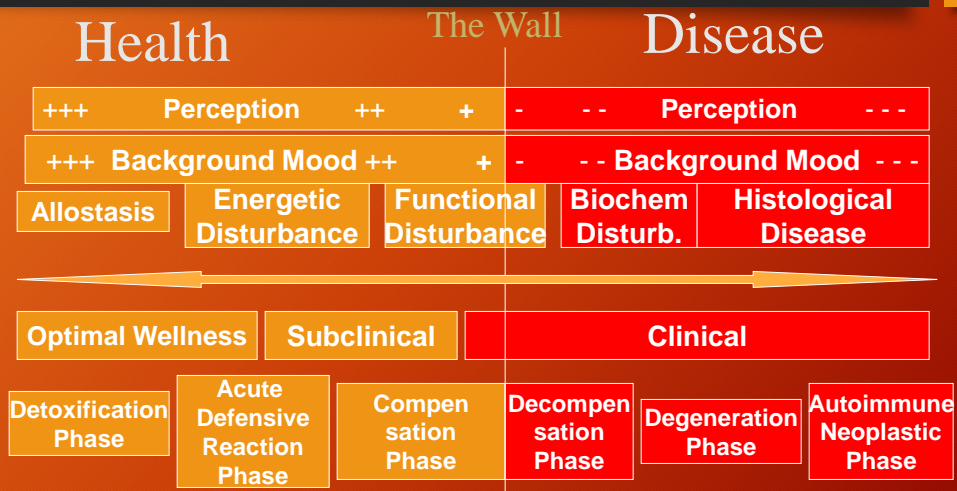


# Organ Reserve and Trophorestoratives

Kevin Spelman, PhD, MCPP  
Health, Education & Research  
Ashland, OR

## Health as a Continuum

*Spelman K. 2004. Allostasis: stability through change. Australian J Medical Herbalism 16(4):99-109.*



## Organ Reserve Defined

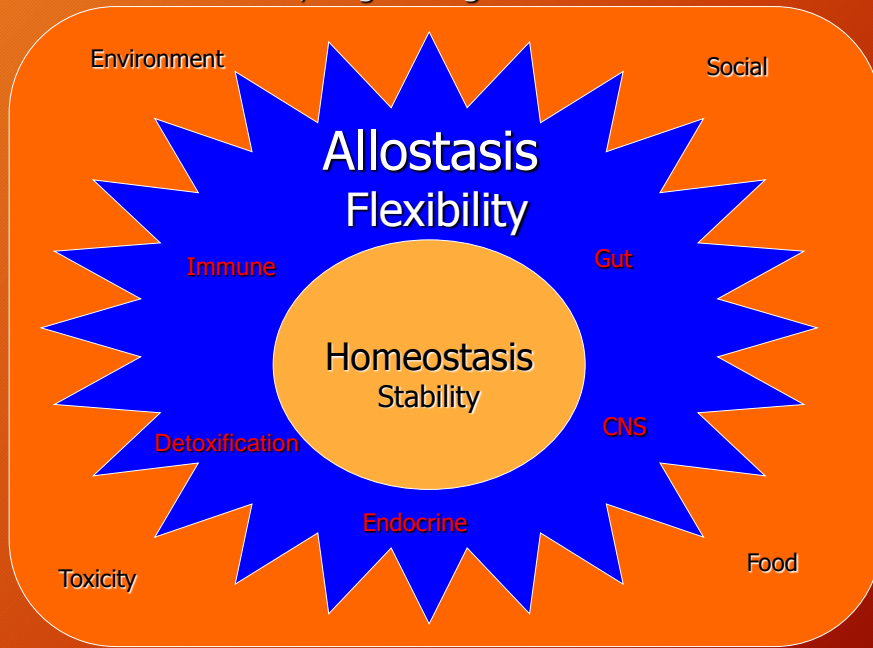
- James Fries suggested the construct
- The reserves in human functional capability/tissue/function

## Why Do We Age?

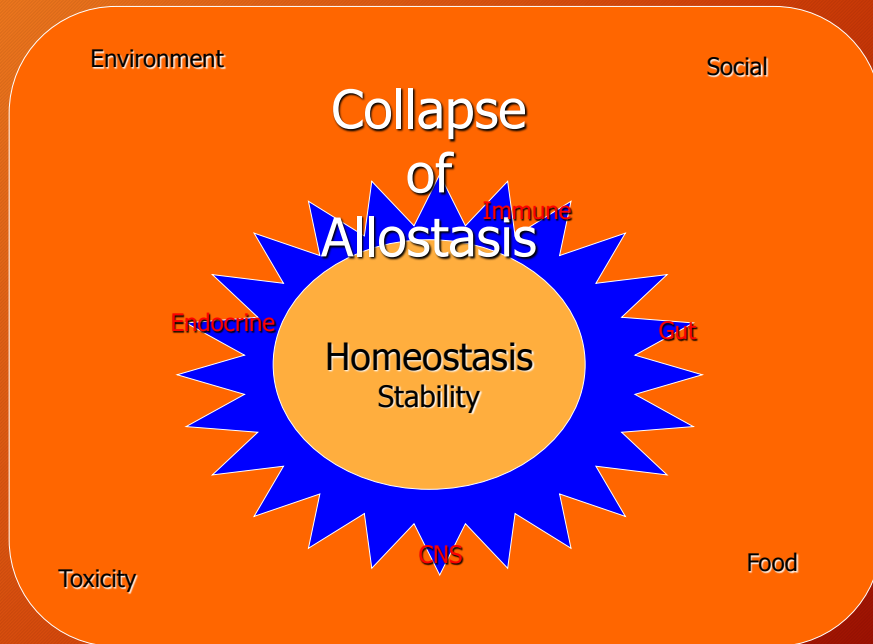
Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

- Determinism is represented by molecular genetics, with the notion that your health over a lifespan is ultimately determined only by your genes
- Free will is represented by the advocates of health promotion, seeking voluntary changes in behavioral risk factors, such as lack of exercise, cigarette smoking, obesity, and dietary fat, which can enhance organ reserve, preserve function, and extend life. In this view, health requires that you take care of yourself.

## Allostasis, Negotiating the Environment



## Collapse of Allostasis



## At What Cost?

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

- pH
- blood chemistry
- other homeostatic values

do not vary over the lifespan, representing the internal physiologic environment essential for cellular function.

Physiologic normal values remain constant with increasing age.

## Loss of ....

In post-mitotic tissue like the heart, brain, or muscle, it is not a good thing to lose cells at a rapid rate, particularly after infancy and youth when a lot of new tissue is produced



## Loss of ....

As a 40- or 50-year-old individual, you want to slow the rate of untoward apoptosis in the brain, heart, and muscles. Oxidative injury can increase apoptotic loss of cell mass in those particular organs

## Organ Reserved Defined

- Despite the aging of the population, few people live past 95 years.
- Fries's hypothesis was that there could be an increased health span of individuals after middle age, with reduced need for medical intervention if they practiced the right things, such as improving the reserves in their functional capability – which he called "organ reserve."

## Organ Reserved Defined

The maintenance of organ reserve, according to Fries, is related directly to biological age. As we lose organ reserve, our resilience declines, and our biological age increases.

## Organ Reserve Defined

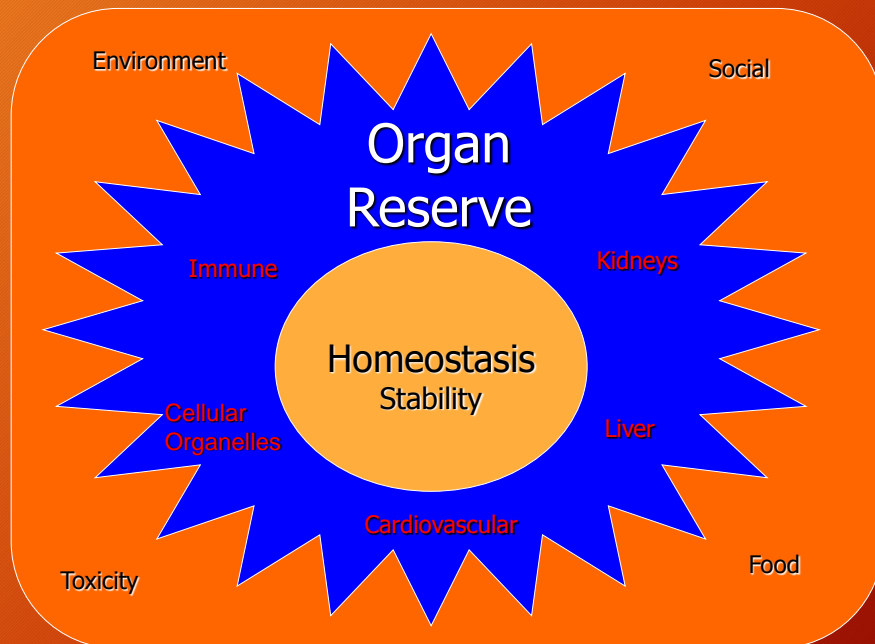
Bland J. Organ Reserve and Homeodynamic Degrees of Freedom. Jan 1997. *FMU*

- The more metabolic energy resources a person has, the more stable his or her system will be.
- It can be compared to wires to a generator. If you lose a wire or two along the way and you have multiple connections between your energy source and your energy need, you still have a functionally stable system.
  - That redundancy is what is found in a homeodynamic, functionally capable physiological system.

## Organ Reserve Defined

Bland J. Organ Reserve and Homeodynamic Degrees of Freedom. Jan 1997. *FMU*

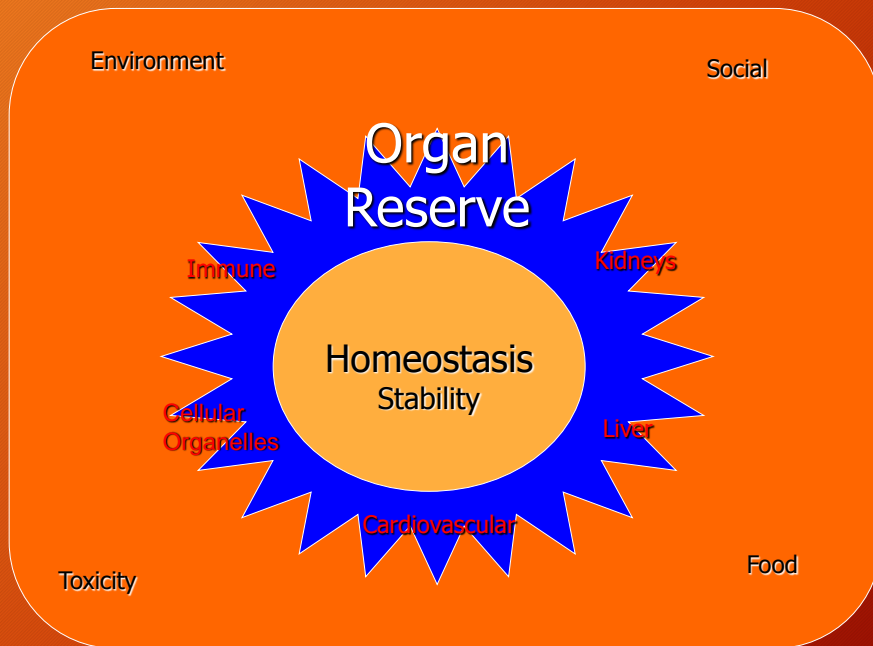
Stress the individual or organism experiences that may place demands on one specific pathway will have other, collateral routes for moving around a block or through a situation of stress to maintain function.



# Loss of Reserve/Adaptability

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

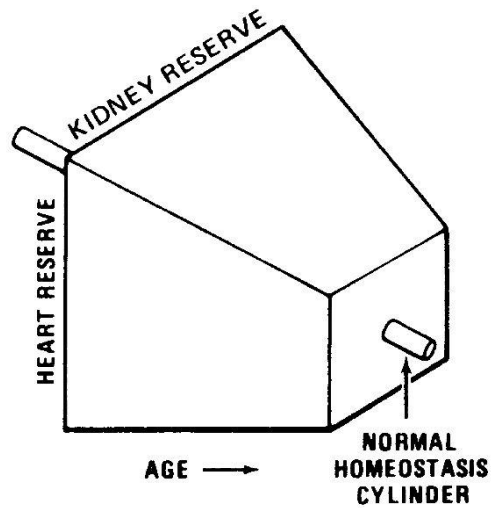
- With the linear decrease in organ reserve in multiple organs the ability to respond physiologically to a perturbation decreases exponentially
- As a result, mortality rates increase exponentially, with a doubling of mortality rates each 8 years after age 30





## Declining Reserve and Loss of Adaptability

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9



## An Existential Pondering

Is “spiritual reserve” necessary for forgiveness?

## Organ Reserve

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

- Data from longitudinal studies of aging show a consistent decline in the maximum function of the various organs with age,
  - the decline being linear at a rate of 1.5% per year after age 30
- Data on maximal performance, such as world record marathon times, similarly show a nearly linear decline with age at the same rate from age 30 to age 80

## Loss of Antioxidant Reserve

Stadtman ER. 2002. Importance of individuality in oxidative stress and aging. *Free Radic Biol Med.* 33(5):597-604.

Reactive oxygen species generated under various conditions of oxidative stress are able to oxidize nucleic acids, proteins, and lipids

## Loss of Antioxidant Reserve

Stadtman ER. 2002. Importance of individuality in oxidative stress and aging. *Free Radic Biol Med.* 33(5):597-604.

- Aging is associated with the accumulation of oxidized forms of cellular constituents
- There is an inverse relationship between the maximum life span of organisms and the age-related accumulation of oxidative damage

## Organ Reserve

- Organ Reserve includes
  - Protein synthesis
  - Blood Flow
  - Mitochondria
- Loss of Organ Reserve involves
  - Loss of enzyme activity runs parallel with the loss of enzyme protein
  - Loss of activity of the respiratory chain during aging may well be one of the factors responsible for the loss of skeletal and heart muscle

## The Price of Adaptation

Muller-Hocker J. 1992. Mitochondria and Ageing *Brain Pathology* 2:149-58

- Aged human tissues show deletions of the mitochondrial genome in the
  - Skeleton
  - Myocardium
  - Brain
  - External eye muscles
  - Liver
  - “other” tissues

## Loss of Reserve/Adaptability

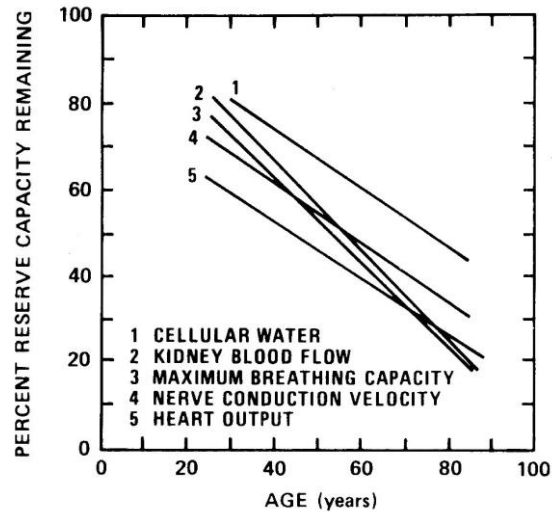
Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

- With the linear decrease in organ reserve in multiple organs, the ability to respond physiologically to a perturbation decreases exponentially
- As a result, mortality rates increase exponentially, with a doubling of mortality rates each 8 years after age 30



## Organ Reserve

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9



## The Process of Breakdown

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

- The human aging process, when not prematurely stopped by trauma or disease, moves towards multiple organ system frailty
- The immediate cause of death shifts from external towards intrinsic factors, underlying frailty, the inability of the aging organism to withstand even a minor perturbation.

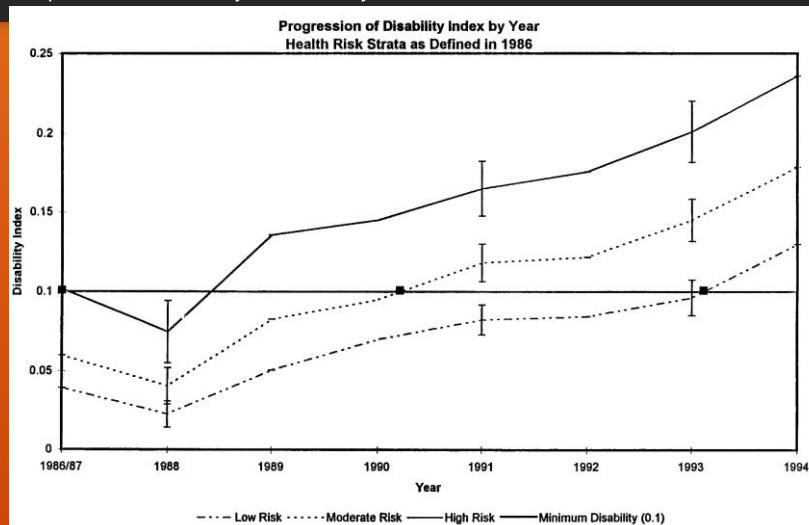
## The Process of Breakdown

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

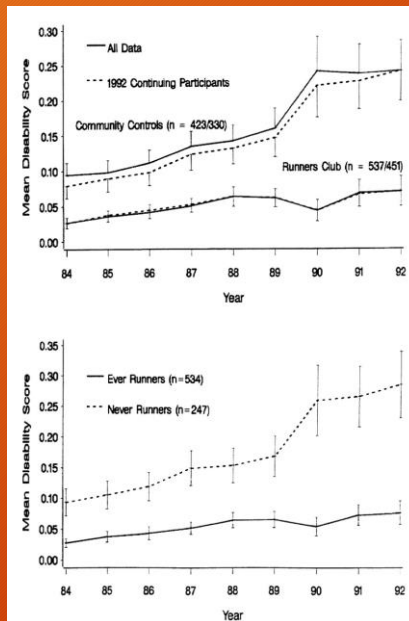
Frailty is like an old curtain rotted by the sun, where an attempt to repair a tear in one place is followed by a tear in another

## Organ Reserve and Longevity

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9



### Progression of disability over time



Runners' club members compared with community controls

Ever-runners compared with never-runners

Annals of Internal Medicine

Fries, J. F. et. al. Ann Intern Med 1994;121:502-509

Weuve J. Physical activity, including walking and cognitive function in older woman. JAMA. 2004; 292: 1454-1461

"... the apparent cognitive benefits of greater physical activity were similar in extent to being about three years younger in age and were associated with a twenty percent lower risk of cognitive impairment. The association was not restricted to women engaging in vigorous activities ..."

Weuve J. Physical activity, including walking and cognitive function in older woman. *JAMA*. 2004; 292: 1454-1461

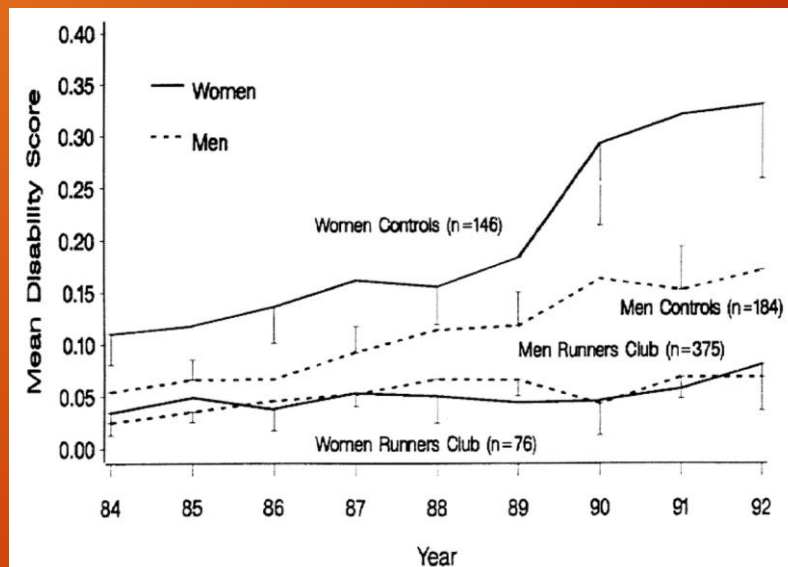
"In summary, in our study, as well as in other epidemiologic investigations, higher levels of physical activity, including walking, are associated with better cognitive function and less cognitive decline."

Abbott RD. Walking and dementia in physically capable elderly men. *JAMA*. 2004; 292: 1447-53.

- Elderly men ranging in age from 71 to 93 who walked more than 2 miles a day were nearly half as likely to get dementia as men who walked less than one-quarter mile a day
  - also a reduction in the risk of death, heart disease, and fatal cancers was seen
- "Physically capable elderly men who walk more regularly are less likely to develop dementia"



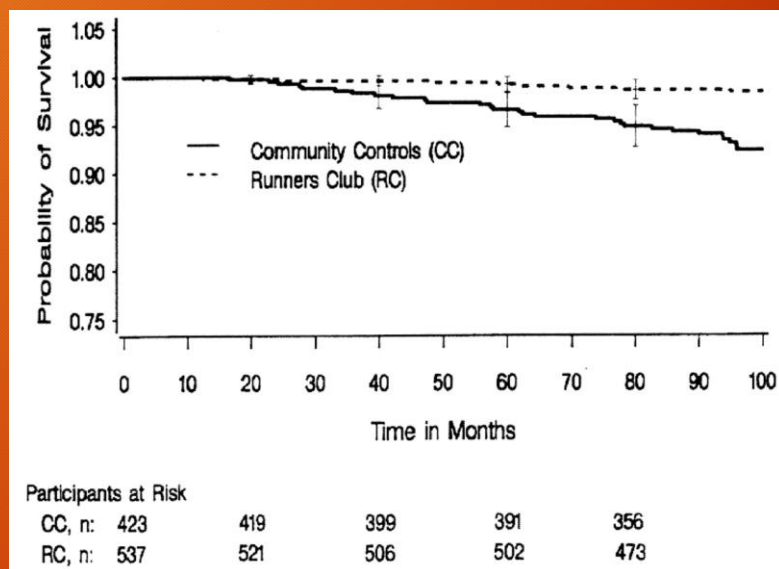
### Progression of disability over time by sex



Fries, J. F. et. al. Ann Intern Med 1994;121:502-509

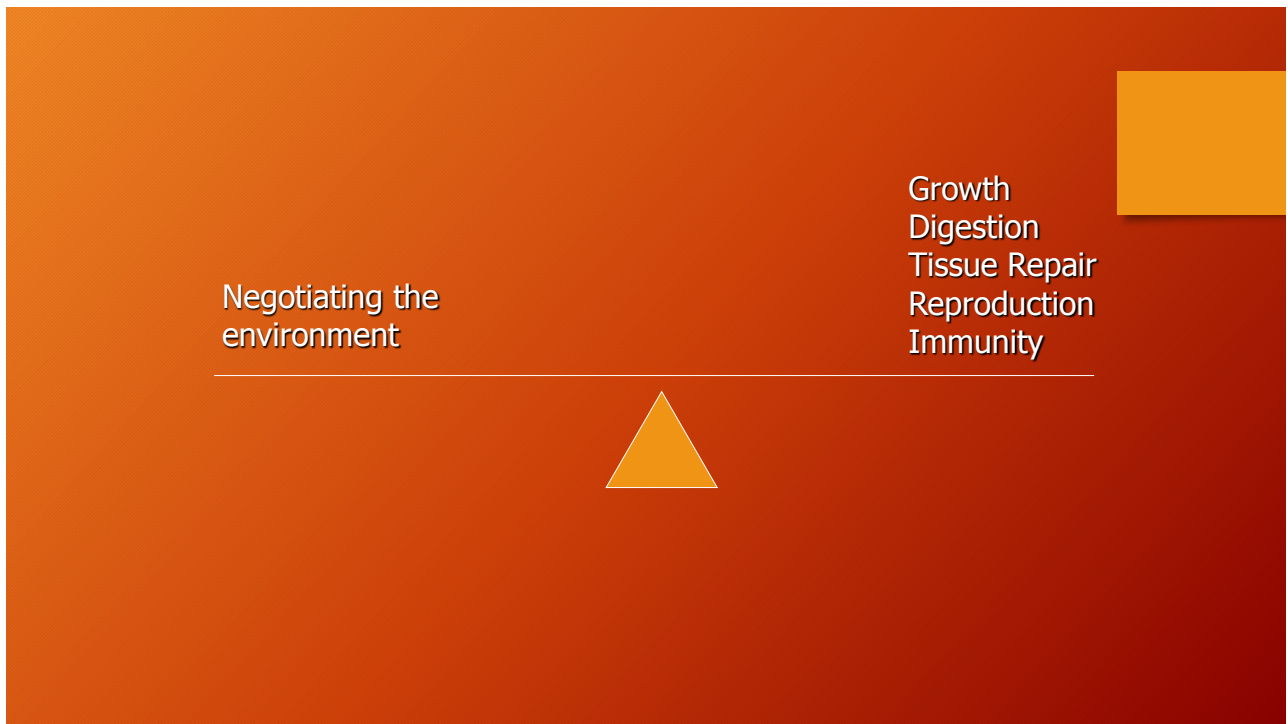
Annals of Internal Medicine

### Survival analysis



Fries, J. F. et. al. Ann Intern Med 1994;121:502-509

Annals of Internal Medicine



Meaney MJ, et al. (1995). Individual differences in hypothalamic-pituitary-adrenal activity in later life and hippocampal aging. *Exp Gerontol* 30, 229-51.

- Our studies over the past few years have added support to the idea that individual differences in HPA axis activity can account for part of the variation seen in neurological function among the elderly
- Evidence suggests that the adrenal glucocorticoids can compromise hippocampal function and produce cognitive impairments

## Negotiating the Environment

Carrasco GA & Van de Kar LD. 2003 *Europ J Pharmacol* 463:235– 272

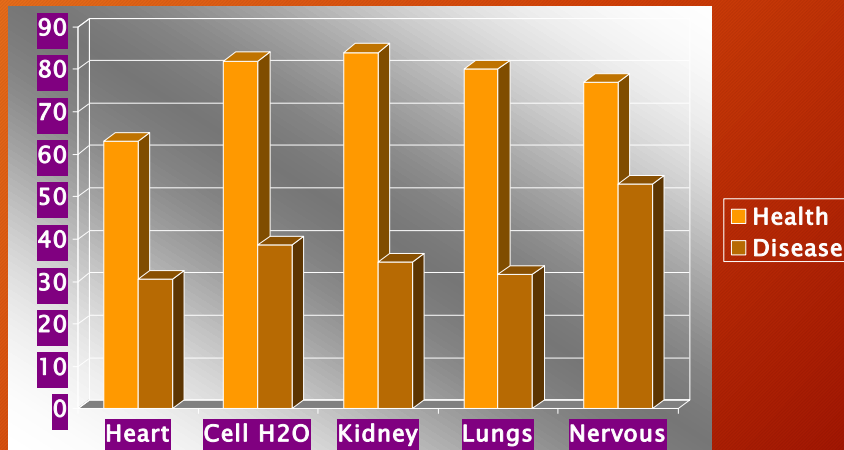
- Some of the physiological changes associated with the stress response include:
  - (1) mobilization of energy to maintain brain and muscle function
  - (2) sharpened and focused attention on the perceived threat
  - (3) increased cerebral perfusion rates and local cerebral glucose utilization
  - (4) enhanced cardiovascular output and respiration, and redistribution of blood flow, increasing substrate and energy delivery to the brain and muscles
  - (5) modulation of immune function
  - (6) inhibition of reproductive physiology and sexual behavior
  - (7) decreased feeding and appetite.

Negotiating  
the  
environment



Growth  
Digestion  
Tissue Repair  
Reproduction  
Immunity

## Resources Allocated, Resources Spent



## Standardized Patients

- Depending on genetics, particular resources spent, environmental conditions the effects of ANY disease process will be unique to the patient



## CNS Reserve

Clough CG. Parkinson's disease: management. *Lancet*. 1991;337:1324-1327.

- One must lose 70 percent of the dopaminergic neurons in the nigra before he or she begins to exhibit symptoms that can be diagnosed as Parkinson's disease

## Loss of Liver Reserve

Muller-Hocker J. 1992. Mitochondria and Ageing *Brain Pathology* 2:149-58

- The rate of protein synthesis in the liver can be reduced 40% in the old as compared to the young (murine)

## Loss of Liver Reserve

Sloan RW. 1992. Principles of Drug Therapy in Geriatric Patients *Am Fam Phys* 45(6):2709-

- Hepatic blood flow reduces up to 50% in the elderly

## Cardiovascular Reserve

Wald NJ, Law MR. 2003. A strategy to reduce cardiovascular disease by more than 80% *BMJ* 326:1419

- Extensive evidence exists that reducing the four risk factors
  - LDL cholesterol
  - Blood pressure
  - Homocysteine
  - Platelet function
- by any means lowers the risk of cardiovascular disease

## Loss of CV Reserve

Frenzel H. 1985. Das Herz im Alter. Licht- und elektronenmikroskopische Befunde. *Z Kardiol* 74:(S7):17-25.

- In the heart the total volume fraction of mitochondria appears unchanged (in most studies), whereas the number of mitochondria appears to increase while their size appears to decrease

## Organism-Wide Processes

Petersen KF, et al. 2003. Mitochondrial dysfunction in the elderly: possible role in insulin resistance. *Science*. 300(5622):1140-2.

Elderly study participants, matched for lean body mass and fat mass, were markedly insulin-resistant as compared with young controls

this resistance was attributable to reduced insulin-stimulated muscle glucose metabolism. These changes were associated with increased fat accumulation in muscle and liver tissue and with a approximately 40% reduction in mitochondrial oxidative and phosphorylation activity

These data support the hypothesis that an age-associated decline in mitochondrial function contributes to insulin resistance in the elderly

## Loss of Antioxidant Reserve

Muller-Hocker J. 1992. Mitochondria and Ageing *Brain Pathology* 2:149-58

- Activity of anti-oxidative enzymes
  - Superoxide dismutase
  - Catalasehave been repeatedly reported to decline with age

## Loss of Antioxidant Reserve

Muller-Hocker J. 1992. Mitochondria and Ageing *Brain Pathology* 2:149-58

- Evidence implies that free radical attack and defective antioxidative repair mechanisms in causing the observed deletions of mitochondrial DNA during aging are probably ten times higher than the mutation rate in nuclear DNA



## Loss of Organ Reserve (While Curing)

Jonas CR. Plasma Antioxidant Status after High-Dose Chemotherapy: a Randomized Trial of Parenteral Nutrition in Bone Marrow Transplantation Patients *Am J Clin Nut* 2000 72(1):181-9

- Using TPN with the normal levels of antioxidants and minerals found in TPN in patients who had undergone high-dose chemotherapy was not adequate to replete their antioxidant reserves.
- Plasma glutathione and vitamin E concentrations decreased significantly after chemotherapy and TPN was not able to replete these levels.

## Organ Reserve

Fries JF. Aging, natural death, and the compression of morbidity. *N Engl J Med*. 1980;303:130-135.

If one could compress morbidity by increasing organ reserve through the election of positive, healthful lifestyles at a younger age, one could retain organ reserve throughout midlife and later age

## Organ Reserve

Fries JF. Aging, natural death, and the compression of morbidity. *N Engl J Med.* 1980;303:130-135.

- Members of the medical community said there was no evidence to indicate that individuals who changed their lifestyles – improved their exercise patterns, nutrition, or environmental exposures – would retain organ reserve, compress morbidity, live to the end of their biologically determined life expectancy, and undergo natural death.

## Increasing Organ Reserve

Fries JF. 2000. Compression of morbidity in the elderly. *Vaccine* 18:1584-9

- Decline in organ reserve is inevitable, yet we can increase organ reserve quite readily, at almost any age.
- For example, an increase in exercise can increase cardiopulmonary reserve very substantially, even at advanced ages

## Maintaining Organ Reserve

Fries JF et al. 1994. Running and the Development of Disability with Age. *Ann Intern Med* 121(7):502-9

- Increased fitness and training
    - increases cardiovascular reserve
    - increases bone density
    - increases strength
- could delay or prevent disability

## Preserving Organ Reserve

O'Keefe JH Jr, Cordain L. 2004 Cardiovascular disease resulting from a diet and lifestyle at odds with our Paleolithic genome: how to become a 21st-century hunter-gatherer. *Mayo Clin Proc.* 79(1):101-8.

- The human genome has remained primarily unchanged since the agricultural revolution 10,000 years ago, yet our diet and lifestyle have become progressively more divergent from hunter-gatherers.

## Preserving Organ Reserve

O'Keefe JH Jr, Cordain L. 2004 Cardiovascular disease resulting from a diet and lifestyle at odds with our Paleolithic genome: how to become a 21st-century hunter-gatherer. *Mayo Clin Proc.* 79(1):101-8.

- Until 500 generations ago, all humans consumed only wild and unprocessed food foraged and hunted from their environment. Wild and unprocessed food foraged and hunted providing a diet high in
  - Lean protein
  - Polyunsaturated fats (especially omega-3 fatty acids)
  - Monounsaturated fats
  - Fiber
  - Vitamins
  - Minerals
  - Antioxidants
  - other beneficial phytochemicals

## Preserving Reserve

Cordain L, Eaton SB, Miller JB, Mann N, Hill K. 2002 The paradoxical nature of hunter-gatherer diets: meat-based, yet non-atherogenic. *Eur J Clin Nutr.* 56 (S1):S42-52.

It is likely that important qualitative differences in fat intake, including relatively high levels of MUFA and PUFA and a lower omega-6/omega-3 fatty acid ratio, would have served to inhibit the development of CVD



## Preserving Reserve

Cordain L, Eaton SB, Miller JB, Mann N, Hill K. 2002 The paradoxical nature of hunter-gatherer diets: meat-based, yet non-atherogenic. *Eur J Clin Nutr.* 56 (S1):S42-52.

Other dietary characteristics including high intakes of antioxidants, fiber, vitamins and phytochemicals along with a low salt intake may have operated synergistically with lifestyle characteristics (more exercise, less stress and no smoking) to further deter the development of CVD

## Preserving Reserve

- Polyunsaturated fats
- Monounsaturated fats
- Antioxidants
- Fiber
- Vitamin
- Phytochemicals

Plants were (and are) quite important in preserving reserve!

## Preserving Reserve

Vina J, et al. 2003. Mitochondrial theory of aging: importance to explain why females live longer than males. *Antioxid Redox Signal* 5(5):549-56.

- Females live longer than males in many species, including humans
  - This can be explained on the basis of the mitochondrial theory of aging
  - Mitochondria from females produce significantly less hydrogen peroxide than those from males and have higher levels of mitochondrial reduced glutathione, manganese superoxide dismutase, and glutathione peroxidase than males

## Preserving Reserve

Vina J, et al. 2003. Mitochondrial theory of aging: importance to explain why females live longer than males. *Antioxid Redox Signal* 5(5):549-56.

- Oxidative damage to mitochondrial DNA is also fourfold higher in males than in females
  - These differences may be explained by estrogens
  - Ovariectomy abolishes the gender differences between males and females and estrogen replacement rescues the ovariectomy effect
- The challenge for the future is to find molecules that have the beneficial effects of estradiol, but without its feminizing effects
- Phytoestrogens or phytoestrogen-related molecules may be good candidates to meet this challenge.

## Maintaining Organ Reserve

Wald NJ, Law MR. 2003. A strategy to reduce cardiovascular disease by more than 80% *BMJ* 326:1419

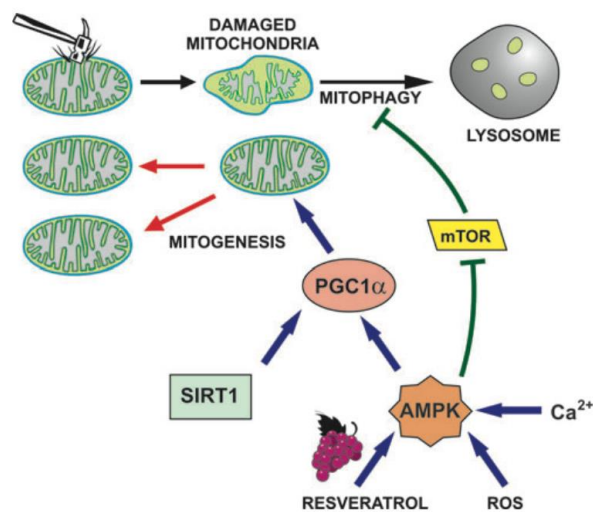
- The Polypill strategy, based on a single daily pill containing six components
  - A statin
  - Three blood pressure lowering drugs, each at half standard dose
  - Folic acid (800 mcg)
  - Aspirin (75 mg)
- would prevent 88% of heart attacks and 80% of strokes
- About 1 in 3 people would directly benefit, each on average gaining 11-12 years of life without a heart attack or stroke (20 years in those aged 55-64).

## Extending Organ Reserve

- Organ reserve is an argument for good nutrition and herb tonification especially considering the research suggesting an extension of life by 11 years using 6 medications together in “dilute” doses

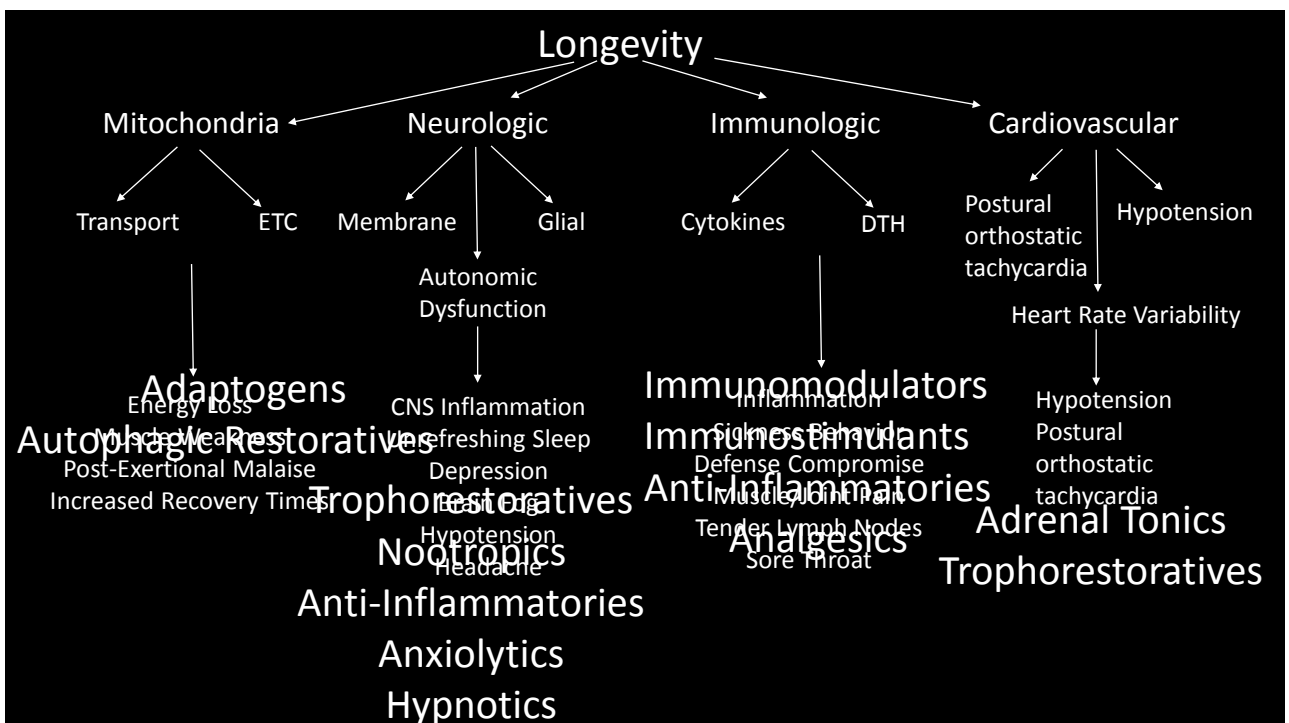
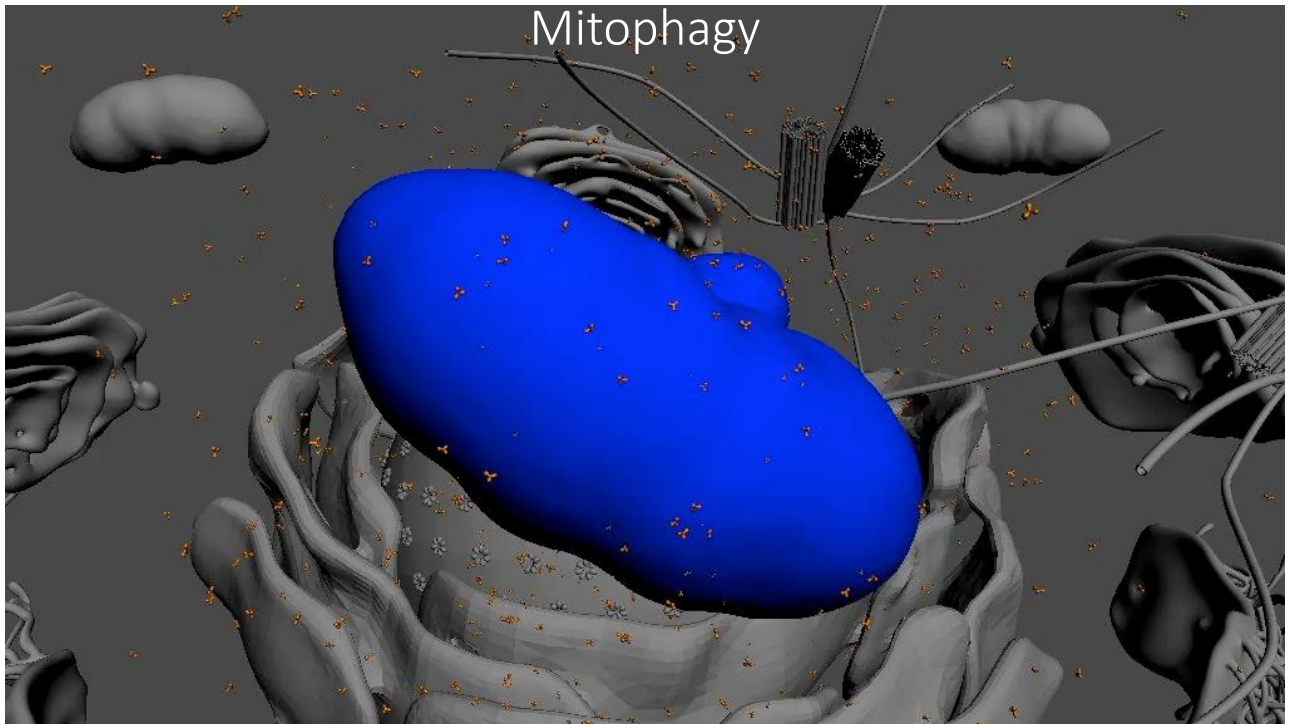
# Phytotherapeutics

## AMPK Integrates Signals To Coordinates Mitophagy



Biasutto L, Szabo' I, Zoratti M. 2011. Mitochondrial Effects of Plant-Made Compounds. *Antioxidants & Redox Signaling* 15(12):3039-59.

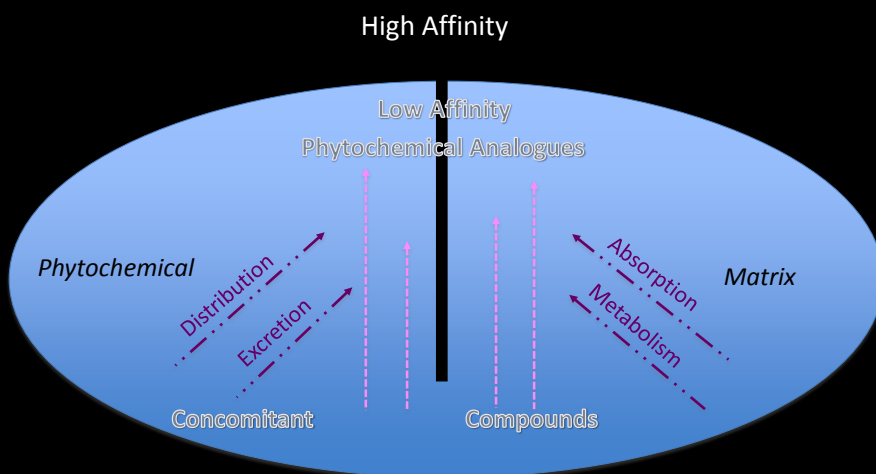




# Deductive Landscape

## A Broad Perspective

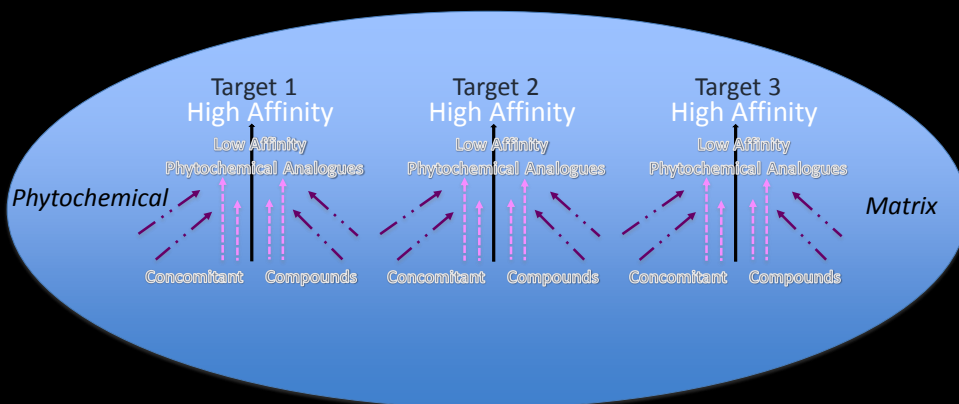
Spelman K. 2007. Ecological Pharmacology II: Molecular Details *UnifiedEnergetics* 3(6): 58-62.



# Deductive Landscape

## A Broader Perspective

Spelman K. 2007. Ecological Pharmacology II: Molecular Details *UnifiedEnergetics* 3(6): 58-62.



## Disclosures

I have been a Natural Products, Pharma and *Cannabis* Industry Consultant, for SOPs, GMPs, Regulatory Issues, Pharmacology, Research Initiatives and Formulation

I have financial interests in the dietary supplements industry

## The Trophorestoratives

# Trophorestorative

## Definition

agent that helps restore optimal function and structure of an organ or tissue

# The Entourage Effect

The rule, not the exception, in plant medicines



## *Lycium barbarum*



## *Lycium barbarum*

Long-term use of wolfberry was considered beneficial for strengthening the body, keeping fit, prolonging life, and easing life through all the seasons

J Med Food. 2009 Oct;12(5):1159-65. doi: 10.1089/jmf.2008.0300.

## Immunomodulatory effects of a standardized *Lycium barbarum* fruit juice in Chinese older healthy human subjects.

Amagase H<sup>1</sup>, Sun B, Nance DM.

### Author information

#### Abstract

*Lycium barbarum* has been traditionally used in combination with several herbs for medicinal properties, but systematic modern clinical evaluation as a single herb has not been reported. To examine the systematic effects of *L. barbarum* on immune function, overall well-being, and safety, we tested the effects of a standardized *L. barbarum* fruit juice (GoChi, Enl-life International).

The *Lycium* group showed a significant increase in general feelings of well-being, such as fatigue and sleep, and showed a tendency for increased short-term memory and focus between pre- and post-intervention, the placebo group showed no significant positive changes in these measures.

intervention and the placebo group, whereas the number of CD4, CD8, and natural killer cells or levels of interleukin-4 and immunoglobulin A were not significantly altered. The placebo group showed no significant changes in any immune measures. Whereas the GoChi group showed a significant increase in general feelings of well-being, such as fatigue and sleep, and showed a tendency for increased short-term memory and focus between pre- and post-intervention, the placebo group showed no significant positive changes in these measures. No adverse reactions, abnormal symptoms, or changes in body weight, blood pressure, pulse, visual acuity, urine, stool, or blood biochemistry were seen in either group. In conclusion, daily consumption of GoChi significantly increased several immunological responses and subjective feelings of general well-being without any adverse reactions.

Rejuvenation Research, Vol. 15, No. 1 | Original Articles

## Immunomodulatory Effects of Dietary Supplementation with a Milk-Based Wolfberry Formulation in Healthy Elderly: A Randomized,

The effect of dietary Lacto-Wolfberry supplementation on immune functions in the elderly, especially vaccine response known to decline with aging in a 3 mo placebo controlled RCT (n = 150, 65-70 y/o)

The subjects receiving Lacto-Wolfberry had significantly higher postvaccination serum influenza-specific immunoglobulin G levels and seroconversion rate, between days 30 and 90, compared with the placebo group demonstrating enhanced capacity to respond to antigenic challenge without overaffecting their immune system

Wolfberry (fruit of *Lycium barbarum*) has been prized for many years in China for its immunomodulatory property and its

## *Theobroma cacao*



## Theobroma cacao

A very useful nutritive article of diet for invalids, persons convalescing from acute diseases

Felter HW, Lloyd, J.U. *King's American dispensatory*. Cincinnati: Ohio Valley Co, 1898.

J Psychopharmacol. 2010 Oct;24(10):1505-14. doi: 10.1177/0269881109106923. Epub 2009 Nov 26.

## Consumption of cocoa flavanols results in acute improvements in mood and cognitive performance during sustained mental effort.

Scholey AB<sup>1</sup>, French SJ, Morris PJ, Kennedy DO, Milne AL, Haskell CF.

### Author information

A randomized, controlled, double-blinded, balanced, three period crossover trial 30 healthy adults consumed drinks containing 520 mg, 994 mg CF and a matched control, with a three-day washout between drinks.

containing 520 mg, 994 mg CF and a matched control, with a three-day washout between drinks. Assessments included the state anxiety inventory, a computerized 15-min test of Cognitive Demand, and the performance of the serial subtraction task (Serial 7s).

The 994 mg CF beverage significantly speeded Rapid Visual Information Processing responses but also resulted in more errors during Serial Sevens. Increases in self-reported 'mental fatigue' were significantly attenuated by the consumption of the 520 mg CF beverage only. This is the first report of acute cognitive improvements following CF consumption in healthy adults.

## Cardiac risk factors and prevention

### ORIGINAL ARTICLE

## Beneficial effect of a polyphenol-rich diet on cardiovascular risk: a randomised control trial

Rebecca L Noad,<sup>1,2</sup> Ciara Rooney,<sup>1</sup> Damian McCall,<sup>2</sup> Ian S Young,<sup>1,2</sup> David McCance,<sup>2</sup> Michelle C McKinley,<sup>1,3</sup> Jayne V Woodside,<sup>1,3</sup> Pascal P McKeown<sup>1,2</sup>

► Additional material is published online only. To view

### ABSTRACT

polyphenol-specific dietary intervention studies of

Increasing the polyphenol content of the diet via consumption of F&V, berries and dark chocolate results in a significant improvement in an established marker of cardiovascular risk in hypertensive participants.

<sup>1</sup>Belfast Health and Social Care Trust, Belfast, UK  
<sup>2</sup>UKCRC Centre of Excellence for Public Health, Queen's University Belfast, Belfast, UK

### Correspondence to

phase, consuming <2 portions of fruit and vegetables (F&V) daily and avoiding berries and dark chocolate. Subjects were then randomised to continue with the low-polyphenol diet for 8 weeks or to consume a high-polyphenol diet of six portions F&V (including one portion of berries/day and 50 g of dark chocolate).

microvascular function, measured by forearm blood flow (FBF) responses to an endothelium-dependent vasodilator, and also have a beneficial effect on a range of other markers of CVD risk, such as systolic blood pressure (SBP) and lipid profile, in patients with hypertension.



## *Eleutherococcus senticosus*



## *Eleutherococcus senticosus*

- In Chinese medicine, used to expel *Wind Dampness*, to strengthen the sinews and bones, transform *Dampness* and reduce swelling
- It is especially useful when the smooth flow of *Qi* and *Blood* is obstructed, and is particularly used for treating the elderly

Bone K., Mills, S. *Principles and practice of phytotherapy: Modern herbal medicine* 2nd ed. New York: Churchill Livingstone Elsevier, 2013.

## *Eleutherococcus senticosus*

Used to treat oedema, joint pain, muscular spasm, difficult urination, and, in combination with other herbs, to assist muscular development in children. It has *Spleen* invigorative, *Kidney* tonifying and tranquillising actions, and is also used for back pain, insomnia and anorexia, temporary fatigue, general debility; chronic inflammatory conditions;

Bone K., Mills, S. *Principles and practice of phytotherapy: Modern herbal medicine* 2nd ed. New York: Churchill Livingstone Elsevier, 2013.

[Chin J Physiol](#), 2010 Apr 30;53(2):105-11.

### **The effect of eight weeks of supplementation with *Eleutherococcus senticosus* on endurance capacity and metabolism in human.**

[Kuo J<sup>1</sup>](#), [Chen KW](#), [Cheng JS](#), [Tsai PH](#), [Lu YJ](#), [Lee NY](#).

#### Author information

<sup>1</sup> Graduate Institute of Nutrition and Food Sciences, Fu Jen Catholic University, Taipei, Republic of China.

#### **Abstract**

The major finding of this study was the VO<sub>2</sub> peak of the subjects elevated 12% ( $P < 0.05$ ), endurance time improved 23% ( $P < 0.05$ ) and the highest heart rate increased 4% ( $P < 0.05$ ) significantly. The second finding was at 30 min of 75% VO<sub>2</sub> peak cycling, the production of plasma FFA was increased and the glucose level was decreased both significantly ( $P < 0.05$ ) over 8-week supplementation with ES.

plasma FFA was increased and the glucose level was decreased both significantly ( $P < 0.05$ ) over 8-week ES supplementation. This is the first well-conducted study that shows that 8-week ES supplementation enhances endurance capacity, elevates cardiovascular functions and alters the metabolism for sparing glycogen in recreationally trained males.

[Journal of Bone and Mineral Metabolism](#)

September 2009, Volume 27, [Issue 5](#), pp 584–590 | [Cite as](#)

## The effects of *Acanthopanax senticosus* extract on bone turnover and bone mineral density in Korean postmenopausal women

Authors

[Authors and affiliations](#)

You-Cheol Hwang, In-Kyung Jeong, Kyu Jeung Ahn, Ho Yeon Chung 

After treatment with AS extract for 6 months, the AS extract group showed a significant increase in serum osteocalcin levels compared with the control group ( $P = 0.041$ ).

The purpose of this prospective randomized study was to investigate the effects of the extract of *Acanthopanax senticosus* (AS extract), a widely used oriental herb, on bone remodeling and bone mineral density in Korean postmenopausal women. A total of 81 postmenopausal women with osteopenia or osteoporosis, an age of less than 65 years, were enrolled in the study.

### *Ganoderma lucidum*



## *Ganoderma lucidum*

- Tonifying effects, enhancing vital energy, strengthening cardiac function, increasing memory, and antiaging effects
- Acts to replenish Qi, ease the mind, and relieve cough and asthma, and it is recommended for dizziness, insomnia, palpitation, and shortness of breath

Wachtel-Galor A, Yuen, J., Buswell, J., Benzie, I. Chapter 9 *Ganoderma lucidum* (Lingzhi or Reishi). Herbal medicine: Biomolecular and clinical aspects. 2nd ed. Boca Raton, FL: CRC Press, 2011.

### Central Actions of Adenosine, a Nucleotide of *Ganoderma lucidum*<sup>†</sup>

Yoshimasa Kasahara and Hiroshi Hikino<sup>‡</sup>

Pharmaceutical Institute, Tohoku University, Aoba-yama, Sendai, Japan

In order to isolate an active constituent from the central inhibitory *Ganoderma* extract, an activity-guided fractionation was performed to yield adenosine. Adenosine reduced spontaneous motor activity, elevated pain threshold, prolonged the death time induced by caffeine and relaxed skeletal muscle in mice.

**Keywords:** Adenosine; central activity; *Ganoderma lucidum*

#### INTRODUCTION

The crude drug 'reishi', which is prepared from the fruiting bodies of *Ganoderma lucidum* Karsten (Polyporaceae), has been used in Oriental medicine for the treatment of bronchitis, indigestion, insomnia and neurasthenia. A number of pharmacological properties of *Ganoderma* have so far been experimentally verified (Hikino, 1986). We recently carried out a pharmacological examination of *Ganoderma* extract and found that it exhibited significant central inhibitory effects (analgesic effects, inhibitory effects of spontaneous motor activity, a prolonging effect of the death time induced by caffeine)

lower layer) to furnish adenosine (15 mg) as a colorless powder, mp 233–234 °C (from MeOH); HR-MS *m/z*: 267.0963; IR  $\nu_{\text{max}}^{\text{KBr}}$ : 3230, 1665, 1605, 1570, 1475, 1300, 1210, 980, 830; <sup>1</sup>H-NMR (pyridine-*d*<sub>5</sub>, 500 MHz)  $\delta$ : 4.14 (1H, d, J 17 Hz), 4.13 (1H, dd, J 17, 3 Hz), 4.76 (1H, m), 5.49 (1H, t, J 5 Hz), 6.72 (1H, d, J 6 Hz), 8.37 (1H, s), 8.60 (1H, s); <sup>13</sup>C-NMR (pyridine-*d*<sub>5</sub>, 125 MHz)  $\delta$ : 62.99 (t), 72.34 (d), 75.45 (d), 87.77 (d), 90.82 (d), 121.40 (s), 140.56 (d), 149.95 (s), 153.28 (d), 157.56 (s), identified with an authentic sample by TLC, IR and NMR comparisons.

**Biological assay.** The animals used were male mice of the Std: ddY strain (25–30 g).



J Med Food. 2005 Spring;8(1):53-8.

## A randomized, double-blind and placebo-controlled study of a *Ganoderma lucidum* polysaccharide extract in neurasthenia.

Tang W<sup>1</sup>, Gao Y, Chen G, Gao H, Dai X, Ye J, Chan E, Huang M, Zhou S.

### Author information

#### Abstract

*Ganoderma lucidum* has been widely used to treat various diseases, including cancer, diabetes, and neurasthenia in many Asian countries. This randomized, double-blind, placebo-controlled parallel study aimed to investigate the efficacy and safety of a polysaccharide extract of *G. lucidum* (Ganopoly) in Chinese patients with neurasthenia. One hundred thirty-two patients with neurasthenia according to the diagnosis criteria of the 10th International Classification of Diseases were included in this study. Written consents were obtained from the patients, and the study was conducted in accordance with Good Clinical Practice guidelines. Patients were randomized to receive Ganopoly or placebo orally at 1,800 mg three times a day for 8 weeks. Efficacy assessments comprised the Clinical Global Impression (CGI) improvement of severity scale and the Visual Analogues Scales for the sense of fatigue and well-being. In 123 assessable patients in two treatment groups at the end of the study, Ganopoly treatment for 8 weeks resulted in significantly lower scores after 8 weeks in the CGI severity score and sense of fatigue, with a respective reduction of 15.5% and 28.3% from baseline, whereas the reductions in the placebo group were 4.9% and 20.1%, respectively. The score at day 56 in the sense of well-being increased from baseline to 38.7% in the Ganopoly group compared with 29.7% in the placebo group. The distribution of the five possible outcomes from very much improved to minimally worse was significantly different ( $X^2 = 10.55$ ;  $df = 4$ ;  $P = .0322$ ) after treatment with Ganopoly or placebo. There was a percentage of 51.6% (32 of 62) in the Ganopoly group rated as more than minimally improved compared with 24.6% (15 of 61) in the placebo group ( $X^2 = 9.51$ ;  $df = 1$ ;  $P = .002$ ). Ganopoly was well tolerated in the study patients. These findings indicated that Ganopoly was significantly superior to placebo with respect to the clinical improvement of symptoms in neurasthenia.

Hindawi Publishing Corporation  
Evidence-Based Complementary and Alternative Medicine  
Volume 2012, Article ID 809614, 8 pages  
doi:10.1155/2012/809614

### Research Article

## Spore Powder of *Ganoderma lucidum* Improves Cancer-Related Fatigue in Breast Cancer Patients Undergoing Endocrine Therapy: A Pilot Clinical Trial

Hong Zhao, Qingyuan Zhang, Ling Zhao, Xu Huang, Jincui Wang, and Xinmei Kang

Department of Internal Medicine, The Third Affiliated Hospital of Harbin Medical University, Harbin 150086, Heilongjiang Province, China

Correspondence should be addressed to Qingyuan Zhang, honghuhu2009@gmail.com

Received 24 May 2011; Accepted 1 September 2011

Academic Editor: José Luis Ríos

Copyright © 2012 Hong Zhao et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

The fatigue prevalence in breast cancer survivors is high during the endocrine treatment. However, there are few evidence-based interventions to manage this symptom. The aim of this study was to investigate the effectiveness of spore powder of *Ganoderma lucidum* for cancer-related fatigue in breast cancer patients undergoing endocrine therapy. Spore powder of *Ganoderma lucidum* is a kind of Basidiomycete which is a widely used traditional medicine in China. 48 breast cancer patients with cancer-related fatigue undergoing endocrine therapy were randomized into the experimental or control group. FACT-F, EORTC QLQ-C30

## *Panax ginseng*



## *Panax ginseng*

Nervous dyspepsia; mental and other forms of nervous exhaustion  
from overwork

Felter HW, Lloyd, J.U. *King's American dispensatory*. Cincinnati: Ohio Valley Co, 1898.

## *Panax ginseng*

- Used for severe collapsed *Qi* conditions marked by shallow respiration and shortness of breath
- Benefits *Yin* and generates *Fluids* (used in high fevers, profuse sweating in very depleted individuals), tonifies the *Lungs*, the *Stomach*, and strengthens the *Spleen* (used for labored breathing, lethargy, chest and abdominal distension and prolapse).
- Ginseng also benefits and calms the *Spirit* (palpitations with anxiety, insomnia and restlessness)

Bone K., Mills, S. *Principles and practice of phytotherapy: Modern herbal medicine* 2nd ed. New York: Churchill Livingstone Elsevier, 2013.

### International Journal of Food Sciences and Nutrition >

Volume 66, 2015 - Issue 7

Studies in Humans

## American ginseng tea protects cellular DNA within 2 h from consumption: results of a pilot study in healthy human volunteers

Yim Tong Szeto ✉, Yuk Shan Pauline Sin, Sok Cheon Pak & Wouter Kalle

The blood samples were challenged with ultraviolet B irradiation and DNA damage was assessed. Results showed a significant decrease in DNA damage after American ginseng supplementation and no change in the control group.

[Full Article](#) [Figures & data](#) [References](#) [Citations](#) [Metrics](#) [Reprints & Permissions](#) [Get access](#)

## *Schisandra chinensis*



## *Schisandra chinensis*

- Arrest discharges, replenish 'qi', promote fluid secretion, tonify the 'Kidney' and induce sedation
- Used for chronic cough, asthma, nocturnal emission, spermatorrhoea, leukorrhoea, enuresis, frequent urination, protracted diarrhoea, spontaneous or night sweating, impairment of body fluid with thirst, shortness of breath and feeble pulse, diabetes caused by internal heat, palpitation, amnesia and insomnia.

Bone K., Mills, S. *Principles and practice of phytotherapy: Modern herbal medicine* 2nd ed. New York: Churchill Livingstone Elsevier, 2013.



## Phytotherapy Research



Research Article

### Improvement of Liver Function in Humans Using a Mixture of *Schisandra* Fruit Extract and Sesamin

Intervention of *Schisandra* + sesamin clearly reduced the levels of ALT and AST, but it made no change in the total bilirubin and direct bilirubin. Intake of SCH also greatly increased the antioxidant capacity and decreased the values of thiobarbituric acid reactive substances, total free radicals, and superoxide anion radicals in the plasma.

The activities of glutathione peroxidase and reductase in the erythrocytes were significantly increased. In addition, the lag time for low-density lipoprotein oxidation, an inflammatory marker, was evidently increased.

[Int J Biol Macromol](#). 2016 Dec;93(Pt A):322-332. doi: 10.1016/j.ijbiomac.2016.08.042. Epub 2016 Aug 18.

#### Metabolic mechanism of a polysaccharide from *Schisandra chinensis* to relieve chronic fatigue syndrome.

Chi A<sup>1</sup>, Zhang Y<sup>2</sup>, Kang Y<sup>2</sup>, Shen Z<sup>2</sup>.

⊕ Author information

#### Abstract

*Schisandra chinensis* fruits are a famous traditional Chinese medicine to treat all kinds of fatigue. This study aimed to investigate the therapeutic effect and metabolic mechanism of a polysaccharide (SCP) from *Schisandra chinensis* fruits on chronic fatigue syndrome (CFS). SCP was isolated and the physicochemical properties were analyzed. A CFS model of rats was established and the urinary metabonomic studies were performed using gas chromatography time-of-flight mass spectrometry (GC-TOF-MS) in combination with multivariate statistical analysis. The results showed that SCP is a protein-bound polysaccharide. The amino acid composition of SCP consisted of 12 amino acids. The growth and the behaviors of the rats in the CFS model group were worse than those in the control group and improved after SCP treatment. Analysis of the GC-TOF-MS revealed that twelve metabolites were significantly changed, and six metabolites were oppositely and significantly changed after the SCP treatment. The TCA cycle metabolic pathways and the alanine, aspartate and glutamate metabolism were identified as significant metabolic pathways involved with SCP. The therapeutic mechanism of SCP against CFS was partially due to the restoration of these disturbed pathways.

## *Withania somnifera*



*Integr Cancer Ther.* 2013 Jul;12(4):312-22. doi: 10.1177/1534735412464551. Epub 2012 Nov 9.

### **Effect of *Withania somnifera* (Ashwagandha) on the development of chemotherapy-induced fatigue and quality of life in breast cancer patients.**

Biswal BM<sup>1</sup>, Sulaiman SA, Ismail HC, Zakaria H, Musa KI.

#### **Author information**

#### **Abstract**

**Hypothesis.** *Withania somnifera* is an herb with antioxidant, anti-inflammatory, anticancer, antistress, and adaptogenic properties. Previous studies have shown its antistress effects in animals. Traditional Indian medicine has used it for centuries to alleviate fatigue and improve general well-being.

**METHODS:** This is an open-label prospective nonrandomized comparative trial on 100 patients with breast cancer in all stages undergoing either a combination of chemotherapy with oral *Withania somnifera* or chemotherapy alone. The chemotherapy regimens were either taxotere, adriamycin, and cyclophosphamide or 5-fluorouracil, epirubicin, and cyclophosphamide. *Withania somnifera* root extract was administered to patients in the study group at a dose of 2 g every 8 hours, throughout the course of chemotherapy. The quality-of-life and fatigue scores were evaluated before, during, and on the last cycles of chemotherapy using the EORTC QLQ-C30 (Version 3), Piper Fatigue Scale (PFS), and Schwartz Cancer Fatigue Scale (SCFS-6).

**RESULTS:** The median age distributions in the study and control arm were 51 years (range = 36-70) and 50.5 years (range = 32-71), respectively. The majority (77%) of patients had stage II and III disease. Patients in the control arm experienced statistically significant higher estimated marginal means of fatigue score compared with the study group ( $P < .001$  PFS,  $P < .003$  SCFS-6). Furthermore, various symptom scales of the EORTC QLQ-C30 were statistically significant in 7 out of 18 symptoms in the intervention group compared with the control group ( $P < .001$ ). The 24-month overall survival for all stages in study and control group patients were 72% versus 56%, respectively; however, the result was not significant ( $P = .176$ ), at a median follow-up duration of 26 months.

**CONCLUSIONS:** *Withania somnifera* has potential against cancer-related fatigue, in addition to improving the quality of life. However, further study with a larger sample size in a randomized trial is warranted to validate our findings.

## *Avena sativa*



## *Avena sativa*

- **Specific Indications and Uses.**—Nerve tonic, stimulant, and antispasmodic. Spasmodic and nervous disorders, with exhaustion; cardiac weakness; nervous debility of convalescence; spermatorrhoea from the nervous erythrim of debility; tense articular swellings.

Felter HW, Lloyd, J.U. *King's American dispensatory*. Cincinnati: Ohio Valley Co, 1898.

Remember that we only look where we already know/understand MOAs

We cannot see what we do not see



"I'm searching for my keys."



Thank you for your attention  
Questions?