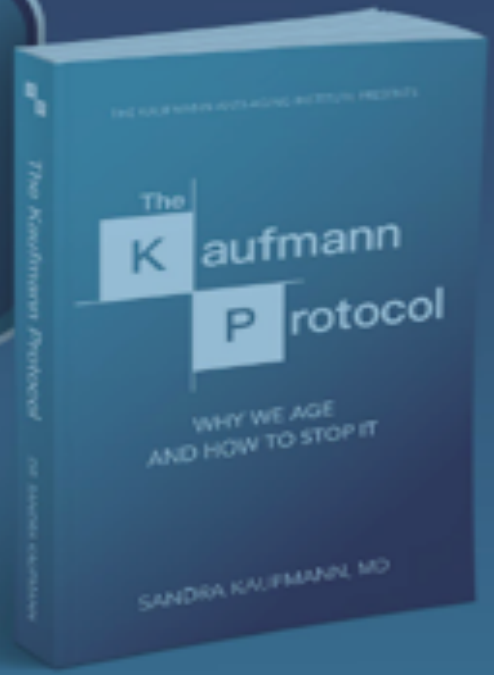
My subjects have experienced/ reported:

- Higher energy levels
- Decreased rates of infection/ URI’s
- Improved hair growth and color
- Improved skin quality
- Improved vision
- Weight loss
- Decreased joint pain/edema
- Improved sex life

Kaufmann Protocol

Kp

App and book available through Amazon and the Apple Store.



REVERSE AGING ON A MOLECULAR LEVEL.

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