

Collagen and the Extracellular Matrix



Personalised Nutrition

Medscape Medical News

Life Expectancy Nears 90 Years in Some Countries, but US Falls Short

Diana Phillips
February 22, 2017

14 comments     

Following top-ranked South Korea, female life expectancy in France, Japan, and Spain have overlapping distributions, making them similarly likely to occupy any of the next three positions in rank. For men, South Korea, Australia, and Switzerland occupy the top three ranks, with overlapping distributions of projected life expectancy.

Average life expectancies in developed countries are predicted to increase through 2030, and female life expectancy in some countries may break the 90-year barrier, according to a study published online February 21 in the *Lancet*.

The United States, however, emerges as a relative poor performer compared to other high-income countries, given its already shorter life expectancy at birth and smaller projected gains.

Unlike most current mortality and life expectancy projections that rely on a single model, the current projections are derived from an ensemble of forecasting models "to more completely capture the uncertainty about future trends," write Vasilis Kontis, PhD, of the Department of Epidemiology and Biostatistics in the School of Public Health, Imperial College London, United Kingdom, and colleagues.

We have thought of connective tissue as being a structural component of the body, but now we recognize it is a composite not only of structure, but also function because it participates in transduction of signals.

Signals from the environment are transduced into the interior of cells, to the very heart of the cell where our book of life resides within the library called our genome.

These signals then unlock portions of our library, and certain chapters in our book of life are read to create the stories that become the phenotype of those cells and alter function as a consequence.

Collagen gives strength to

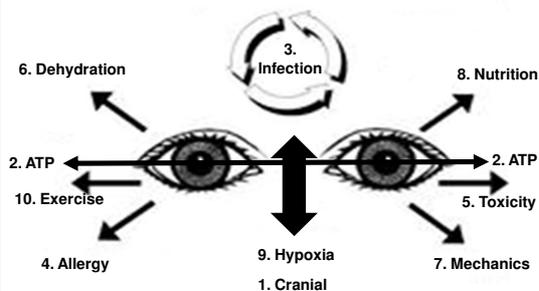
Skin	Muscle
Ligaments	Tendons
Bone	Fascia
Blood vessels	Heart
Lungs	Intestines
Bladder	Ears
Eyes	Nose
Intervertebral disc	
Teeth and Gums	

Diagnostic Entry Points

Body Type Acetates
Meridian points – Biophoton acetates
Hormones
Therapy localisation
Biomarkers
Weak muscle(s)
Eyes into Distortion
Food allergens
Phonocardiograph

1. Remove – Allergens, Toxins, Infections
2. Replace – Nutrients, Digestive enzymes
3. Re-inoculate - Probiotics
4. Repair – High or Low
5. Regeneration – High or Low

Eyes into Distortion (EID)



<p>395nm RADIATION ACETATE ↑ Ammonia</p> <p>Challenge for radiation source</p>	<p>370nm NEURAL REPAIR AND REGENERATION ↑ Malondialdehyde</p> <p>Challenge for weakening</p>	<p>380nm POLYMORPHISMS ↑ Nitric oxide</p> <p>Challenge for SNIPs. Check for appropriate Co-enzyme</p>	<p>390nm LOW HORMONES ↑ Hydrogen</p> <p>Challenge against specific hormones</p>	<p>HIGH HORMONES ↑ Hypochlorus</p> <p>Challenge for weakening against specific hormones</p>
<p>400nm PORPHYRINS ↑ Methane</p> <p>Codon challenge Challenge for porphyrins that weaken.</p>	<p>385nm LOW REPAIR ↑ Acetic acid</p> <p>Challenge for nutrients especially Zinc</p>	<p>HIGH REPAIR ↑ Hydrogen sulfide</p> <p>Indicates inflammation. Challenge for Allergy Infection Toxin Hypoxia EPAs</p>	<p>375nm LOW REGENERATION ↑ Propionic</p> <p>Indicates Toxic metals. Challenge for chelators</p>	<p>HIGH REGENERATION ↑ Formic acid</p> <p>May indicate neoplasm. Challenge with Nagalase</p>

<p>360nm ATP</p> <p>Challenge for Glycolysis Kerbs cycle Electron transport</p>	<p>365nm Water</p> <p>Challenge for quantity of good water</p>
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Causes of aging

1. Excess Free radicals (ROS)
2. Chronic Inflammation
3. Decreased immune system
4. Cell apoptosis – programmed cell death

Any or all leading to-

1. Degradation of “cellular timekeepers”, known as telomeres.
2. Progressive death over time to the cellular main “power source”, the mitochondria.
3. Oxidative damage to Lipids, Amino acids, DNA and Glycosylation(i.e. the “rusting” of the body’s cells).

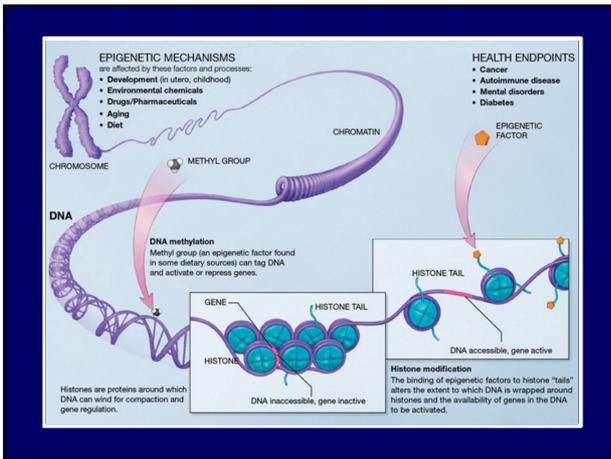
So any remedy(s) should address each / all of these issues.

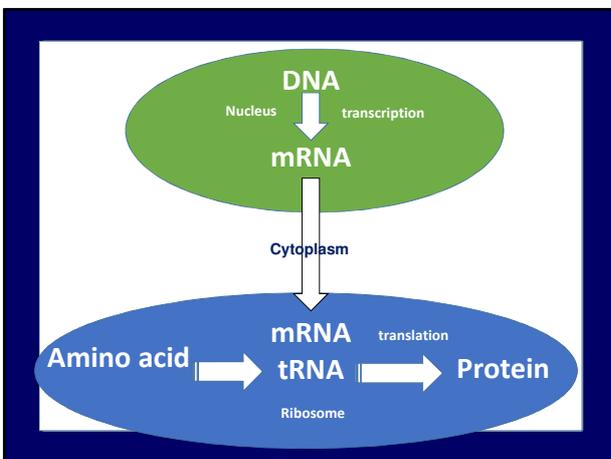
All common pathological disorders have **three things** in common

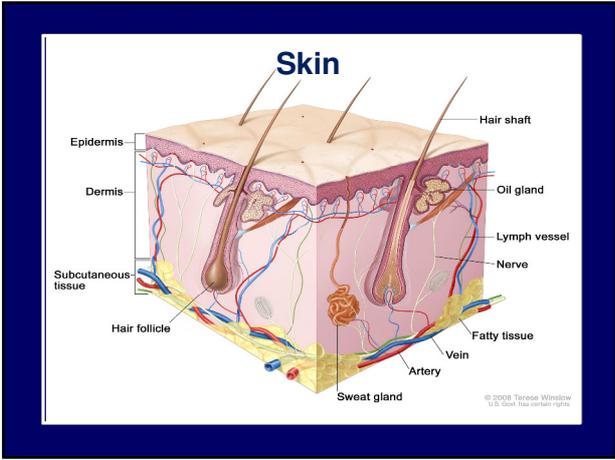
1. Genetics
2. Environment
3. Emotions

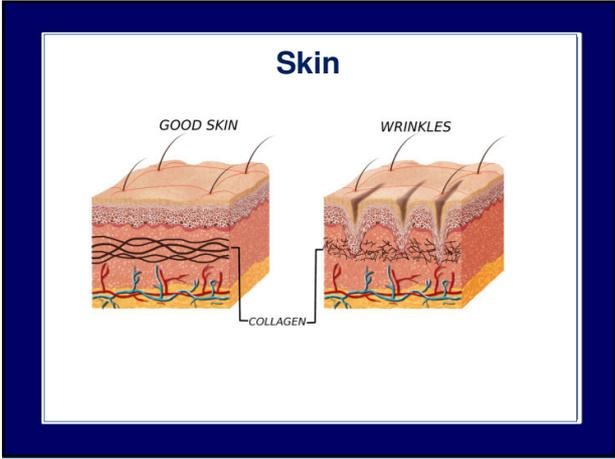
Genetics

1. Damage to the DNA – DNA polymerase enzyme - Zn
2. Single nucleotide polymorphisms SNIPs – need for extra co-enzyme
3. Histones - (De)Methylation and (De)Acetylation
4. Malfunctioning codons – need for specific mineral









The human body has a **skin** with receptors – big ones such as eyes, ears, nose, taste and small ones such as touch, temperature pain etc. to read the environment and send signals to the brain.

So the skin is really part of our brain.

Embryological connection-
Sperm and Egg



Zygote

Morula

Blastula

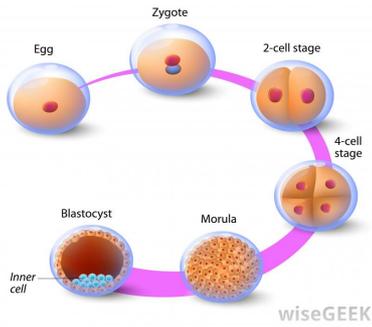


Gastrula

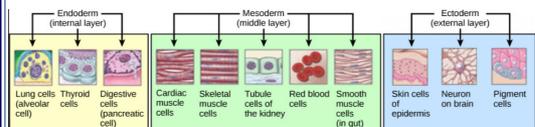
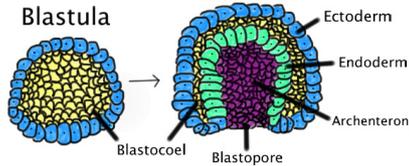
3 Dermal layers

Ectoderm
Mesoderm
Endoderm

DEVELOPMENT OF THE EMBRYO



The Ectoderm provides for the Skin and the CNS



Skin Senses Light In "Eye-Like" Fashion

Written by [Catharine Padock PhD](#)

Published: Saturday 5 November 2011

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New research published this week reveals that our skin is able to "sense" ultraviolet light in the same way as our eyes because skin cells contain rhodopsin, the same photosensitive receptor that the eye uses to detect light. The study also shows that the receptor is part of the skin's melanin-producing defense against DNA damage, the trigger for which occurs much faster than previously thought.

You can read how biologists at Brown University in Providence, Rhode Island, in the US arrived at these findings in the 3 November online first issue of *Current Biology*.

Senior author Elena Dancoea, assistant professor of biology in the Department of Molecular Pharmacology, Physiology, and Biotechnology at Brown, told the press:

"As soon as you step out into the sun, your skin knows that it is exposed to UV radiation."

"This is a very fast process, faster than anything that was known before," she added.

Dancoea and colleagues found that melanocytes, specialized skin cells that produce the pigment melanin, detect ultraviolet light using rhodopsin, a light-sensitive receptor previously thought to exist only in the eye. This ability starts the production of melanin within hours, much sooner than previously thought. Melanin not only gives skin its color, but also protects it against DNA damage from the sun by absorbing its UVB rays.

Previous to this study, scientists thought that melanin production only kicked in after a few days, about the same length of time as it takes to develop a "tan".

Genotype (Definitive or Constitutional meridian) is the sum total of the genes transmitted from parents to the offspring.

Phenotype (Gene expression) is the appearance of an organism resulting from the interaction of the genotype and the environment.

Phenotype-Scale of Gene Expression
On a Scale of 1 to 100 the percentage of your gene expression with 100 being absolutely perfect is

2. Environment

1. Infections – Bacteria, Viruses, Fungus, Parasites
2. Chemicals – Endogenous and Exogenous
3. Toxic metals
4. Radiation – Ionizing and Non-ionizing
5. Allergy
6. Hypoxia

All caused by
Nutritional Deficiency
or Toxicity

3. Emotions

The **consciousness mind** is your awareness at the present moment. You are aware of something on the outside as well as some specific mental functions happening on the inside. For example, you are aware of this lecture room, the person next to you, or me talking.

The **subconscious mind** consists of accessible information. You can become aware of this information once you direct your attention to it. Think of this as memory recall. You drove from your house without consciously needing to be alert to your surroundings. Acquired input through 5 senses.

The **unconscious mind**, consists of the primitive, instinctual wishes and the information that we cannot access. We don't have easy access to the information stored in the unconscious mind. Inherent within us as beliefs, patterns, subjective maps of reality that drive our behaviours. Carl Jung's dark shadow.

In Jungian psychology, the "dark shadow" may refer to (1) an unconscious aspect of the personality which the conscious ego does not identify in itself.

Because one tends to reject or remain ignorant of the least desirable aspects of one's personality, the shadow is largely negative.
or (2) the entirety of the unconscious, i.e., everything of which a person is not fully conscious.

The Extra-Cellular Matrix

- Tissues outside of the cell
- Network of macromolecules that determine the physical properties of body tissues
- Contains collagen, elastin and proteoglycans
- To produce fibrous connective tissue

Key Tissues in Degenerative Joint Diseases are

1. Collagen type 1,2 and 3
2. Elastin
3. Lubricin and Hyaluronic acid
4. Hyalin cartilage

The Steroid Hormones and Body Tissues

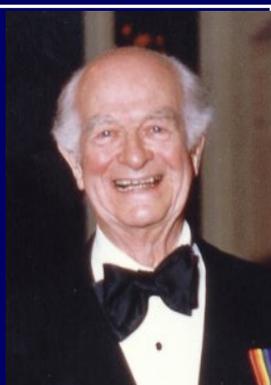
- Fat – Estrogen
- Muscle – Testosterone
- Cartilage –
- Bone – DHEA, DHT
- Ligament – Aldosterone
- Elastin - Progesterone

Extracellular matrix consists of

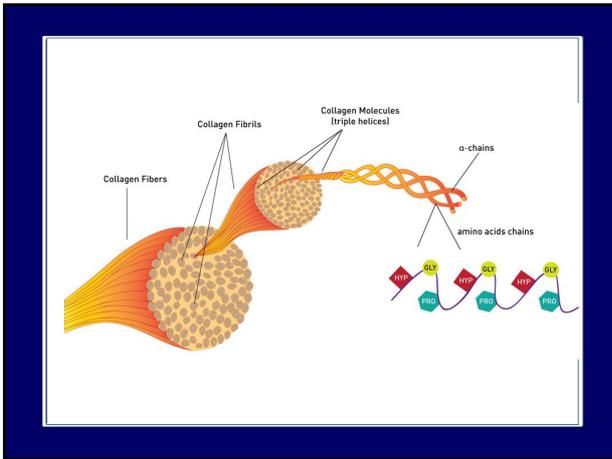
1. Fibrous tissue i.e. collagen (90% of connective tissue)
2. Elastin and Fibrin designed to withstand stretching tensions.
3. Fibrillin, Fibronectin and Laminin, which act as scaffolding for collagen and elastin.
4. Proteoglycans or Ground Substance designed to withstand compression forces.

Collagen Synthesis

Widespread protein: provides tensile strength.



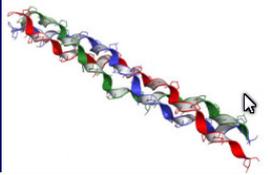
Dr Linus Pauling 1901-1994



Collagen is the most abundant protein in the human body and is the substance that holds the whole body together. It is found in the bones, muscles, skin and tendons, where it forms a scaffold to provide strength and structure.

Endogenously produced **collagen** plays numerous important roles in health, with the breakdown and depletion of the body's natural collagen associated with a number of health problems.

Collagen is a hard, insoluble and fibrous protein that makes up one-third of the protein in the human body. In the majority of collagens, the molecules are packed together to form very similar long thin fibrils.



Collagen is the most common protein found in mammals. Collagen comprises a family of genetically distinct molecules, all of which have a unique triple helix configuration of three polypeptide subunits known as alpha-chains.

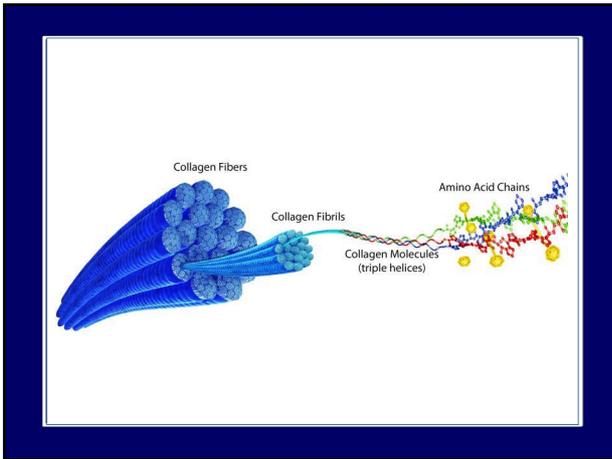
Each chain contains around **1,000 amino acids**, and usually features an amino acid sequence consisting of Glycine, Proline (or Hydroxyproline) and Lysine (or Hydroxylysine).

Gly-X-X-Gly-X-X-Gly-X-X-Gly-X

There are numerous different types of collagen, at least **28 types**, but 80-90% of collagens in the body belong to types I, II and III. The collagens in the human body are strong and flexible. Type I collagen fibrils are particularly tensile, and are stronger than steel, gram for gram.

Collagen is most commonly found in the skin, bones and connective tissue, providing structural support, strength and a degree of elasticity (in combination with elastin). Collagens can be found in the extracellular matrix - an intricate network of macromolecules that determine the physical properties of body tissues.

In the middle layer of the skin - the dermis - **collagen** helps form a fibrous network, upon which new cells can grow. Collagen is also required in the replacement and restoration of dead skin cells. Some collagens also function as protective coverings for delicate organs in the body such as the kidneys.



Collagen production naturally declines with age, reducing the structural integrity of the skin and leading to sagging skin, the formation of lines and wrinkles and the weakening of cartilage in joints.

Collagen is secreted by a variety of different cells, but primarily by connective tissue cells (fibroblasts). While young, the body consistently produces collagen, but collagen synthesis begins to decline around the age of 40, with a dramatic reduction in synthesis in women after menopause.

By the **age of 60** there is typically a considerable decline in collagen production. Age-related collagen changes could explain both the wrinkling and sagging of skin and a simultaneous deterioration of bone quality and quantity.

Dr. Lubna Pal, a reproductive endocrinologist stated: 
"We hypothesized that because skin and bone share common tissue architecture, the physical attributes of skin in menopausal women will relate to bone density and bone quality. And what we found is consistent with that hypothesis."

"Gut talks to Bone."
When you have elevated serotonin production at the gut level, you have increased bone loss by activating osteoclastogenesis and reducing osteoblastogenesis because you block the Wnt/beta-catenin signaling process.

Serotonin produced by the gut has a very dramatic effect, then, on increasing the potential for bone loss (that's serotonin production in the enterochromaffin cells within the small intestine).

What happens if people constantly activate the inflammatory pathway of their gut, increasing gut enterochromaffin cell production of serotonin, and bathe the bone remodeling unit with increased serotonin that influences the Wnt signaling pathway and shifts the balance of osteoblastogenesis and osteoclastogenesis toward osteoclastic activity and bone loss?

Lowered osteocalcin production, increased inflammatory potential, lowered adiponectin, increased regulatory storage, blunting of thermogenic effects on the brown fat, and now we shift that whole-body archetype systemically into a person with central fat deposition, insulin resistance, metabolic syndrome, high triglycerides and cardiovascular risks.

According to the Arthritis Foundation, about half of all **bone loss** women experience in a lifetime occurs during the first decade following menopause.

More than **100 women** in their late 40s and early 50s were analyzed. All the participants had entered menopause within the three years leading up to the study. No participants were taking hormone therapy, and none had undergone any cosmetic skin procedures.

Researchers tested skin firmness in the forehead and cheek region with a device called a durometer, and tallied the number and depth of face and neck wrinkles at 11 sites. To test bone density in different parts of the body, researchers used dual X-ray absorptiometry (**DEXA**) and a portable heel ultrasound device.

The key finding was that the firmer the face and forehead, the greater the bone density; the more wrinkles, the lower the bone density in the **back and feet** to be specific.

Osteoporosis – Not inherited genetically, brought on with age, associated with reduced levels of collagen in the skin and bones, growth hormone injections are being researched as a possible treatment to counteract any loss of collagen.
Test for low Dihydrotestosterone levels.

Collagen is the main structural protein in the extracellular space in the various connective tissues in animal bodies. As the main component of connective tissue, it is the most abundant protein in mammals, making up from 25% to 35% of the whole-body protein content).

Depending upon the degree of mineralization, **collagen** tissues may be rigid (bone), compliant (tendon), or have a gradient from rigid to compliant (cartilage).

Collagen, in the form of elongated fibrils, is mostly found in fibrous tissues such as tendons, ligaments and skin. It is also abundant in corneas, cartilage, bones, blood vessels, the gut, intervertebral discs and the dentin in teeth. In muscle tissue, it serves as a major component of the endomysium.

Collagen constitutes one to two percent of muscle tissue, and accounts for 6% of the weight of strong, tendinous muscles. The **fibroblast** is the most common cell that creates collagen.

Types of collagen

Collagen occurs in many places throughout the body. Over 90% of the collagen in the human body, however, is type I. So far, 28 types of collagen have been identified and described. They can be divided into several groups according to the structure they form:

COLLAGEN TYPE 1 Most connective tissues including skin, blood vessels, cornea, bone, ligaments and tendons. Thick fibres.

COLLAGEN TYPE 11 Cartilage (?O/A) intervertebral disc, vitreous humor and tendons. Thin fibres.

COLLAGEN TYPE 111 Extensible connective tissue such as skin, lung and the vascular system

COLLAGEN TYPE 1V Basement membranes. Very fine fibres.

COLLAGEN TYPE V Minor component of tissues containing type 1 especially tendons and bone, cell surfaces, hair and placenta.

Fibrillar (Type I, II, III, V, XI)

Non-fibrillar

FACIT (Fibril Associated Collagens with Interrupted Triple Helices) (Type IX, XII, XIV, XVI, XIX)

Short chain (Type VIII, X)

Basement membrane (Type IV)

Multiplexin (Multiple Triple Helix domains with Interruptions) (Type XV, XVIII)

MACIT (Membrane Associated Collagens with Interrupted Triple Helices) (Type XIII, XVII)

Other (Type VI, VII)

Collagenous cardiac skeleton

The **collagenous cardiac skeleton** which includes the four heart valve rings, is histologically, elastically and uniquely bound to cardiac muscle. The cardiac skeleton also includes the separating septa of the heart chambers – the interventricular septum and the atrioventricular septum.

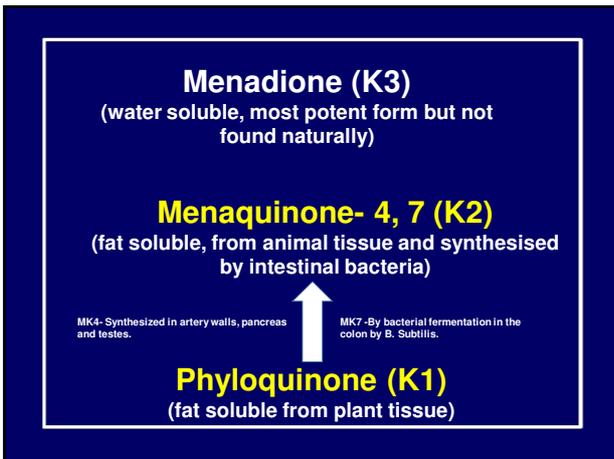
Collagen contribution to the measure of cardiac performance summarily represents a continuous **torsional force** opposed to the fluid mechanics of blood pressure emitted from the heart.

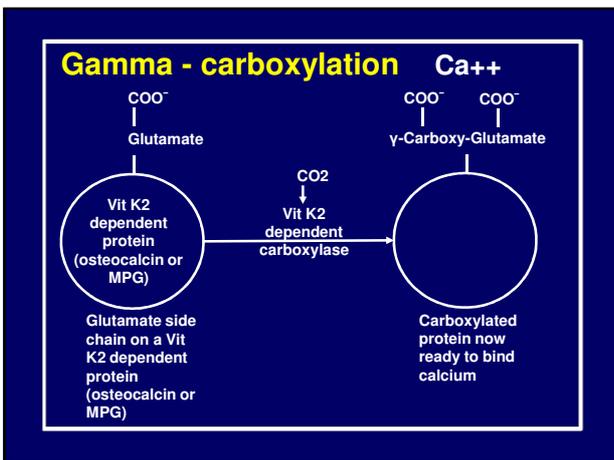
The **collagenous structure** that divides the upper chambers of the heart from the lower chambers is an impermeable membrane that excludes both blood and electrical impulses through typical physiological means. With support from collagen, atrial fibrillation should never deteriorate to ventricular fibrillation.

Collagen is layered in variable densities with cardiac muscle mass. The mass, distribution, age and density of collagen all contribute to the compliance required to move blood back and forth. Individual cardiac valvular leaflets are folded into shape by specialized collagen under variable pressure.

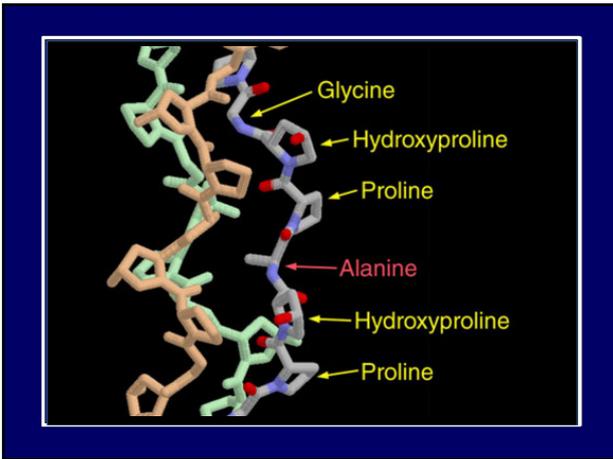
Gradual **calcium deposition** within collagen occurs as a natural function of aging. Calcified points within collagen matrices show contrast in a moving display of blood and muscle.

Test for Magnesium, EFAs, Vitamin K2.





The **collagen protein** is composed of a triple helix, which generally consists of two identical chains ($\alpha 1$) and an additional chain that differs slightly in its chemical composition ($\alpha 2$). The amino acid composition of collagen is atypical for proteins, particularly with respect to its high hydroxyproline content.



The most **common motifs** in the amino acid sequence of collagen are **glycine-proline-X** and **glycine-X-hydroxyproline**, where X is any amino acid other than glycine, proline or hydroxyproline.

Amino acid	Abundance in mammal skin (residues/1000)	Abundance in fish skin (residues/1000)
Glycine	329	339
Proline	126	108
Alanine	109	114
Hydroxyproline	95	67
Glutamic acid	74	76
Arginine	49	52
Aspartic acid	47	47
Serine	36	46
Lysine	29	26
Leucine	24	23
Valine	22	21
Threonine	19	26
Phenylalanine	13	14
Isoleucine	11	11
Hydroxylysine	6	8
Methionine	6	13
Histidine	5	7
Tyrosine	3	3
Cysteine	1	1
Tryptophan	0	0

Synthesis

First, a three-dimensional stranded structure is assembled, with the amino acids glycine and proline as its principal components. This is procollagen. Procollagen is then modified by the addition of hydroxyl groups to the amino acids proline and lysine.

This step is important for later glycosylation and the formation of the triple helix structure of collagen. The hydroxylase enzymes that perform these reactions require **Vitamin C** as a cofactor, and a deficiency in this vitamin results in impaired collagen synthesis and the resulting disease **scurvy**.

Scurvy

These **hydroxylation** reactions are catalyzed by two different enzymes: prolyl-4-hydroxylase and lysyl-hydroxylase. **Vitamin C** also serves with them in inducing these reactions. In this service, one molecule of vitamin C is destroyed for each H replaced by OH.

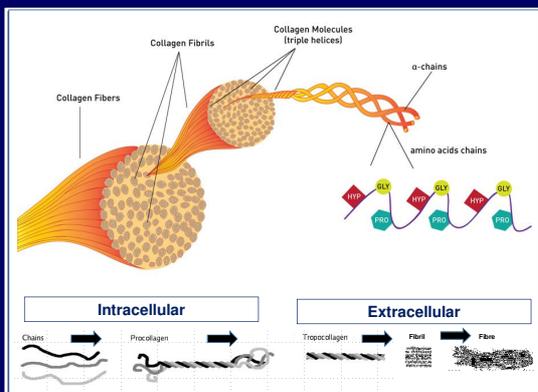
Vitamin C is required as a cofactor for prolyl hydroxylase and lysyl hydroxylase; these enzymes need an Fe²⁺ ion to be present. The problem being, that Fe²⁺ is unstable and will oxidize very easily. **Vitamin C** though, will end up keeping the Fe from going to the more stable 3⁺ form, rather keeping it at the required 2⁺ form.

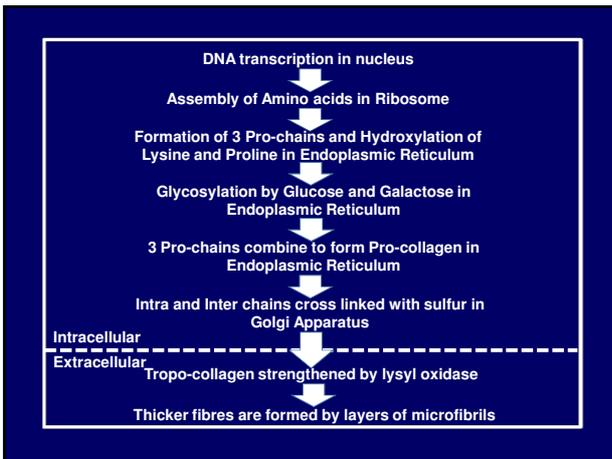
Vitamin C is important for many metabolic processes, including:

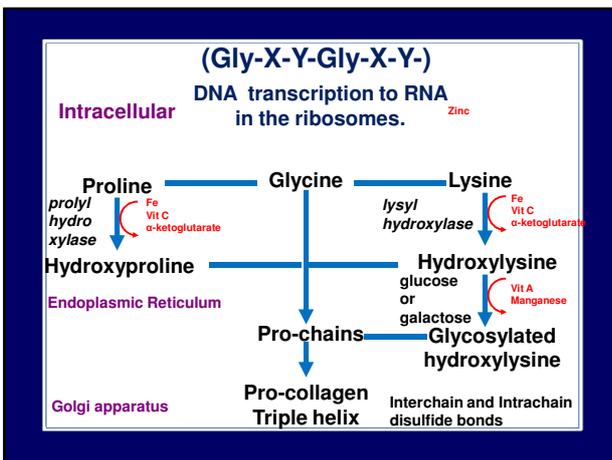
- Collagen formation** – collagen is used in different ways throughout the body. Its primary role is to strengthen the skin, blood vessels and bone. The body also relies on collagen to heal wounds.
- Antioxidant function** – the metabolism of oxygen within the body releases molecular compounds called 'free radicals', which damage cell membranes. Antioxidants are substances that destroy free radicals, and vitamin C is a powerful antioxidant.
- Iron absorption** – the process of iron absorption is aided by vitamin C, particularly non-haem iron (the form of iron found in plant foods such as beans and lentils).
- Infection fighting** – the immune system, particularly cells called lymphocytes, requires vitamin C for proper functioning.
- Other roles** – vitamin C is used to produce other important substances in the body such as brain chemicals (neurotransmitters). Metabolises histamine.

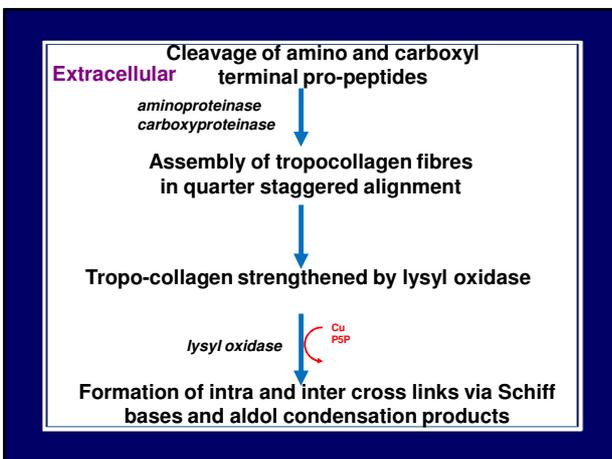
The synthesis of collagen occurs inside and outside of the cell. The formation of **collagen** which results in fibrillary collagen (most common form). Meshwork collagen, which is often involved in the formation of filtration systems, is the other form of collagen.

All types of collagens are triple helices, and the differences lie in the make-up of the alpha peptides created in step 2.



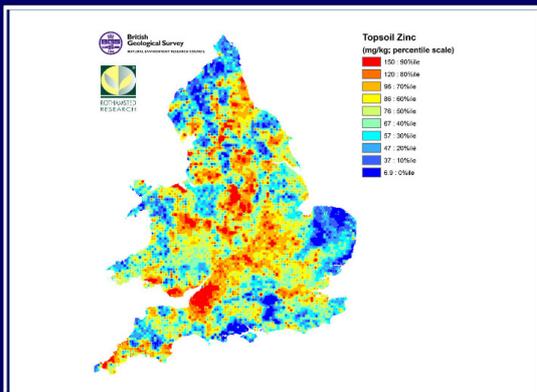




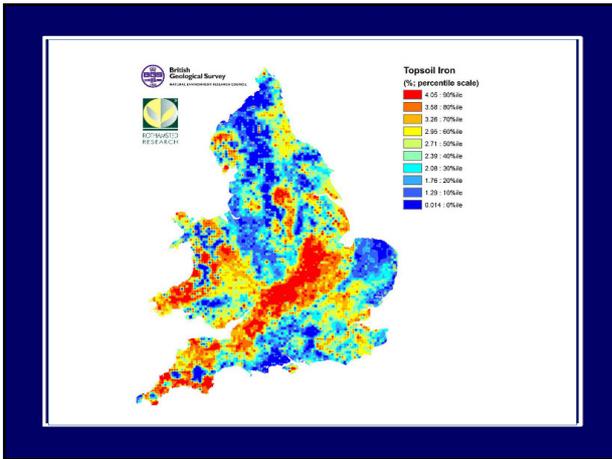


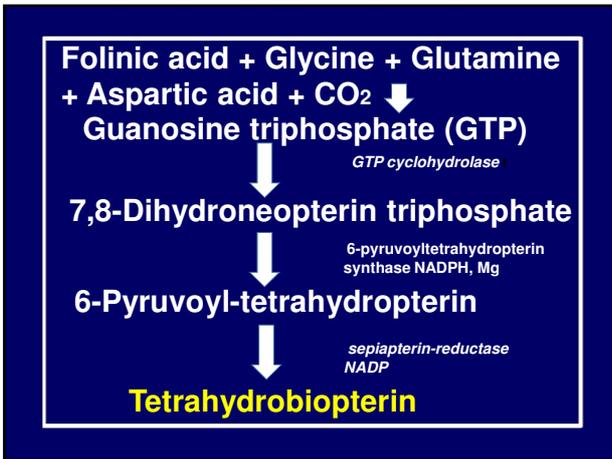
Collagen Production is as follows-

1. DNA transcription of various RNA molecules. About 34 genes are associated with collagen formation which is **Zinc** dependant.
2. RNA instructs amino acids, mainly Glycine, Proline and Lysine to form collagen configurations in the ribosomes.



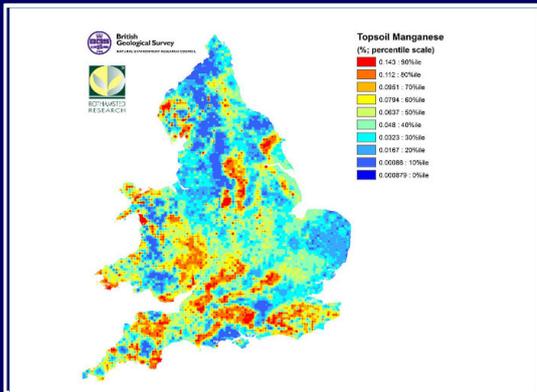
3. These are then attached to the Endoplasmic Reticulum where they produce single prochains. Proline and Lysine may be hydroxylated here by prolyl hydroxylase and lysyl hydroxylase co-factored by Alpha keto glutarate, **Iron and Vitamin C Tetrahydrobiopterin?**



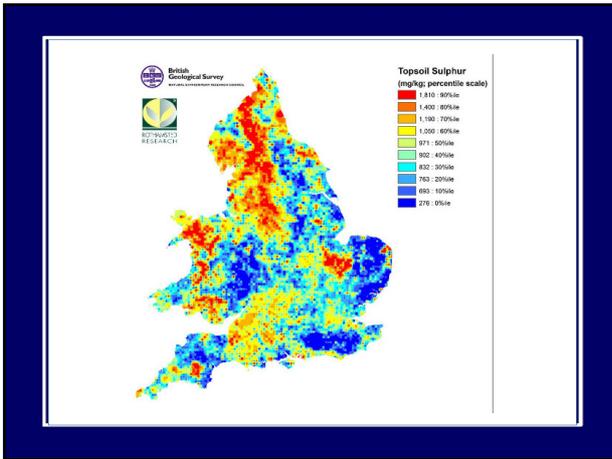


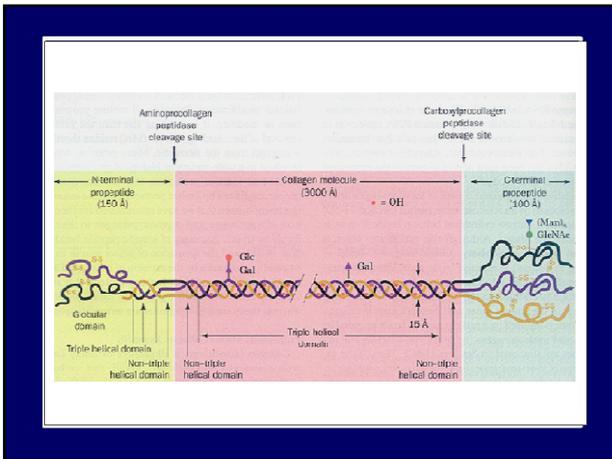


4. These are then glycosylated with glucose or galactose (co-factored by **Manganese** and **Vitamin A**).



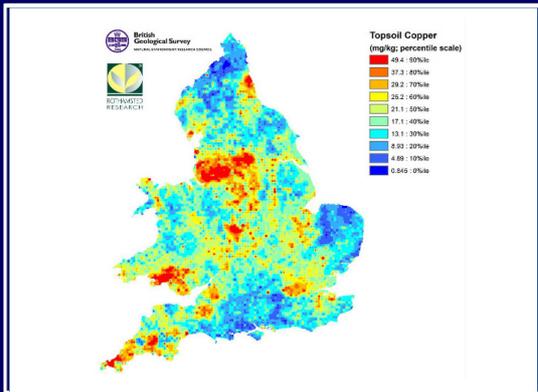
5. Three pro-chains combine to form **pro-collagen** in the Endoplasmic Reticulum. And are then transported to the Golgi Apparatus and then to the plasma membrane. The pro-collagen intra and inter-chains are held together by disulfide bonds formed from PAPs, cysteine or **sulfur**.





6. Pro-collagen is then released into the extra-cellular space (co-factored by **Zinc** and **Vitamin A**)

7. Registration peptides are cleaved and tropocollagen is formed by *procollagen peptidase*, and strengthened by cross-linking of the micro-fibrils by lysyl oxidase, a **copper** dependant enzyme which is inhibited by high levels of homocysteine (**P-5-P** and **Vit C**).



8. **Thicker collagen fibres** are formed by layers of microfibrils.

9. Joint immobilisation leads to excess cross linking causing adhesion formation.

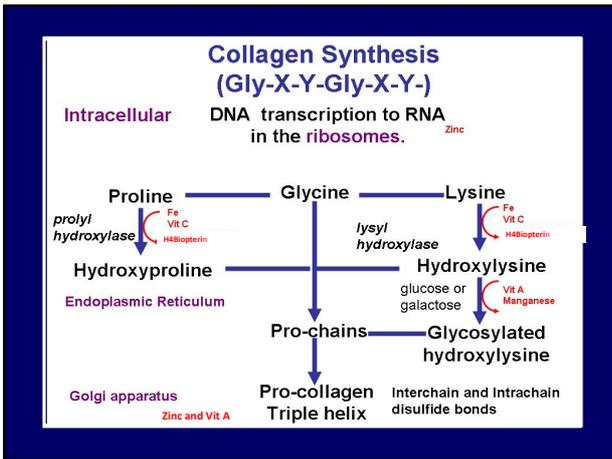
The bioflavonoid catechin (from **Green Tea**) stimulates the normal collagen cross linking and so helps prevent adhesion formation especially after surgery.

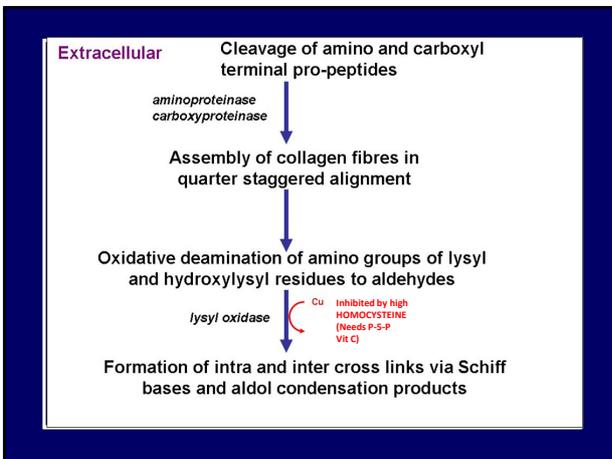
Other polyphenolic compounds also aid normal collagen cross linking. Such as **SMART Vitamin C** and the Anthocyanidins such as **Bilberry**.

Cortisol stimulates degradation of (skin) collagen into amino acids.









Collagenase are enzymes that break the peptide bonds in collagen.

Inhibited by
Epigallocatechin
Quercetin

Stimulated by
Glucose

General rules for preserving collagen.

1. Increase Vitamin C intake
2. Stop smoking
3. Stay sun safe
4. Retinol (Smart Vitamin A)
5. Avoid sugar
6. Exfoliate
7. Use our new Epicollagen cream

8. Add plant proteins – hummus, nuts, soy, pinto beans which contain phytoestrogens.
9. Massage face daily.

Epigenetic Testways - Collagen

Positive sustained challenge –skin tug

Negated by
Collagen Type 1
Collagen Type 2
Collagen Type 3
Collagen Type 4
Collagen Type 5

Challenge against
Zinc
Proline, Hydroxyproline
Lysine, Hydroxylysine
Glucose, Galactose
Fe, Vit C, Manganese, Vit A
PAP's, Sulfur, MSM
Zinc, Vit A
Cu, Vit B6
Bilberry, Si, (silica for scarring), Vit E. Vit K2

Collagen in the Mouth

Teeth

Cavities – Calcium fluoride
Wobbly teeth – Collagen
(Vitamin C, Mn)
Receding gums – Folates, CoQ10
Silica
Bleeding gums – P-5-P, Folates
Bioflavonoids
(Rutin),

Plaque - Probiotics
Bad breath - Probiotics
Gingivitis - Vit C, Rutin,
B Complex
Tartar - Magnesium,
Oils, Vit K2
Mouth ulcers - P-5-P
Amalgam extraction -
Selenium, Charcoal,
Bamboo, Chlorella, Spirulina

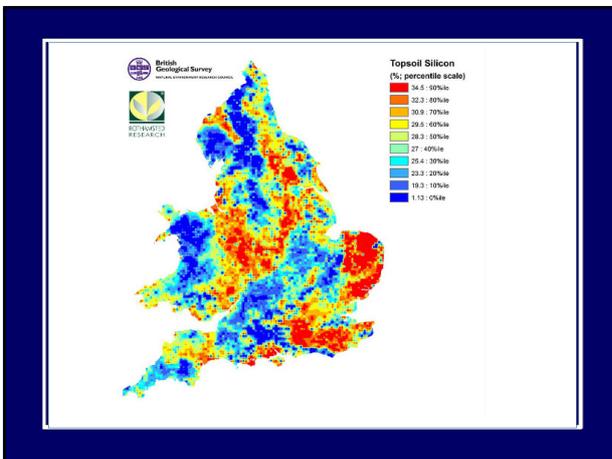
Quite how **Silica** may be involved in collagen synthesis and or its stabilisation is still not established. It has been implicated in gene transcription of type I collagen gene, a cofactor for prolyl hydroxylase the enzyme involved in collagen synthesis, in the utilisation (i.e. gastrointestinal uptake and metabolism) of essential elements that are required for bone and collagen synthesis, such as copper, calcium and magnesium and in the scavenging and detoxifying toxic aluminium. Silicon has also been found at the mineralisation front of growing bone suggesting also an involvement in early calcification/mineralization of bone matrix.

Scientific Opinion on the substantiation of health claims related to **silicon** and protection against aluminium accumulation in the brain, "cardiovascular health", forming a protective coat on the mucous membrane of the stomach, neutralisation of gastric acid, contribution to normal formation of collagen and connective tissue, maintenance of normal bone, maintenance of normal joints, maintenance of normal appearance and elasticity of the skin, and contribution to normal formation of hair and nails.

*Panel on Dietetic Products, Nutrition and Allergies
EFSA Journal:
EFSA Journal 2011;9(6):2259 [28 pp].
DOI:
10.2903/j.efsa.2011.2259*







Pre-activity BCAA
Nitric oxide formula
Vitamin E

During Magnesium and
B Complex

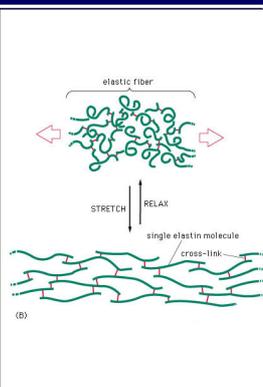
Post activity Omega 3

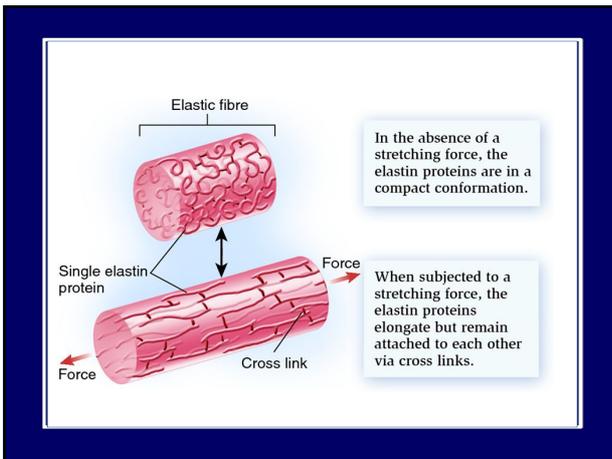
Elastin

Elastin

Elastin

Fibrous protein
forming elastic
mesh and
imparts yellow
colour e.g. skin,
aorta





Elastin is a connective tissue protein that possesses elastic recoil properties.

Present in ligament, lung, arteries, skin, ear cartilage

It is 1/3rd Glycine, 1/3rd Alanine + some Valine and Proline.

It contains no hydroxyproline or hydroxylysine.

The covalent cross links are formed by a lysine aldol as in collagen and requires *lysyl oxidase*, the Cu⁺ dependant enzyme. (Inhibited by high **Homocysteine** levels).

Elastic fibres (or yellow fibres) are bundles of proteins found in extracellular matrix of connective tissue and produced by fibroblasts and smooth muscle cells in arteries. These fibres can stretch up to 1.5 times their length, and snap back to their original length when relaxed.

Elastic fibres include elastin, elaunin and oxytalan.

Elastin is a highly elastic protein in connective tissue and allows many tissues in the body to resume their shape after stretching or contracting. Elastin helps skin to return to its original position when it is poked or pinched.

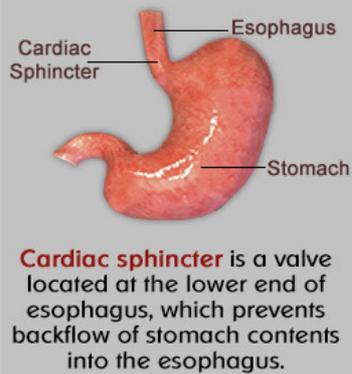
Elastin serves an important function in arteries as a medium for pressure wave propagation to help blood flow and is particularly abundant in large elastic blood vessels such as the aorta. Elastin is also very important in the lungs, elastic ligaments, elastic cartilage, the skin, and the bladder.

The **ELN gene** encodes a protein that is one of the two components of elastic fibers. The encoded protein is rich in hydrophobic amino acids such as glycine and proline, which form mobile hydrophobic regions bounded by crosslinks between lysine residues.

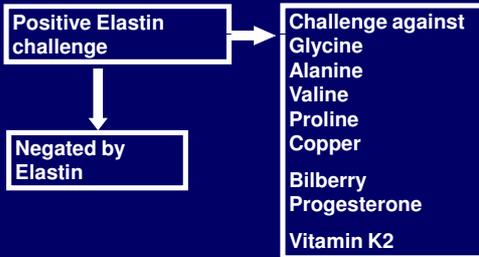
Deletions and mutations in this gene are associated with supravalvular aortic stenosis. It is composed of simple amino acids such as glycine, valine, alanine, and proline.

Elastin is made by linking many soluble tropoelastin protein molecules, in a reaction catalyzed by lysyl oxidase, a copper dependant enzyme.

The Cardiac Sphincter is rich in Elastin

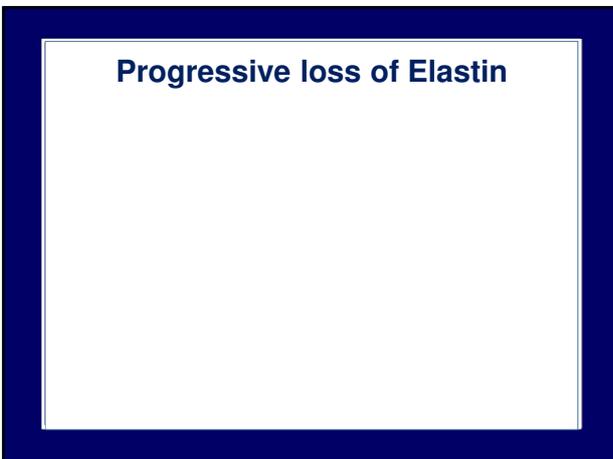


Epigenetic Testways - Elastin

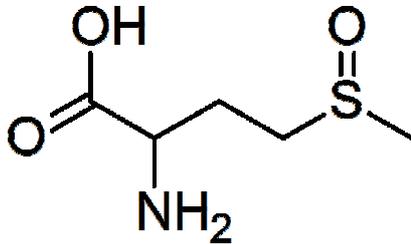








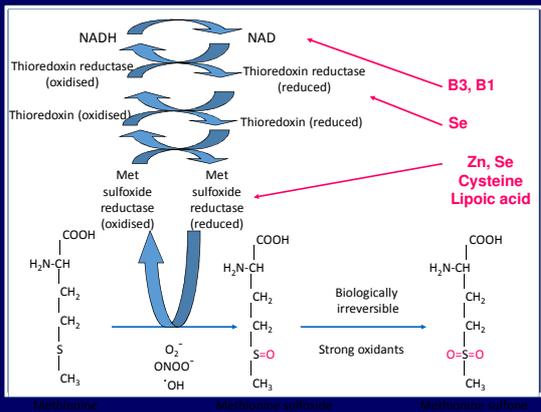
Methionine sulfoxide

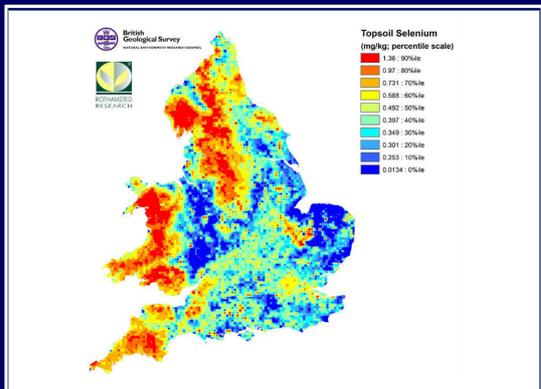


Proteins are subject to modification by reactive oxygen species (ROS), and oxidation of specific amino acid residues can impair their biological function, leading to an alteration in cellular homeostasis. Methionine is among the amino acids the most susceptible to oxidation by almost all forms of ROS, resulting in both S and R diastereoisomeric forms of methionine sulfoxide. These modifications can be repaired specifically by the peptide methionine sulfoxide reductase A and B enzymes (MsrA and MsrB), respectively. MsrA is tightly implicated in protection against oxidative stress and in protein maintenance, which is critical in the aging process. Several studies have shown that overexpression of MsrA led to an increased resistance against oxidative stress, while MsrA null mutants are more sensitive toward oxidative stress. Since oxidative damage is a key factor in aging, overexpression of MsrA in some organisms led to an increased life span whereas deletion of the gene led to the opposite. MsrA could also be involved, by regulating the function and/or expression of target proteins, in ROS-mediated signal transduction. In fact, changes in gene expression, including certain oxidative stress-response genes, have been observed when MsrA is overexpressed.

Methionine sulfoxide, the oxidized form of the amino acid methionine, increases with age in body tissues, which is believed by some to contribute to biological ageing. Oxidation of methionine residues in tissue proteins can cause them to missfold or otherwise render them dysfunctional.

Uniquely, the **methionine sulfoxide reductase** group of enzymes act with thioredoxin to catalyze the enzymatic reduction and repair of oxidized methionine residues. Moreover, levels of methionine sulfoxide reductase decline in aging tissues.





Methionine sulfoxide reductase (MSR)

- Small Zn, Cys, Se-containing enzyme localised both in cytosol and mitochondria, with dihydrolipoic acid being a cofactor
- Important mechanism for repair of oxidatively damaged proteins, especially antiproteinases
- Decrease of MSR activity in the brain is associated with Alzheimer's disease
- MSR gene expression and enzyme activity decrease during aging
- Activation of MSR in T-cells makes them more resistant to oxidative stress

Ruan H. et al. High-quality life extension by the enzyme peptide methionine sulfoxide reductase. Proc Nat Acad Sci USA 2002, 99(5), 2748-2753

- Overexpression of the MSR gene predominantly in the nervous system markedly expands the lifespan
- The study was performed in *Drosophila melanogaster*

Clinical conditions in which activation of MSR is most required

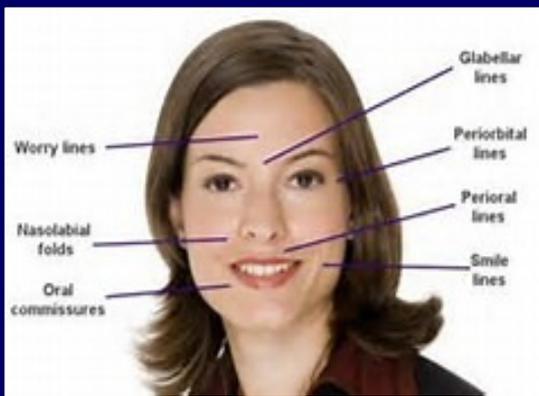
- Reperfusion injury
- Rheumatoid arthritis
- Pulmonary emphysema (α 1-antiproteinase deficiency)
- T-cell related immunodeficiency
- Dyslipoproteinemia (Apo A-1 and HDL deficiency)
- Alzheimer's disease
- K⁺-channel defects (long QT syndrome, episodic ataxia etc.)
- Retinitis pigmentosa?

Thioredoxin reductase (FAD, NADPH, Selenium) participates in the regeneration of several antioxidants, possibly including vitamin C and Vitamin E.

Since the activity of this enzyme is essential for cell growth and survival, it is a good target for anti-tumour therapy. Furthermore, the enzyme is upregulated in several types of cancer, including malignant mesothelioma. It is inhibited by - As, Au, Hg, Pd, Pt.

Thioredoxin is a class of small redox proteins known to be present in all organisms. It plays a role in many important biological processes, including redox signalling.

Wrinkles



Wrinkles – Laughter lines!

- Fold, ridge or crease in the skin
- Result of the aging process
- Sun damage
- Smoking
- Habitual facial expressions

Cause of wrinkles

- Kind of Fibrosis of the skin
- Formation of excess fibrous connective tissue in a reparative process
- Deposits connective tissue which can obliterate the architecture and function of the underlying tissue

Cause of wrinkles

- Misrepair – incorrect repairs of injured elastin and collagen fibres
- During the repair process some of the broken fibres are not regenerated or replaced by altered fibres

Cause of wrinkles

- When an elastin fibre is broken in an extended state, it may be replaced by a “long” collagen fibre
- Accumulation of “long” collagen fibres makes part of the skin looser and stiffer so a big fold of skin appears

Cause of wrinkles

- When a long collagen is broken in a compressed state, it may be replaced by a short collagen fibre.
- The shorter collagen fibre will restrict the extension of longer fibres and make the long fibres in a folding state permanently
- A permanent wrinkle then appears

Unconscious emotions, Meridians and the Neurotransmitters

SCALE of CONSCIOUSNESS

God-view	Life-view	Level	Log	Emotion	Process
Self	Is	Enlightenment	700-1000	Ineffable	Pure Consciousness
All-Being	Perfect	Peace	600	Bliss	Illumination
One	Complete	Joy	540	Serenity	Transfiguration
Loving	Benign	Love	500	Reverence	Revelation
Wise	Meaningful	Reason	400	Understanding	Abstraction
Merciful	Harmonious	Acceptance	350	Forgiveness	Transcendence
Inspiring	Hopeful	Willingness	310	Optimism	Intention
Enabling	Satisfactory	Neutrality	250	Trust	Release
Permitting	Feasible	Courage	200	Affirmation	Empowerment
Indifferent	Demanding	Pride	175	Scorn	Inflation
Vengeful	Antagonistic	Anger	150	Hate	Aggression
Denying	Disappointing	Desire	125	Craving	Enslavement
Punitive	Frightening	Fear	100	Anxiety	Withdrawal
Disdainful	Tragic	Grief	75	Regret	Despondency
Condemning	Hopeless	Apathy	50	Despair	Abdication
Vindictive	Evil	Guilt	30	Blame	Destruction
Despising	Miserable	Shame	20	Humiliation	Elimination

Meridians, Emotions and Neurotransmitters

BI = Shame and Humiliation = Low Serotonin
GB = Guilt and Blame = Low Acetylcholine
LI = Apathy and Despair = Low Inhibitory
CV = Grief and Regret = Low Dopamine
Kid = Fear and Anxiety = High Serotonin
GV = Craving and Desire = High Dopamine
Lung = Anger and Hate = High Inhibitory
Liv = Pride and Scorn = High Acetylcholine
TW = Neutrality and Trust = Low Excitatory
Cx = Courage and Affirmation = High Excitatory
St = Acceptance and Forgiveness = Low Histamine
Sp = Willingness and Optimism = High Histamine
SI = Reason and Understanding = Low Noradrenalin
Ht = Love and Reverence = High Noradrenalin

Unconscious emotions are

1. Shame and humiliation
2. Guilt and blame
3. Apathy and despair
4. Grief and regret
5. Anxiety and fear
6. Craving and desire
7. Anger and hate
8. Pride and scorn

Meridians, Emotions and Neurotransmitters

BI = Shame and Humiliation = Low Serotonin
GB = Guilt and Blame = Low Acetylcholine
LI = Apathy and Despair = Low Inhibitory
CV = Grief and Regret = Low Dopamine

Low self esteem

Guilt and Blame

Despair

Grief and Regret

Meridians, Emotions and Neurotransmitters

Kid = Fear and Anxiety = High Serotonin
GV = Craving and Desire = High Dopamine
Lung = Anger and Hate = High Inhibitory
Liv = Pride and Scorn = High Acetylcholine

Anxiety and Fear

Craving and Desire

Anger

Pride

Meridians, Emotions and Neurotransmitters

BI = Shame and Humiliation = Low Serotonin
 GB = Guilt and Blame = Low Acetylcholine
 LI = Apathy and Despair = Low Inhibitory
 CV = Grief and Regret = Low Dopamine

Yang

Kid = Fear and Anxiety = High Serotonin
 GV = Craving and Desire = High Dopamine
 Lung = Anger and Hate = High Inhibitory
 Liv = Pride and Scorn = High Acetylcholine

Yin

Meridians, Emotions and Neurotransmitters

Depression

BI = Shame and Humiliation = Low Serotonin
 GB = Guilt and Blame = Low Acetylcholine
 LI = Apathy and Despair = Low Inhibitory
 CV = Grief and Regret = Low Dopamine

Yang

Anxiety

Kid = Fear and Anxiety = High Serotonin
 GV = Craving and Desire = High Dopamine
 Lung = Anger and Hate = High Inhibitory
 Liv = Pride and Scorn = High Acetylcholine

Yin

Unconscious Meridians and Positive Emotions

BI = Gentleness with self
 GB = Kindness towards self and others
 LI = Motivation, Hope
 CV = Inspired (breath in) letting go (breath out)

Kid = Calm, peace
 GV = Sense of strength. Contentment
 Lung = Tolerance and kindness
 Liv = Feeling centred and secure

Collagen – Wrinkles

ACh↑ Dop↑ Inh ↑ Ser↓

Elastin

ACh↑ Dop↑ Inh↓ Ser ↑

Here are some quick tips to get you there within the next 30 days:

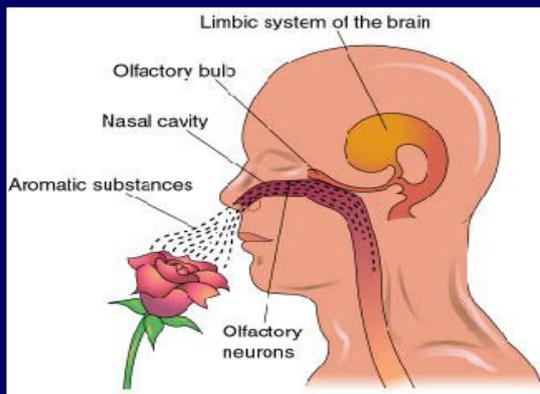
- Each time you feel a negative thought enter your head, instantly replace it with a positive one.
- Don't feel doom and gloom, regardless of what's happening around you. Constantly believe that something amazing is about to happen that will change your life for the better.
- For 5 minutes a day, go into a quiet, private setting and meditate. Close your eyes and focus intensely on the life you want to have. Be vivid with your imagination and try to transport yourself to that new life you desire.
- Surround yourself with only positive people. If someone is negative, try your best to not be around them so they won't influence your thoughts.
- Don't consider your dreams "dreams." Think of them as something that is easily achievable and is about to become your reality.
- Be grateful for what you currently have. Feel that gratitude deep down and say "Thank you" out loud.
- Remember that like attracts like. If you're a positive being or force, you'll attract other positive beings that will result in success. If you're negative, you'll only attract trouble and problems.

Treating the Emotions

- Treat with aromas/essential oils
- Pert –smell is one synapse away from going into consciousness
- Experiencing a scent can conjure up emotions and memories because the thalamus sends information to the hippocampus and the amygdala, key regions for learning and memory

Treating the Emotions

- New research has shown that the average person can detect at least one trillion different smells
- This new research suggests that the nose can outperform the eyes and ears
- Eyes – several million colours
- Ears – half a million tones



Treating the Emotions

- Once odour molecules bind to olfactory receptors, it initiates signal from the sensory neurons to the olfactory bulb that relays the signal to other brain areas
- Smell information goes to the thalamus, which serves as a relay station for all of sensory information into the brain

Treating Emotions with Aroma

- Clinical research into essential oils to treat each meridian
- Collection of organic essential oils for each meridian
- Work on emotional centre of brain
- Work to modulate the production of neurotransmitter associated with the meridian

Meridian Perfume

- Essential oils for the specific meridian as a perfume
- Blended to complement the 6 essential oils. Maintains the full efficacy in terms of treating the emotional state
- Roll on top in 10 ml miron bottle

Aroma-Chology

- A newly developed science in which the effect of odours on behaviour is scientifically measured through carefully controlled experiments
- Developed in 1982 by the Olfactory Research Fund it was designed to study the relationship

Aroma-Chology

- Between psychology and fragrance by analysing the emotions produced when odours activate the limbic system
- In this region, odours initiate the release of neurotransmitters which can affect the brain and mental state

Aroma-Chology

- Studies have shown that the use of certain aromas can benefit mood, behaviour and productivity by determining what neurotransmitters will be released
- Aromachology – the Psychology of scent

Treating Emotions technique

- Determine the constitutional meridian, the genotype
- Identify the unconscious emotions affecting the patient
- Test which perfume negates the unconscious emotions and the constitutional meridian

Perfumes and Affirmations

- **BL Wonderful You**
 - “I am a great/wonderful person”
- **GB Compassion**
 - “I have compassion for myself and others”
- **LI Hope**
 - “I have hope in the future”

Perfumes and Affirmations

- **CV Inspiration**
 - “I release my regrets and believe in a happy future”
- **Kid Serenity**
 - “I am calm, in control, at peace. I see the world through serene eyes”
- **GV Gratitude**
 - “I am grateful for all aspects of life”

Perfumes and Affirmations

- **Lu Loving Respect**
 - “I extend loving respect to all”
- **Liv Inner Strength**
 - “I am meek. My Inner Strength protects/sustains me”
 - “The opinions of others do not affect me”

Emotions Above 200

- **TW Just Trust**
 - “I trust in the present and the future”
- **CX Empowerment**
 - “I feel empowered within myself”
- **St Harmony**
 - “I accept the past and move forward to a better future”

Emotions Above 200

- **St Harmony**
 - “I forgive others/myself”
- **Sp Optimism**
 - “I see optimism in the world/in my life”
- **SI Faith**
 - “I have faith in the world”

Emotions Above 200

- **SI Faith**
 - “I release my need to reason and understand everything”
- **Ht Love**
 - “I have faith in love”
 - “I see love in the world”
 - “I truly believe I can have a loving relationship”
 - “I truly love myself”

Unconscious emotions and N/Ts

- **Acetylcholine**
 - Low GB High Liv
- **Dopamine**
 - Low CV High GV
- **Inhibitory**
 - Low LI High Lu
- **Serotonin**
 - Low BL High Kid

Meridians and Positive Emotions

- BI = Gentleness with self, feeling self esteem
- GB = Kindness towards self & others
- LI = Motivation, hope
- CV = Inspired (breath in) letting go (breath out)
- Kid = Calm, feeling in control, peace
- GV = Sense of strength, contentment
- Lung = Tolerance and kindness, assertiveness
- Liv = Feeling centred and secure, standing tall
- TW = Neutrality and Trust
- Cx = Courage and Affirmation
- St = Acceptance and Forgiveness
- Sp = Willingness and Optimism
- SI = Reason and Understanding, have faith
- Ht = Love and reverence of self and others

Treatment Protocol

1. Tap Cross Extensor Reflex
2. Identify Body type – check for cranial
3. Identify Constitutional (CON) meridian using bilateral TL to B&E points
4. Check CON weakens in clear. If not tap SCN 60 times

Treatment Protocol

- 4. With meridian acetate on body
- 5. Identify unconscious emotions using TL to navel and B&E points of unconscious meridians
- 6. Calibrate the relevant unconscious meridians

Verbal Challenge for Unconscious

“Your levels of Acetylcholine as determined by the unconscious emotion of Guilt and Blame calibrate at -50 or higher....”

“Your levels of Acetylcholine as determined by the unconscious emotion of Pride calibrate at +50 or higher....”

Treatment Protocol

- 7. Group together the unconscious meridian acetates and place on patient
- 8. Find meridian perfume, this could be an unconscious or CON meridian
- 9. Use eye positions to determine nutrients with TL to navel

Treatment Protocol

- 10. With nutrients on the body, check CON meridian for weakening
- 11. Use eye positions to determine nutrients required

Wonder Epicollagen Cream

- Oils to stimulate the production of collagen and elastin
- Fatty acids and sterols which stimulate the receptors on fibroblasts
- Castor bean oil
- Walnut oil

Organic Castor Bean oil

- Contains a saturated fat – carbon 8 fatty acid which stimulates the fibroblast to produce collagen
- Castor bean is the natural source of castor oil
- The ricin is removed during the extraction process – denatures and deactivates the ricin

Organic Walnut oil

- Composed largely of polyunsaturated fatty acids, 72% of the total fats
- Alpha linolenic 14%
- Linoleic acid 58%
- Oleic acid 13%

Organic Walnut oil

- “Dry” oil so will blend well with castor bean oil
- Excellent for mature skin
- Good for regeneration of the skin so perfect for anti-wrinkle blends

**Active
Ingredients**

Marine Algae

Marine Algae

- Ecocert approved extraction method of *Cylindrotheca Fusiformis* – an oceanic marine algae
- Strongly stimulate the production of structural skin proteins
- 0.5% lead to an increase in collagen synthesis of 17% after

Marine Algae

- 72 hours compared to an untreated control sample
- 2% increased by 19.3% in 24 hours
- Improves elasticity and hydration
- Rich in omega 3 and sterols, soothing and anti-inflammatory
- A/O protects dermal matrix

Organic Comfrey

Organic Comfrey extract

- Latin “con firma” means with strength
- Special beauty herb due to the high content of phytochemical allantoin. This promotes skin cell regeneration and stimulates the growth of new cells
- Tannins and rosmarinic acid – astringent effect

Silicon from Millet

- Part of plant fibres
- Hulls of grains
- Millet good source
- Herb Comfrey

Silicon from Millet

- Silicon molecules in the tissue, such as nails and connective tissue, give them strength and stability
- Silicon is able to form long molecules and give these complex structures durability and strength. Collagen contains Si

Silicon from Millet

- In vivo studies confirmed an improved skin structure by reducing wrinkles and lines after 28 days
- Silicon from millet has a high bio-availability thereby promoting the production of skin proteins

Tannins

Found in leaf, bud, seed, root and stem tissue.

In the growth area of tree, in layer between cortex & epidermis.

Tannins from Oak

- Tannins are astringent, polyphenolic biomolecules that bind to and precipitate proteins and other organic compounds including amino acids
- Form strong complexes with various macromolecules

Tannins from Oak

- Protective for the tree
- In creams they help to neutralise harmful metal ions and protect the skin with anti-oxidative properties
- Astringent and tautening effect

Vitamin C

- A vital component of collagen
- Powerful anti-oxidant
- Stable form of Vitamin C which overcomes the oxidation problems with Vitamin C
- Sodium Ascorbyl Phosphate

Peptides from Lupins

Lupin Peptides

- Blend of penta and hexa peptides from lupin flower protein
- Bioactive peptides are short sequences of amino acids derived from the enzymatic processing of endogenous proteins throughout the body

Lupin Peptides

- Naturally occurring peptides in the skin are generated from ECM proteins
- Due to their influence on collagen homeostasis, bioactive peptides are being investigated for their ability to treat aged and photo-aged skin

Lupin Peptides

- Synthetic bioactive peptides have been generated to exploit this endogenous process in order to influence skin health and appearance
- Given their potential to modulate collagen and melanin homeostasis, topical application is beneficial for cosmetic purposes

Skincare Powerhouse!

- Peptides are chains of amino acids that are building blocks of proteins in the skin
- When peptides form a long chain of amino acids they become proteins
- When they are in a short chain of amino acids, they are able to

Skincare Powerhouse!

- Penetrate the top layer of skin and send signals to our cells to let them know how to function
- Collagen gives skin its suppleness and thickness. When collagen breaks down in the skin due to aging, environment, sun and stress, wrinkles form

Skincare Powerhouse!

- Peptides applied topically to the skin can send a signal to collagen to prompt the formation of new collagen and voila – you have the appearance of more youthful, supple skin

Wonder Epicollagen Cream

- Epi meaning above
- Providing the signals to stimulate the production of collagen – castor oil, comfrey, algae, tannins
- Providing the nutrients to produce collagen – vitamin C, silicon, peptides
- No “nasties” to disrupt function

Wonder Epicollagen Cream

- Organic Castor Bean oil
- Organic Walnut oil
- Vitamin C
- Organic Comfrey extract
- Silicon from Millet/ tannins - oak
- Marine Algae
- Lupin Peptides

Test for the Epicollagen Cream

- Tug and twang test for collagen and elastin
- Stretch a wrinkle

Stretch wrinkle transversely



**Unconscious emotions,
Neurotransmitters and Hormones**

Kundalini Yoga

Unprocessed emotions are stored on our body. Kundalini yoga is a powerful tool to help dislodge these emotions from our body and transmute this energy into higher frequencies. One of the most powerful ways to move out of the state of disempowerment into empowerment is to cultivate our own internal power. Yogically, the navel centre is the place to begin.

Unconscious Thought

↓
Excites or Inhibits Neuronal loop
(Neurotransmitter ↑ or ↓)
(gives feelings to the emotion)

↓
Hypothalamic hormones ↑ or ↓

↓
Target hormones ↑ or ↓
(switches genes on or off)

Hypothalamus	Pituitary	Target Gland
CRH CV-GV	Dopamine ★	ACTH, (MSH) Mineralocorticoids Glucocorticoids
TRH TW-CX	Excitatory	TSH, (PRL) T3 and T4
GnRH GB-LIV	Acetylcholine ★	LH, FSH Androgens, Estrogens, Progestins
GHRH St-Sp	Histamine	GH IGF(1)
Somatostatin SI-Ht	NA	GH, (TSH, FSH, ACTH) IGF(1), T3 and T4
PRIH LI-Lu	Inhibitory ★	PRL Neurohormones
PHL BI-Kid	Serotonin ★	

	Acetylcholine	Dopamine	Inhibitory	Serotonin
1	High	High	High	High
2	High	High	High	Low
3	High	High	Low	Low
4	High	Low	Low	Low
5	Low	Low	Low	Low
6	Low	Low	Low	High
7	Low	Low	High	High
8	Low	High	High	High
9	High	High	Low	High
10	High	Low	High	High
11	Low	Low	High	Low
12	Low	High	Low	Low
13	High	Low	High	Low
14	Low	High	Low	High
15	High	Low	Low	High
16	Low	High	High	Low

When you hear music, many areas of your brain light up. Music triggers activity in the nucleus accumbens, a part of the brain that releases the feel good factor – **dopamine** and is involved with forming expectations. Also enhances **serotonin** and **oxytocin** synthesis.

The End
