

Cardiovascular System

HEART

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Cardiovascular System

- ▶ Transports **fuel** and **building materials** to the motor systems and all cells in the body
- ▶ Provides for the removal of **metabolic waste** by transporting it to the organs of elimination

Cardiovascular System

COMPONENTS:

- ▶ The heart muscle, the myocardium and the functional structures within the heart
- ▶ Vascular Tree:
 - Arteries
 - Capillaries
 - Veins

Cardiovascular System

CLOSELY RELATED:

- ▶ LUNGS – where gas exchange occurs
 - ▶ KIDNEYS – manage blood volume
 - ▶ LIVER – the metabolic powerhouse responsible for nutrient storage and as the transformation organ
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Cardiovascular System

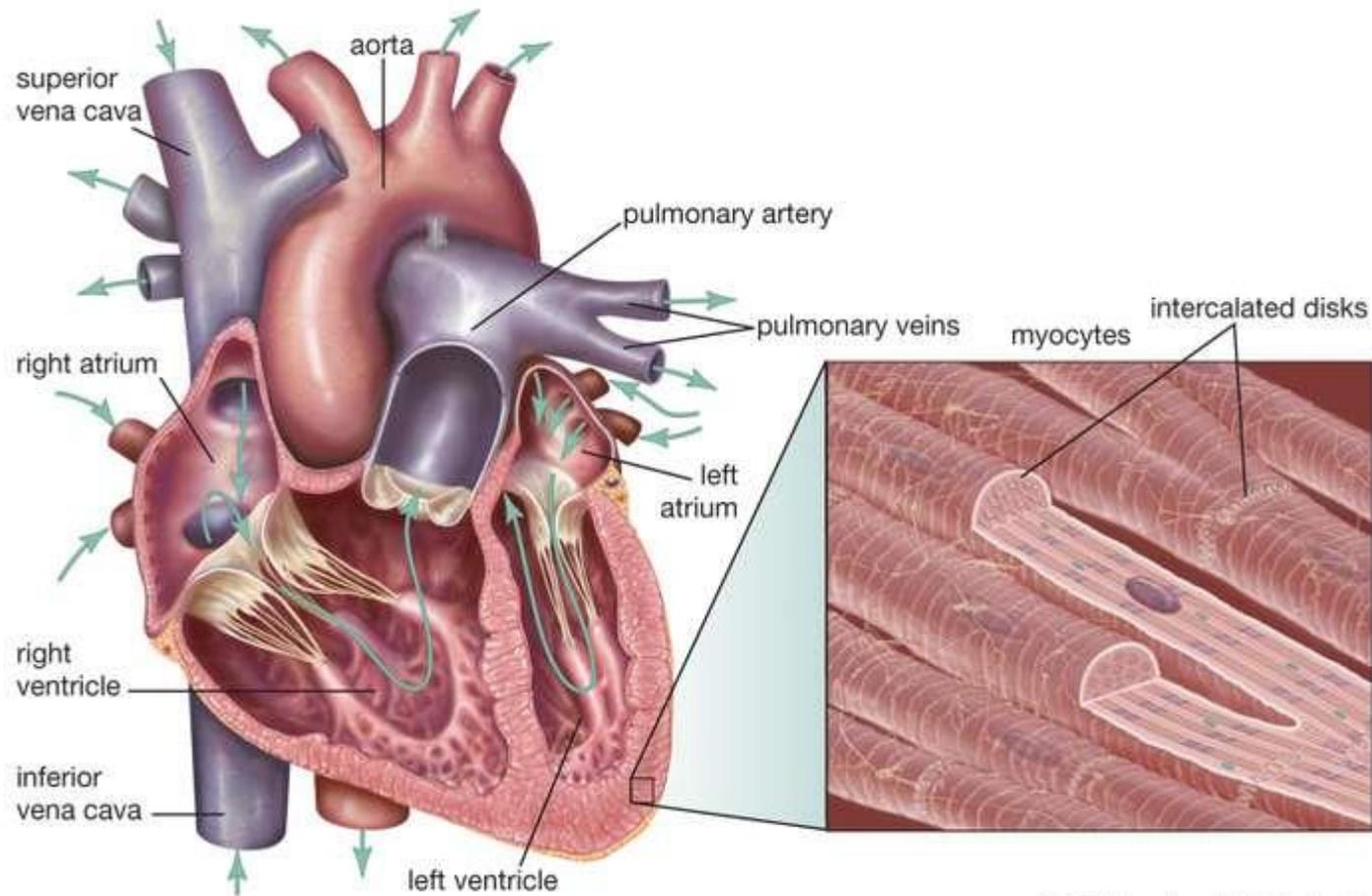
- ▶ HEART – a muscle that beats throughout life
 - Energy reserves come from mitochondria
 - Skeletal muscle – 1–2% mitochondria
 - Heart –30–35% mitochondria
 - Even subclinical deficiency show in the heart recordings
 - The rate and rhythm of the heart sensitive to nutrients
 - NUTRITIONAL THERAPY essential for CV system
- ▶ BLOOD QUALITY and blood's ability to CARRY nutrients, waste products, oxygen and carbon dioxide is critical to CV function.

The Physical Heart

MYOCARDIUM (Cardiac Muscle)

- ▶ Striated muscle: muscle tissue that is marked by transverse dark and light bands, is made up of elongated usually multinucleated fibers, and includes skeletal muscle & cardiac muscle.
- ▶ Cardiac muscle is similar to **skeletal muscle**, another major muscle type, in that it possesses contractile units known as **sarcomeres**; this feature, however, also distinguishes it from **smooth muscle**, the third muscle type. Cardiac muscle differs from skeletal muscle in that it exhibits rhythmic contractions and is not under voluntary control. The rhythmic **contraction** of cardiac muscle is regulated by the **sinoatrial node** of the heart, which serves as the heart's pacemaker.
- ▶ Contractility - the basis for its pumping action
- ▶ Rhythmicity -of the contraction

Heart cross section



HEART

- ▶ The amount of **blood** pumped by the heart per minute (the **cardiac output**) varies to meet the metabolic needs of peripheral tissues, particularly the skeletal muscles, **kidneys, brain, skin, liver**, heart, and **gastrointestinal tract**. The cardiac output is determined by the contractile force developed by the cardiac muscle cells, as well as by the frequency at which they are activated (rhythmicity). The factors affecting the frequency and force of heart muscle contraction are critical in determining the normal pumping performance of the heart and its response to changes in demand.

MYOCARDIUM

- ▶ STRIATED MUSCLE
- ▶ INTERNAL NERVOUS SYSTEM
- ▶ NETWORK OF CAPILLARIES, ARTERIES, VEINS

- ▶ When heart muscles are damaged, resulting in cellular hypoxia, heart muscle cells may die.
- ▶ If survivable either new cardiac muscle cells formed or scar tissue is inserted in its place as a kind of filler tissue.
- ▶ Scar tissue doesn't have **contraction** properties

MYOCARDIUM

- ▶ Scar tissue
 - Disorganized and non-functional
 - It does carry an electric charge
 - May divert the normal electrical charge creating arrhythmias

MYOCARDIUM NUTRIENTS

- ▶ CoQ Zyme Forte 100 Plus
- ▶ Bio B 100
- ▶ Bio C Plus
- ▶ Bio D Mulsion Forte
- ▶ Biomega 1000
- ▶ E mulsion 200
- ▶ Butyric CalMag
- ▶ Cytozyme H
- ▶ Gammanol Forte
- ▶ Mg Zyme or Bio CMP
- ▶ VasculoSIRT

Endocardium

- ▶ The innermost layer of tissue that lines the chambers of the heart. Its **cells** are **embryologically** and **biologically** similar to the **endothelial** cells that line **blood vessels**. The endocardium also provides protection to the valves and heart chambers.
- ▶ The endocardium underlies the much more voluminous **myocardium**, the muscular tissue responsible for the contraction of the heart. The outer layer of the heart is termed **epicardium** and the heart is surrounded by a small amount of fluid enclosed by a fibrous sac called the **pericardium**.

Endocardium

- ▶ The endocardium, which is primarily made up of endothelial cells, controls myocardial function
 - ▶ The endocardial endothelium may also act as a kind of blood–heart barrier (analogous to the **blood–brain barrier**), thus controlling the ionic composition of the extracellular fluid in which the **cardiomyocytes** bathe.
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Endocardium

- ▶ The heart chambers and valves may be damaged from infections, inflammatory metabolites, toxins and immune reactions.
 - ▶ These may lead to plaque deposits, scarring and atherosclerosis.
 - ▶ If plaque deposits attach to the inner wall of the heart valves and chambers, it will affect the shape and function of the inner heart, producing abnormal sounds and irregular electrical patterns within the myocardium.
 - ▶ If plaque breaks it can travel and cause myocardial infarction, pulmonary or brain embolism.
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Endocardium

- ▶ ELASTIC FIBERS found in the muscles and inner chambers of the heart
- ▶ Nutritional intervention may provide support and healing to the endocardium:
 - Chelation therapy
 - Antimicrobial support
 - Muscle physiology support:
 - Bio B 100
 - CoQ Zyme 100 Plus
 - Carnitine
 - Taurine
 - Bio K Forte
 - CaMg Zyme
 - Cytozyme H

Endocardium

▶ ORAL CHELATION THERAPY:

- Porphyrzyme 3 tid
- Intenzyme Forte 10 tid
- Multi Mins 3 bid

▶ Microbial Support:

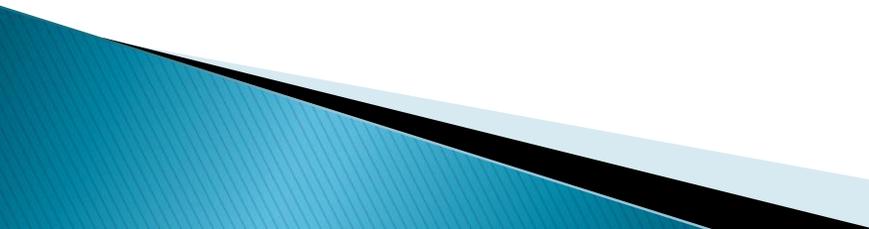
- Berberine
- ADP
- IAG
- GARLIC PLUS
- BIO FCTS

Endocardium

▶ ELASTIC PROPERTIES:

- Purified Chondroitin Sulfates or Chondro Plus
- Bio FCTS
- Bio-Cyanidins
- Bio C Plus

CARDIAC NERVOUS SYSTEM

- ▶ The nerves within a heart provide a regular rhythm
 - ▶ The heart can function without Autonomic Nervous System (ANS), but sinoatrial node, the heart's internal pace maker, has a set of between 80–100 beats per minute.
 - ▶ Parasympathetic influence sets up normal resting rate in the 60–70 bpm range. The resting heart rate and blood pressure indicate the extent of parasympathetic tone.
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CARDIAC NERVOUS SYSTEM

- ▶ CARDIAC RHYTHM
 - ▶ Bio 3BG (B1 is a nerve-promoting and “anti-paralysis” factor, by insuring optimal nerve transmission.
 - ▶ Phosphatidylcholine – phospholipid supports cell membrane integrity.
 - ▶ Bio CMP
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Heart Regulation

- ▶ Vagal input and parasympathetic tone provide a dampening effect on the Sinoatrial SA node (set point 60–100 bpm)
- ▶ **Vagal tone** refers to activity of the **vagus nerve**, the 10th **cranial nerve** and a fundamental component of the **parasympathetic** branch of the **autonomic nervous system**. This branch of the nervous system is not under conscious control and is largely responsible for the regulation of several body compartments at rest. Vagal activity results in various effects, including: **heart rate** reduction, **vasodilation/constriction** of **vessels**, glandular activity in the heart, **lungs**, and **digestive tract**, liver, immune system regulation as well as control of gastrointestinal sensitivity, motility and inflammation

Heart Regulation

- ▶ **Vagal innervation of the heart**
- ▶ **Heart rate** is largely controlled by the heart's internal pacemaker activity. In a healthy heart, the main pacemaker is a collection of cells on the border of the **atria** and **vena cava** called the **sinoatrial node**. Heart cells exhibit automaticity, the ability to generate **electrical activity** independent of external stimulation. The electrical activity spontaneously generated by the sinoatrial node sets the pace for the rest of the heart.
- ▶ In absence of external stimuli, sinoatrial pacing generally maintains the heart rate in the range of 60–100 beats per minute (bpm). The two branches of the **autonomic nervous system** work together to increase or slow the heart rate. The vagus nerve acts on the sinoatrial node, slowing its conduction and modulating vagal tone, via the **neurotransmitter acetylcholine** and downstream changes to **ionic currents** and calcium of heart cells. Because of its effect on heart rate, and cardio health, vagal tone can be measured and understood by examining its correlation to heart rate modulation and **heart rate variability**.

Heart Regulation

- ▶ While baseline **vagal input** is constant, the degree of stimulation it exerts is regulated by a balance of **inputs** from sympathetic and parasympathetic divisions of the autonomic nervous system, with parasympathetic activity generally being dominant.
- ▶ Autonomics and hormonal mediators regulate the heart rate and rhythm.
- ▶ A depressed PSNS or an overactive sympathetic nervous system leads to an elevated pulse rate, not unlike hormonal hyperfunctioning such as hyperthyroidism and hyperadrenia – all lead to tachycardia.
- ▶ Nerve function is affected by nutrient deficiencies, vascular changes, toxin accumulation, infections, autoimmune conditions or depressed trophic function.

Heart Regulation

PARASYMPATHETIC DOMINANCE

- ▶ Phosphorus – Super Phosphozyme – sympathetic stimulation
- ▶ Chlorides – HCL Plus – Acidifying agents
- ▶ Catecholamines – L-Tyrosine or DopaTropic – promotes catecholamines (hormones made by adrenal glands), adrenal, thyroid.
- ▶ Adrenal Glandulars – Cytozyme AD, ADB5
- ▶ B – Bio 3BG

Heart Regulation

SYMPATHETIC DOMINANCE

- ▶ B vitamins G Fractions – Bio-GGG-B
- ▶ Alkaline Ash minerals
 - Bio CMP
 - Potassium HP
 - Mg Zyme, Ca/Mg Zyme
- ▶ Amino Acids, neurotransmitters
 - Phosphatidylserine
 - Neuro-5-HTP Plus
- ▶ Anxiolytics
 - VHP
 - De-Stress
 - Li Zyme Forte

NITRIC OXIDE

- ▶ In 1992, the **American Association for the Advancement of Science** proclaimed it the “molecule of the year.” Nitric oxide’s physiological importance was officially recognized in 1998 when a **Nobel Prize was awarded** to three scientists who discovered that it’s a key molecule in the cardiovascular system and helps keep blood vessels healthy and regulate blood pressure. Since then, nitric oxide has also been found to be essential in many other bodily systems (such as the immune system and the nervous system, including the brain) and in many chronic conditions and diseases (such as chronic inflammation, erectile dysfunction, and cancer). This has led researchers to focus on nitric oxide as a potential target for medical therapies.

NITRIC OXIDE

- ▶ NO can be a double-edged sword. Produced by the body in small amounts where it is needed, it is essential and helps maintain health. But in larger amounts, it can be harmful and damage cells.
- ▶ **How does nitric oxide affect the heart and blood vessels?**
- ▶ Released by the inner layer of cells (endothelium) of blood vessels, nitric oxide relaxes the vessels and keeps them flexible, allowing them to dilate, boosting blood flow, and helping to control blood pressure. Nitric oxide also has anti-inflammatory effects and helps prevent platelets and white blood cells from adhering to the lining of blood vessels, thus reducing the risk of plaque development. As we age, our cells produce less nitric oxide, so blood vessels become less flexible, which contributes to hypertension, inflammation in blood vessels, and atherosclerosis (plaque buildup)—that is, cardiovascular disease. And there's a vicious cycle: increasing blood pressure, inflammation, and atherosclerosis, in turn, impair the production and action of nitric oxide.

NITRIC OXIDE

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|------------------------|---|
| Cardiovascular system | <ul style="list-style-type: none">•Controls vascular tone.•Relaxes vascular smooth muscles and reduces blood pressure.•Dilates vessels and relieves the pain of angina.•Inhibits the aggregation of platelets within the vessels and prevents thrombotic events. |
| Nervous system | <ul style="list-style-type: none">•Acts as a neurotransmitter, including in the autonomic nervous system.•Increases cerebral blood flow and oxygenation to the brain.•One of the important mediators in penile erection during sexual arousal. |
| Lungs | <ul style="list-style-type: none">•Dilates pulmonary vessels.•Beneficial in Adult Respiratory Distress Syndrome, Pulmonary hypertension and Chronic Obstructive Airway Disease.•Produced in abnormal amounts in inflammatory lung conditions.•Concentration of NO in exhaled air is a marker of airway inflammation. |
| Gastrointestinal tract | <ul style="list-style-type: none">•Regulates the relaxation of smooth muscles.•Controls peristalsis and the function of sphincters. |
| Renal system | <ul style="list-style-type: none">•Due to its vasodilatory effect, increases blood flow to the kidney.•Increases the glomerular filtration rate and the production of urine. |
| Immune system | <ul style="list-style-type: none">•Modulates T cell-mediated immune response. |

NITRIC OXIDE

- ▶ NitroGreens
- ▶ L-Arginine
- ▶ Argizyme
- ▶ Oorganic 15

INSULIN RESISTANCE

- ▶ Berberine HCL
 - ▶ GlucoBalance
 - ▶ GlucoResolve
 - ▶ Bio GlycozymeForte
 - ▶ Cr Zyme
 - ▶ Mn Zyme
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