

# Magnesium: A wonder material?

T.S.N. Sankara Narayanan

*National Metallurgical Laboratory  
Madras Centre, CSIR Complex  
Taramani, Chennai-600 113*

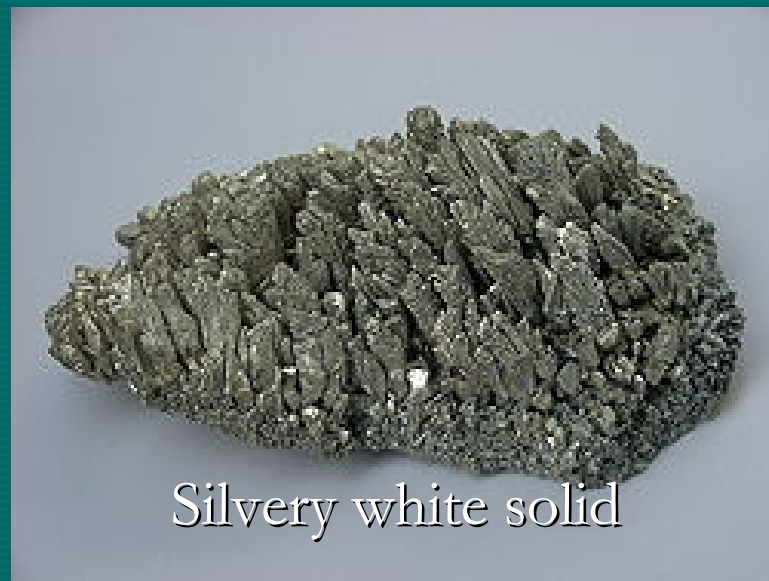
E-mail: [tsnsn@rediffmail.com](mailto:tsnsn@rediffmail.com)



- ☞ This presentation is aimed to give a glimpse of the role of Mg in human life and health
- ☞ The information provided is food for thought
- ☞ It does not advocate any recommendations to follow
- ☞ Please consult your family doctor before you take the next step!



An alkaline earth metal



Pure Mg is a silvery-white metal; burns with a dazzling brilliance

# Mg in the human body – Some facts

- ♣ Magnesium is the
  - ♣ Second most abundant mineral in cells after potassium
  - ♣ Second most abundant intracellular cation
  - ♣ Fourth most abundant cation in the body
- ♣ Magnesium is necessary for the metabolism of carbohydrates, fats and amino acids
- ♣ It is essential for the functions of muscles and nerves and for the formation of bones and teeth.
- ♣ It counteracts and regulates the influence of calcium.
- ♣ Its deficiency in the body is nothing short of disastrous for cell life

*Magnesium is the most important mineral to man and  
all living organism*

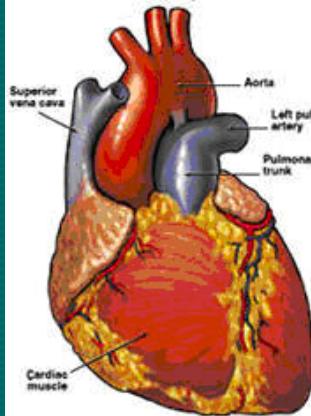
-Dr. Jerry Aikawa

# Heart attack



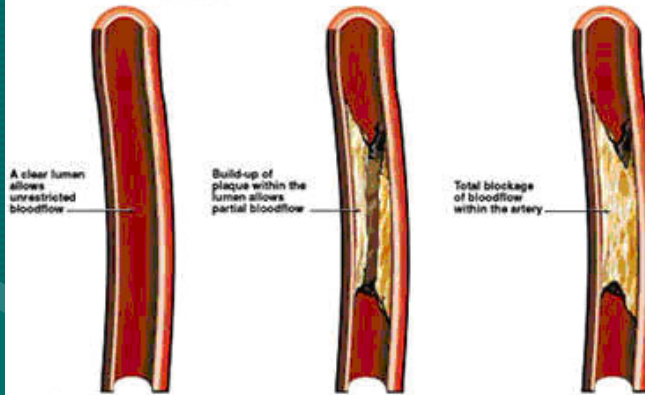
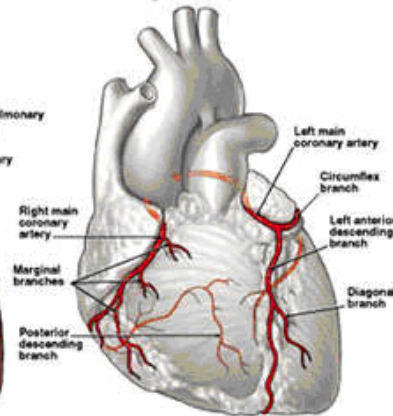
## Anatomy of the Coronary Arteries with Potential Blockages

External Anatomy of the Heart



Anterior view

Coronary Arteries of the Heart

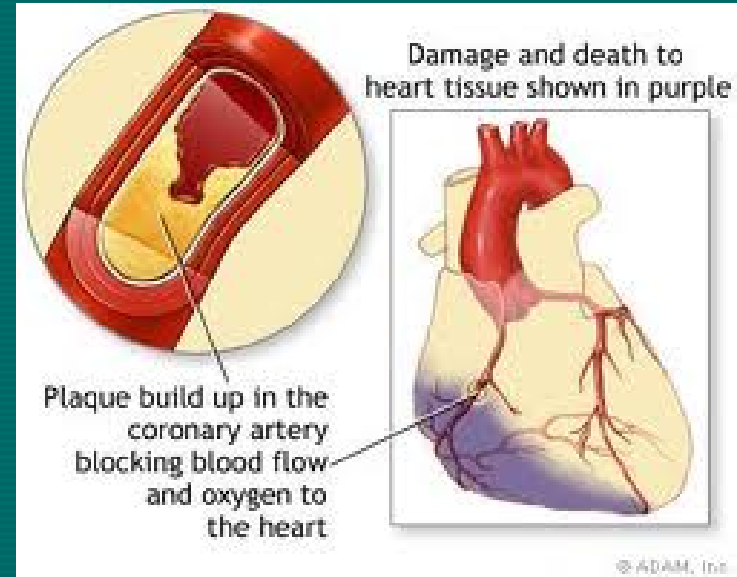


A clear lumen allows unrestricted bloodflow

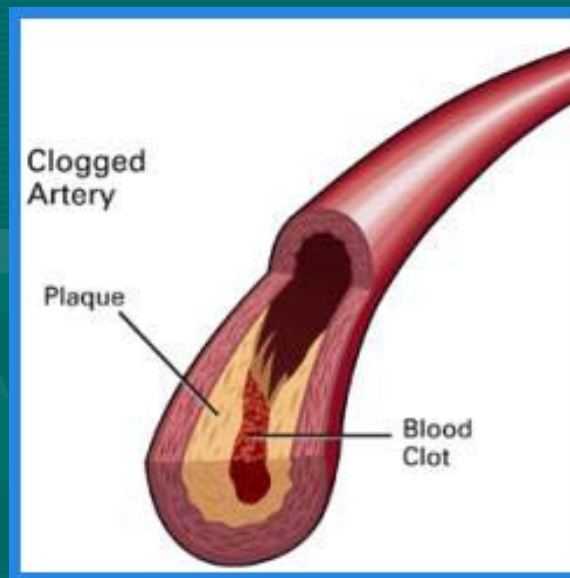
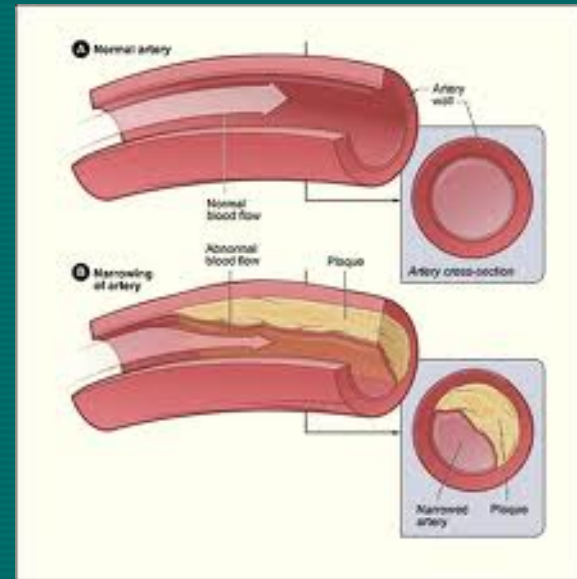
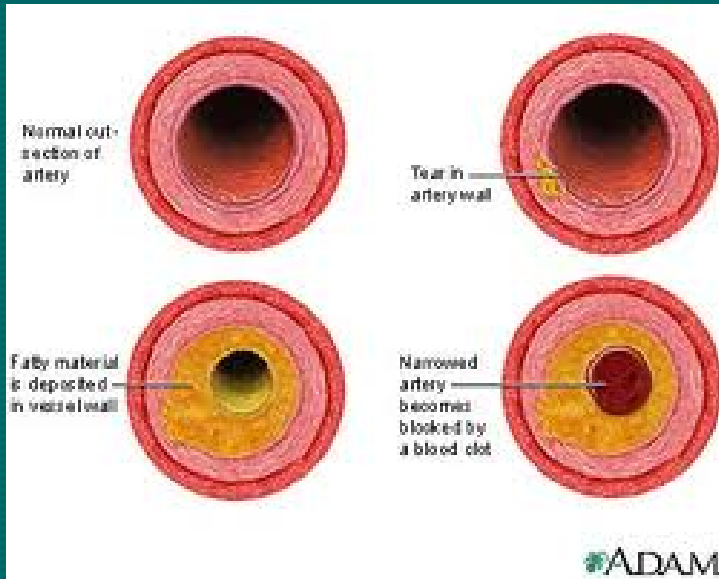
Build-up of plaque within the lumen allows partial bloodflow

Total blockage of bloodflow within the artery

Cut-away view of the coronary artery



© ADAM, Inc





## Heart Attack Symptoms

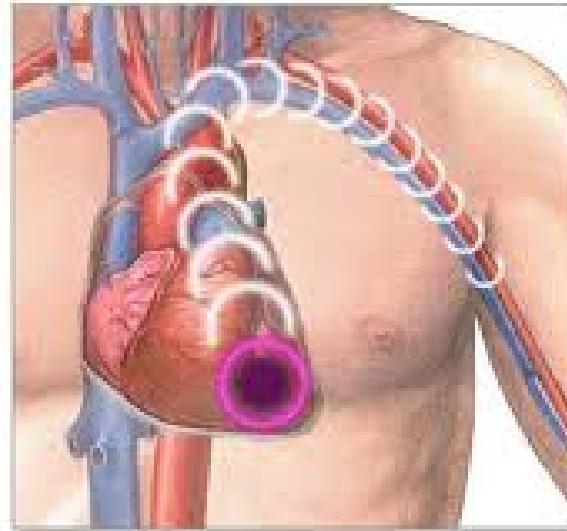
Men and women may experience some common symptoms. But there are differences.



- Nausea/vomiting
- Jaw pain
- Back pain



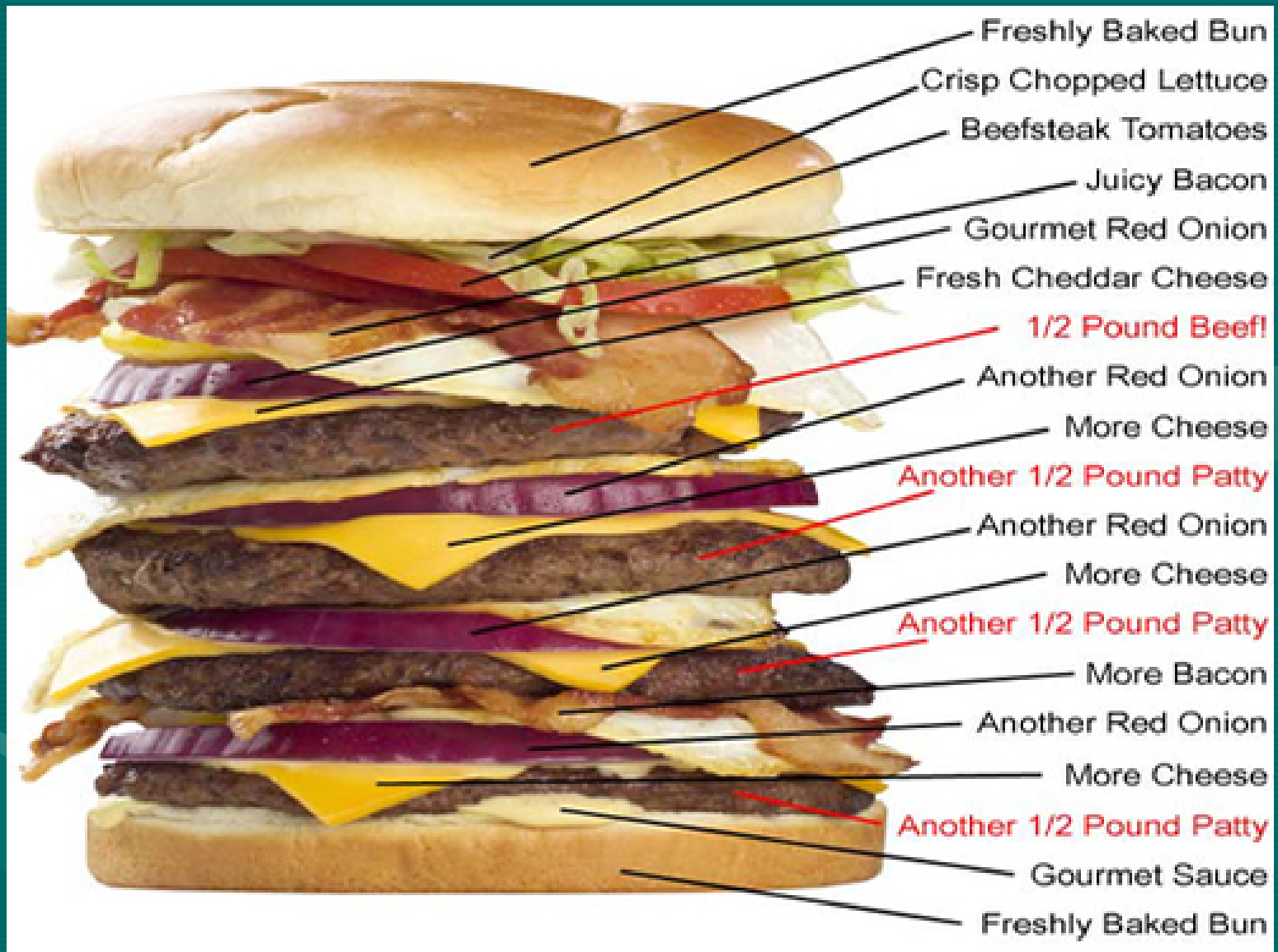
- Chest discomfort
- Arm pain
- Shortness of breath



Pain radiating down arm might signal heart attack

# Reasons?





Many of us do not eat like this stuff



... but some of these stuff – Yes!

## Mg and heart attack

- ✦ Adequate levels of magnesium are essential for the heart muscle
- ✦ Those who die from heart attacks have very low magnesium but high calcium levels in their heart muscles
- ✦ Patients with coronary heart disease who have been treated with large amounts of magnesium survived better than those with other drug treatments.
- ✦ Magnesium dilates the arteries of the heart and lowers cholesterol and fat levels

# Stroke



# Stroke

- ✦ Stroke is the third leading cause of death and the most common cause of adult disability
- ✦ 50% suffer paralysis on one side of their body.
- ✦ 35% have symptoms of depression
- ✦ 30% can't walk without assistance
- ✦ 26% need help with daily activities
- ✦ 26% are living in nursing homes
- ✦ 19% have speech or language problems

# Mg and Stroke

❖ Magnesium is important in

- ✓ Lowering blood pressure
- ✓ Keeping the heart muscle from going into spasm
- ✓ Lowering cholesterol
- ✓ Help heal the damage in the brain caused by a stroke

Dr. Carolyn Dean

❖ Mg deficiency can cause metabolic changes that may contribute to Strokes

National Institute of Health







**Even this guy?**



# Fatigue- Why?

- ✦ Enzymes - protein molecules stimulate every chemical reaction in the body
- ✦ Magnesium is required to make hundreds of these enzymes work - to produce and store energy
- ✦ Lack of Mg results in Fatigue
- ✦ Mg supplementation - enzyme systems that require magnesium help restore normal energy levels



Without magnesium there is  
“no energy, no movement and no life”.

- Dr. Carolyn Dean

# Memory and Cognitive Function



# Magnesium and Memory

- Ω Magnesium deficiency may lead to decreased memory and learning ability, while an abundance of magnesium may improve cognitive function
  - Ω Magnesium may reverse middle-age memory loss
- Massachusetts Institute of Technology

# Mg and Cognitive Function

- ✦ Magnesium is essential in regulating central nervous system excitability
- ✦ magnesium-deficiency may cause aggressive behavior, depression, or suicide
- ✦ Magnesium calms the brain and people do not need to become severely deficient in magnesium for the brain to become hyperactive.

# Detoxification





# Detoxification and Chelation – Role of Mg?

- ✓ Human exposure to heavy metals has risen dramatically in the last 50 years as a result of an exponential increase in the use of heavy metals in industrial processes and products.
- ✓ Magnesium is very important for detoxification and it, along with other minerals like zinc, displaces toxic heavy metals from the body
- ✓ Sufficient magnesium levels not only leads to safer detoxification, it also makes chelation possible

-Dr. Boyd Haley

# Cancer



## Mg and Cancer

- It is generally accepted that a higher magnesium intake in the drinking water is associated with reduced cancer incidence
- Preliminary studies suggest a relationship between low intake of magnesium and kidney cancer.

School of Public Health  
University of Minnesota



# Mg and Pregnancy

## Mg and pregnancy

- ✓ The role of magnesium in our lives continues its importance when we are in the womb
- ✓ When pregnant, magnesium helps build and repair body tissue in both mother and fetus
- ✓ Magnesium relaxes muscles and research suggests that proper levels of magnesium during pregnancy can help keep the uterus from contracting until week 35

A background image showing two hands shaking in a firm grip, rendered in a dark teal color against a lighter teal background. The hands are positioned horizontally across the middle of the frame, with the fingers interlocked in a handshake.

# Magnesium vs. Calcium

# Magnesium vs. Calcium

- ✦ Calcium and magnesium are opposites in their effects on our body structure
- ✦ The more rigid and inflexible our body structure is, the less calcium and the more magnesium we need.
- ✦ The ratio of calcium to magnesium is vital for cell membranes and the Blood Brain Barrier.

## Ca/Mg ratio and heart attacks

- ✦ Countries with the highest calcium to magnesium ratios in soil and water have the highest incidence of cardiovascular disease
- ✦ At the top of the list is Australia
- ✦ In contrast, Japan with its low cardiac death rate, the daily magnesium intake was cited as high as 560 milligrams.
- ✦ The widespread shortage of magnesium, not calcium, in the western diet is attributed to the high rates of sudden-death heart attack.



# Calcium and Potassium vs. Magnesium

- ♣ It is magnesium that controls the fate of potassium and calcium in the body.
- ♣ If magnesium is insufficient
  - ♣ Potassium and calcium will be lost in the urine
  - ♣ Calcium will be deposited in the soft tissues (kidneys, arteries, joints, brain, etc.).
- ♣ Calcium causes muscles to contract, while magnesium helps them relax.

# Magnesium vs. Calcium

- ✓ A healthy cell has high Mg and low Ca levels
- ✓ The higher the Ca level and the lower the Mg level in the extra-cellular fluid, the harder is it for cells to pump the calcium out
- ✓ Up to 30% of the energy of cells is used to pump Ca out of the cells
- ✓ With low Mg levels, the mitochondria gradually calcify and energy production decreases.

# Magnesium vs. Calcium

- Ω Without sufficient Mg, Ca can collect in the soft tissues and cause arthritis
- Ω Mg acts as a smooth muscle relaxant by altering extracellular Ca influx and intracellular phosphorylation reactions
- Ω With a low Mg intake, Ca moves out of the bones to increase tissue levels, while a high Mg intake causes Ca to move from the tissues into the bones
- Ω Thus, high Mg levels leads to bone mineralization.

# Mg deficiency

The background is a solid teal color. In the lower half, there is a faint, semi-transparent image of two hands shaking, rendered in a lighter shade of teal. The text 'Mg deficiency' is centered in the upper half of the image.

# Mg deficiency

- ❖ About 68% of Americans do not consume enough Mg
- ❖ Magnesium deficits have been correlated to
  - Allergies
  - Asthma
  - Attention deficit disorder
  - Anxiety
  - heart disease
  - muscle cramps

-Massachusetts Institute of Technology

# Symptoms of Mg deficiency

- Early symptoms:
  - Irritability
  - Anxiety (including Obsessive Compulsion Disorder)
  - Fatigue
  - Insomnia
  - Muscle twitching
  - Apathy
  - Confusion
  - Poor memory
  - Poor attention
  - Reduced ability to learn

# Symptoms of Mg deficiency

- Moderate deficiency symptoms can consist of the above and possibly
  - Rapid heartbeat
  - Irregular heartbeat
  - Other cardiovascular changes (some being lethal)

# Symptoms of Mg deficiency

- Severe deficiency symptoms can include one or more of the above symptoms and more severe symptoms including
  - Full body tingling
  - Numbness
  - Sustained contraction of the muscles along with hallucinations and delirium (including depression)
  - Dementia (Alzheimer's Disease)



# How much magnesium we need everyday?

We need an average of 200 milligrams more magnesium than we get from the average diet.

Dr. Mildred Seelig  
President, American College of Nutrition

Table 2: Recommended Dietary Allowances for magnesium for children and adults.<sup>38</sup> (National Institute of Health)

Age (years)	Male (mg/day)	Female (mg/day)	Pregnancy (mg/day)	Lactation (mg/day)
1-3	80	80	N/A	N/A
4-8	130	130	N/A	N/A
9-13	240	240	N/A	N/A
14-18	410	360	400	360
19-30	400	310	350	310
31+	420	320	360	320

## Reasons for Mg deficiency

- ✓ Our ancestors ate foods high in magnesium and low in calcium
- ✓ Currently, we tend to take much more calcium (in the form of dairy products) than our ancestors
- ✓ In addition, our sugar and alcohol consumption is higher than our ancestors
- ✓ Both sugar and alcohol increase magnesium excretion through the urine
- ✓ The quality of our soil has deteriorated as well due to the use of fertilizers that contain large amounts of potassium a magnesium antagonist

## Reasons for Mg deficiency

- 💧 Increasing calcium in the diet significantly reduces the absorption of magnesium
  - 💧 In addition:
    - ✓ Diarrhea
    - ✓ Extreme athletic physical training
    - ✓ Sodas (cola type sodas, both diet and regular)
    - ✓ Sodium (high salt intake)
    - ✓ Stress (physical and mental)
    - ✓ Intense sweating
- all of them diminish magnesium levels.

# Other drugs that cause loss of body Mg

- Cocaine
- Beta-adrenergic agonists (for asthma)
- Corticosteroids (CS) (for asthma)
- Theophylline (for asthma)
- Diuretics
- Thiazide
- Phosphates (found in cola drinks)
- Nicotine
- Insulin

**Table 1: the magnesium content of common foods**

<b>Food</b>	<b>MAGNESIUM Content (milligrams per 100g)</b>
Pumpkin seeds (roasted)	532
Almonds	300
Brazil nuts	225
Sesame seeds	200
Peanuts (roasted, salted)	183
Walnuts	158
Rice (whole grain brown)	110
Wholemeal bread	85
Spinach	80
Cooked beans	40
Broccoli	30
Banana	29
Potato (baked)	25
White bread	20
Yoghurt (plain, low fat)	17
Milk	10
Rice (white)	6
Cornflakes	6 ('Frosties' or 'Honeynut')
Apple	4
Honey	0.6

Source; USDA Nutrient Database

**Pumpkin seeds, raw**  
**0.25 cup - 34.50 grams - 186.65 calories**

<b>Nutrient</b>	<b>Amount</b>	<b>DV (%)</b>	<b>Nutrient Density</b>	<b>World's Healthiest Foods Rating</b>
manganese	1.04 mg	52.0	5.0	very good
magnesium	184.58 mg	46.1	4.5	very good
phosphorus	405.03 mg	40.5	3.9	very good
tryptophan	0.11 g	34.4	3.3	good
iron	5.16 mg	28.7	2.8	good
copper	0.48 mg	24.0	2.3	good
vitamin K	17.73 mcg	22.2	2.1	good
zinc	2.57 mg	17.1	1.7	good
protein	8.47 g	16.9	1.6	good

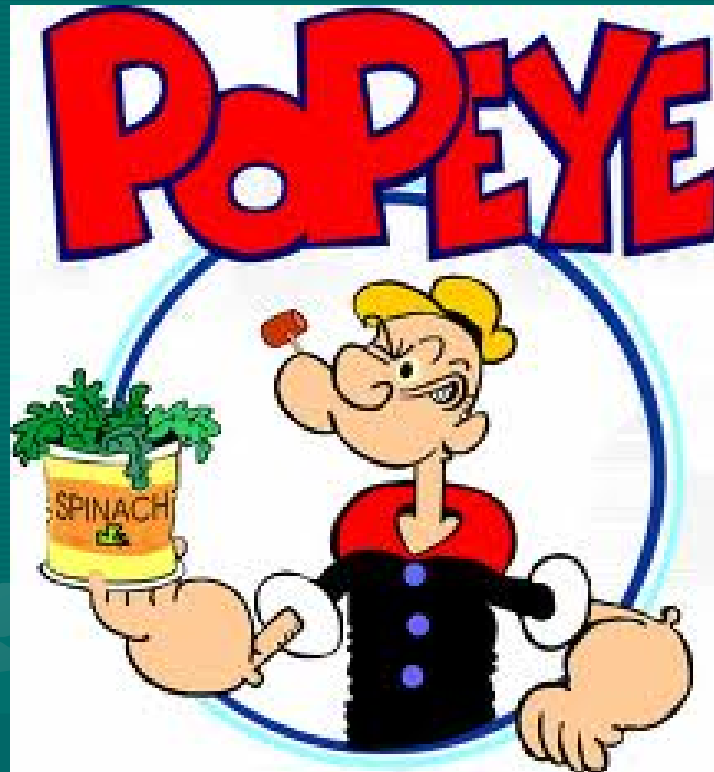
# What is your next action?





Thinking of spinach?

What comes to the mind?



Is he very active because of proper Mg intake through spinach?

# Testimonials

- Magnesium is the most important mineral to man and all living organism

Dr. Jerry Aikawa

- There is no substitute for magnesium; it's as close as a metal comes to being as necessary as air.

## Concluding remarks

- Magnesium is important for us from before we are born until our last breath in life.
- There should be no doubt in anyone's mind that we will live healthier, happier and longer lives if we make sure we satisfy completely our body's need for magnesium.
- Can we consider Mg as a wonder material?
- Why not?

**Thank you**

