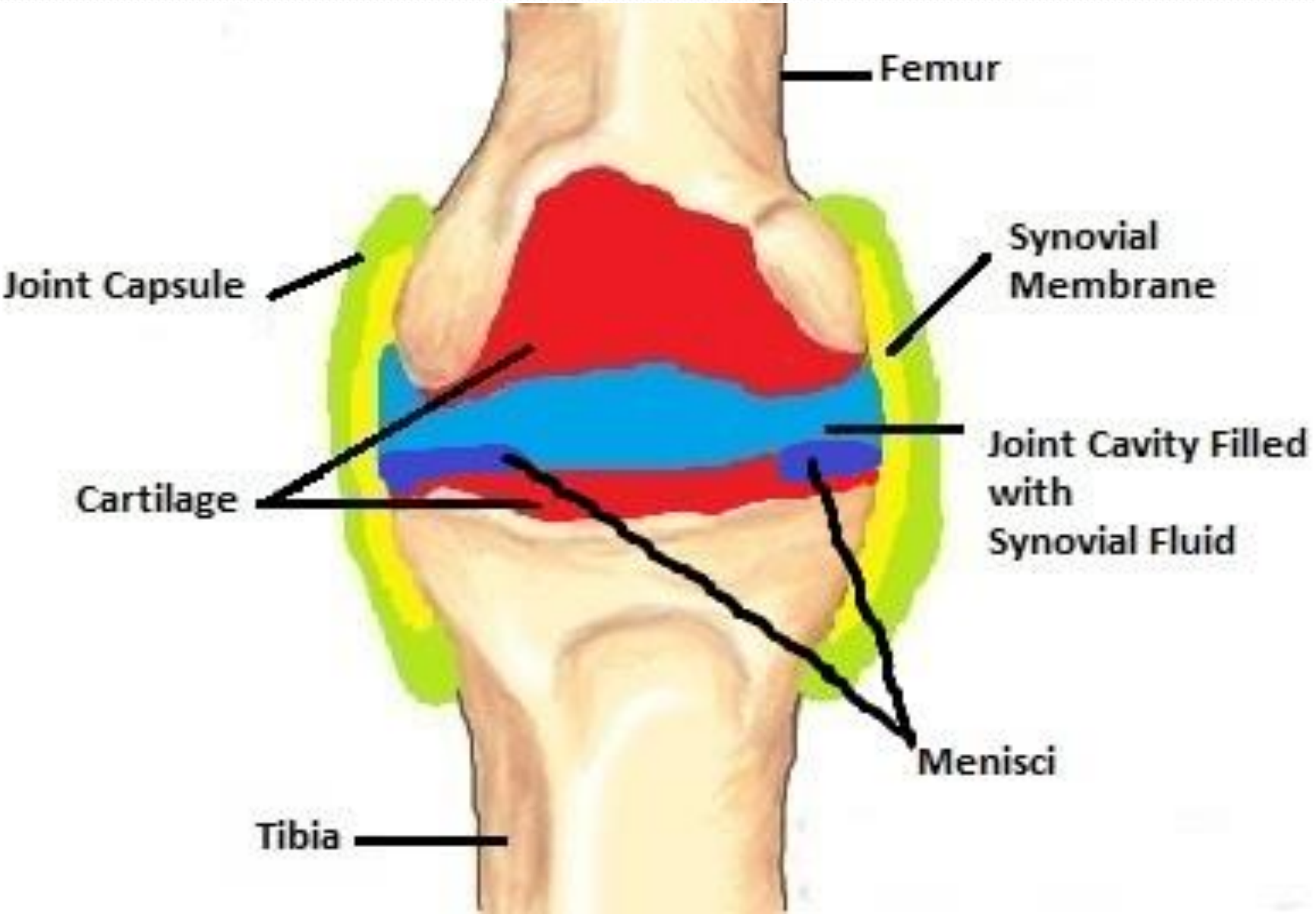
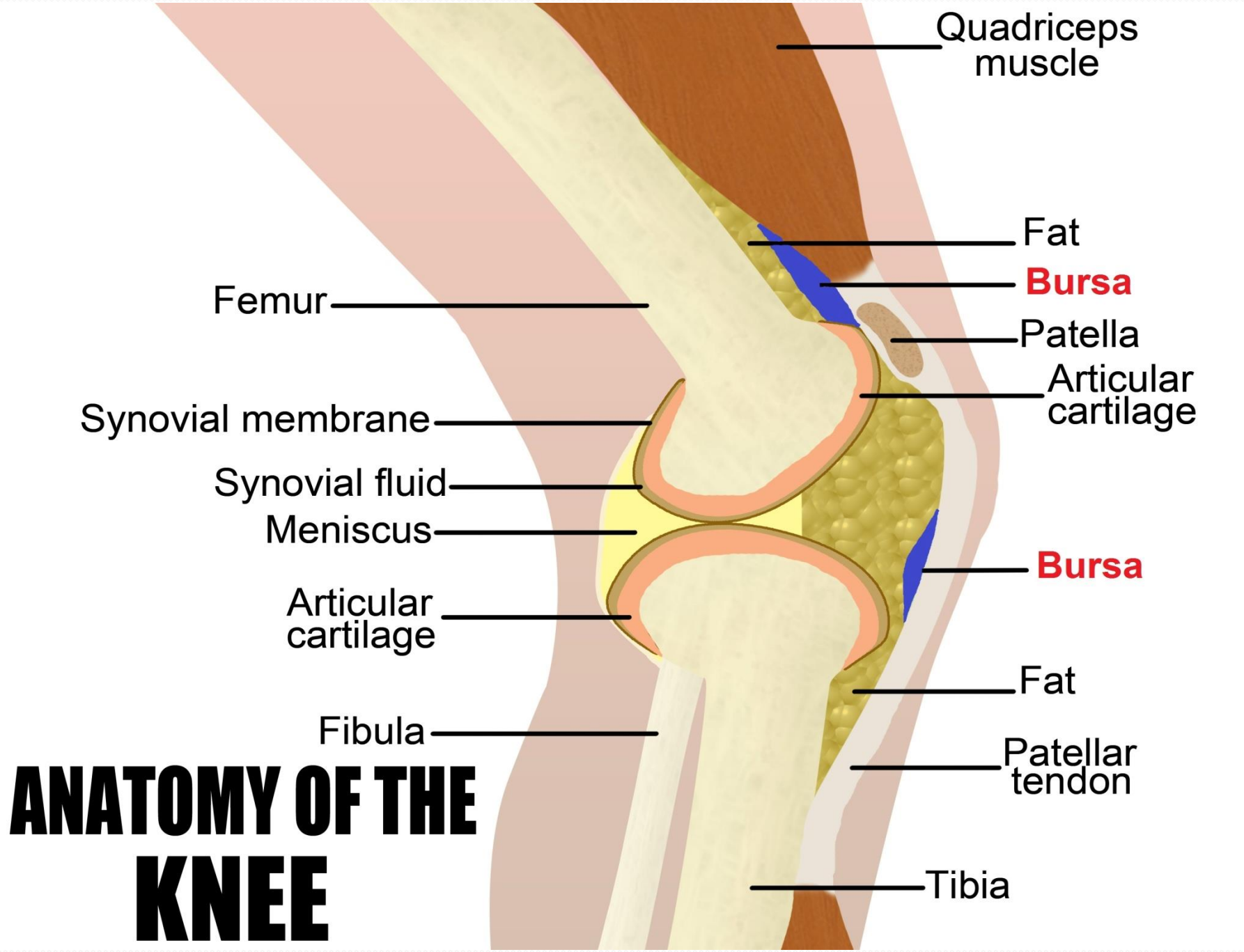
Lecture 66:

Nutrition of the Joints

Copyright Protection:

Structure of a Joint:





ANATOMY OF THE KNEE

Joint pain results from:

1) Damage to cartilage as in Osteoarthritis(OA).
2) Damage to synovial membrane as in Rheumatoid Arthritis (RA).
3) Decreased synovial Fluid.
4) Damage to meniscus (in knees only).
5) Injury to surrounding ligaments and tendons.
6) Deposition of uric acid.
7) Referral pain.

The Joints Are Made of:

Synovial Fluid:

1) Water

2) Hyaluronic acid (Hyaluronan)

Cartilage:

1) Gylcosaminoglycans (GAG):

- Glucosamine
- Chondroitin Sulfate
- Dermatan Sulfate
- Keratan Sulfate

2) Collagen (Protein):

- Glycine
- Lysine → Hydroxylysine
- Proline → Hydroxyproline

Proper Nutrition and Supplementation:

- Reduce pain.
- Decrease inflammation.
- Improve flexibility.
- Help repair cartilage.
- Accelerate healing process.

Decreased Synovial Fluid:

Symptoms

- Pain
- Joint stiffness
- Loss of joint flexibility
- Cracking or Popping Sound *

Dietary Recommendations:

- 1) Drink plenty of water: more than 3 liters a day.
- 2) Hyaluronic acid: 400 mg per day.

Cracking or Popping Sound:

Decreased synovial fluid

Negative pressure within the joint

Release of dissolved gases (mostly Co2)

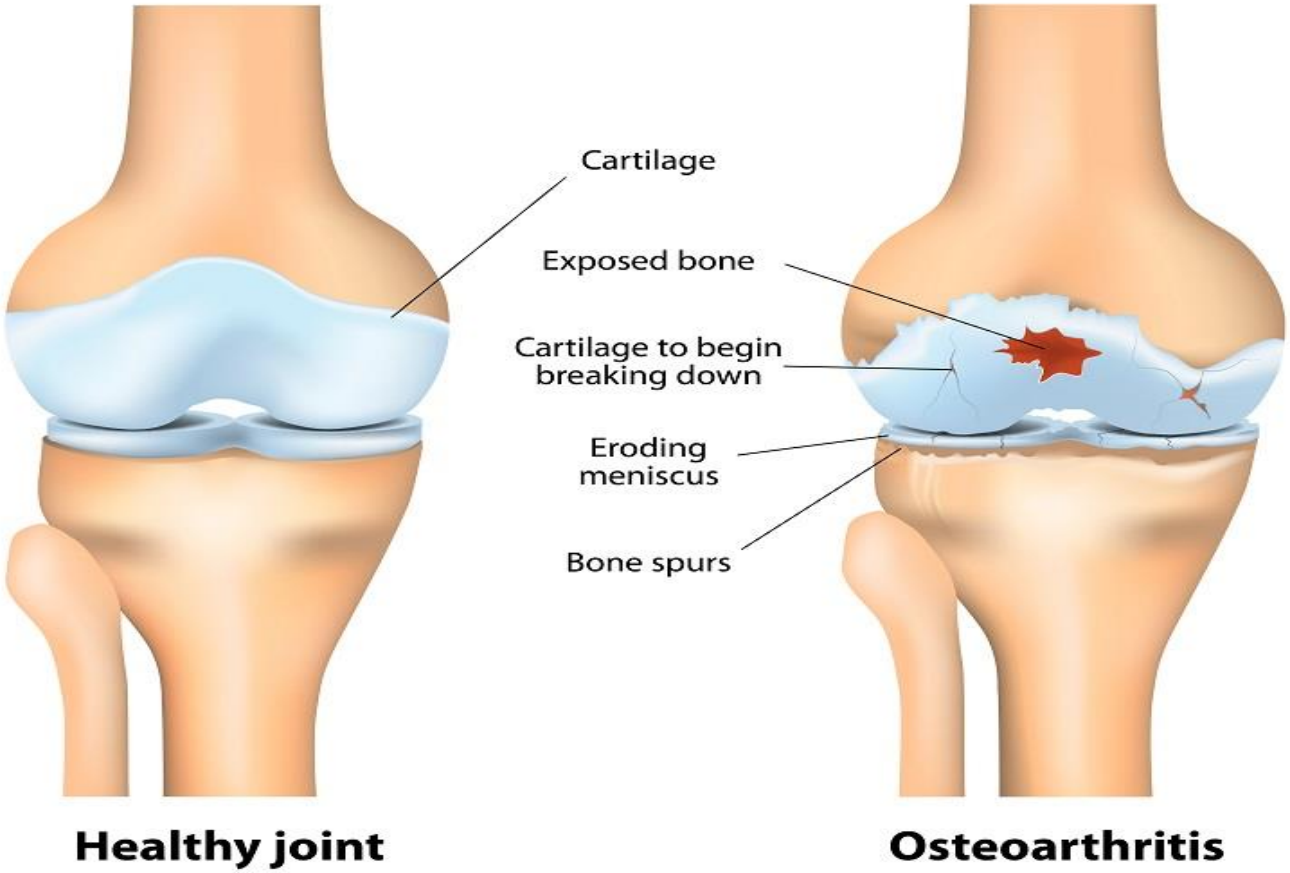
Formation of bubbles

Cracking sound

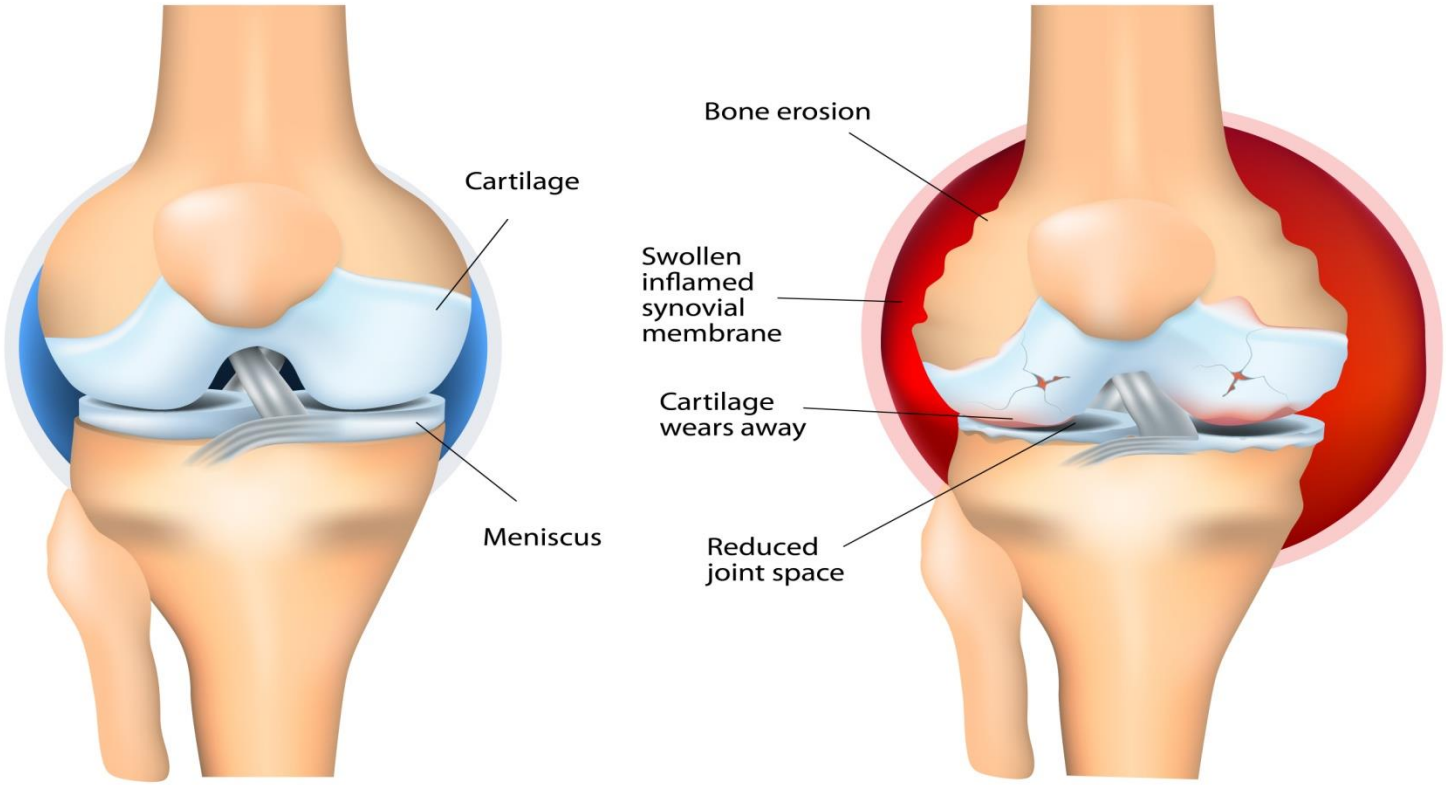
*This process is called "cavitation" within the joint.

** No arthritis or other aliments comes from cracking.

OSTEOARTHRITIS

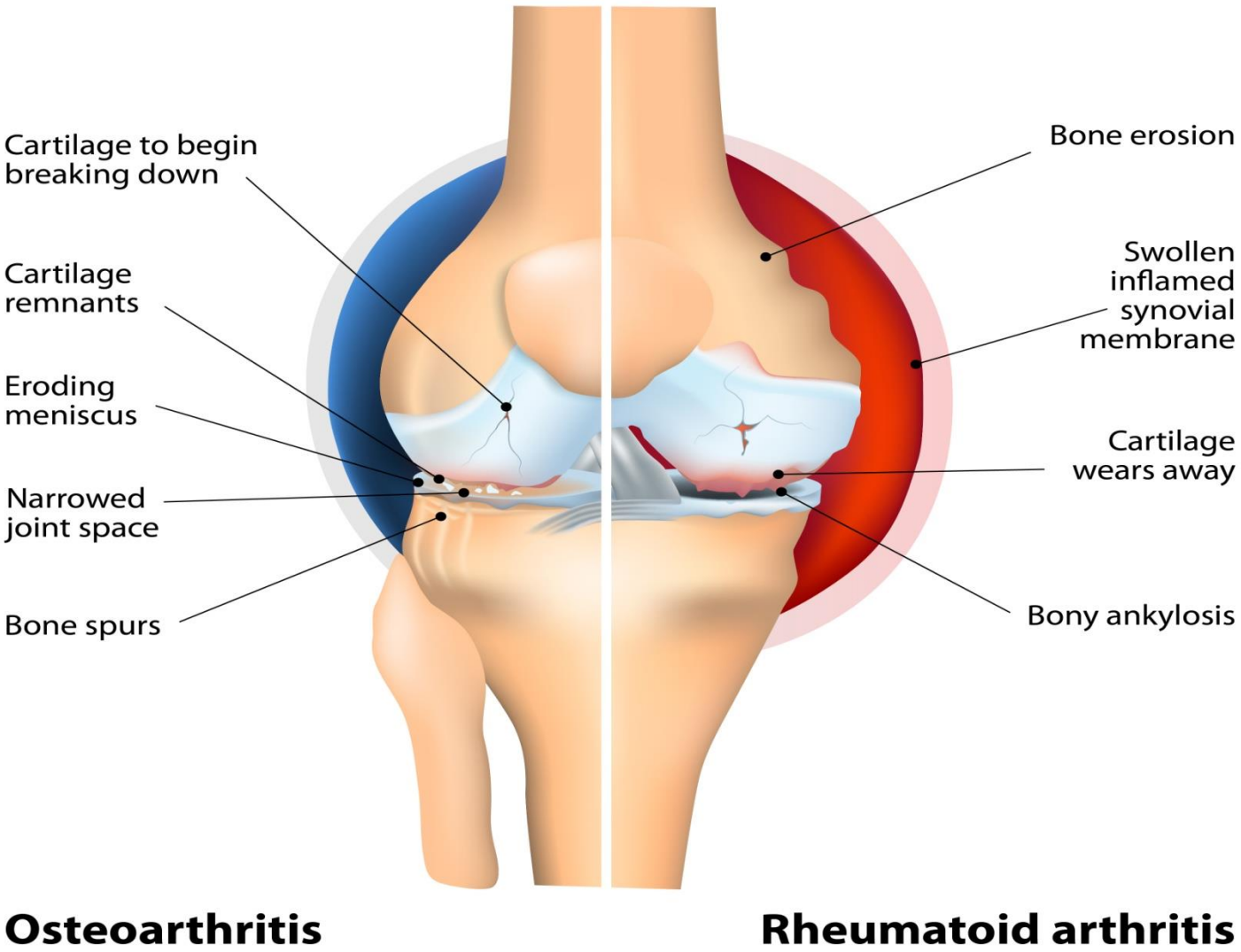


RHEUMATOID ARTHRITIS



Healthy joint

Rheumatoid arthritis


Cartilage to begin breaking down
Cartilage remnants
Eroding meniscus
Narrowed joint space
Bone spurs
Bone erosion
Swollen inflamed synovial membrane
Cartilage wears away
Bony ankylosis
Osteoarthritis
Rheumatoid arthritis

Nutritional Advices in OA and RA:

A) Dietary Recommendations:

1) Drink plenty of water.

2) Eat more fiber.

3) Eat more flaxseed and cold water fish (salmon, mackerel).

4) Eat more of sulfur-rich foods: cabbage, asparagus, garlic, and onion.

B) Foods to Avoid:

1) Saturated fats, acidic foods, sugar, high gluten foods, alcohol, caffeine.

2) Foods high in Omega-6 (sunflower, corn, sesame, borage, evening prim rose oils).

3) Foods high in "Solanine": potatoes, tomatoes, eggplant, and peppers (except black pepper).

Solanine is a poisonous plant alkaloid produced by the plants from nightshade family (potatoes, tomatoes, eggplants, and peppers) as a natural defense mechanism.

Solanine exacerbates inflammation!

green potatoes have solanine!

Canadian Academy of Sports Nutrition

Foods High in Solanine

Eggplant: *Copyright©Depositphotos.com/Valentyn_Volkov*

Tomato: *Copyright©Depositphotos.com/Sergejs Bespalovs*

Bell Pepper: *Copyright©Depositphotos.com/Feng Yu*

Glucosamine:

It is an important building block of cartilage.

Sources:

***Not exist in significant amount in foods.**

***Comes mainly as supplement:**

1) Derived from the shells of shrimps, lobster, and crabs.

2) Made synthetically.

Indications of Glucosamine:

1) **Osteoarthritis:**

   a) **Reduces inflammation.**

   b) **Relieves pain.**

   c) **Helps repair cartilage.**

   d) **Inhibits joint breakdown.**

2) **Strain and Sprains.**

3) **Wound healing.**

Dosage of Glucosamine:

- **It comes in two forms: sulfate, and hydrochloride.**
- **It must be taken 1500 – 2000 mg per day in single dose or divided doses for at least 6 weeks.**

Side Effects and Interactions:

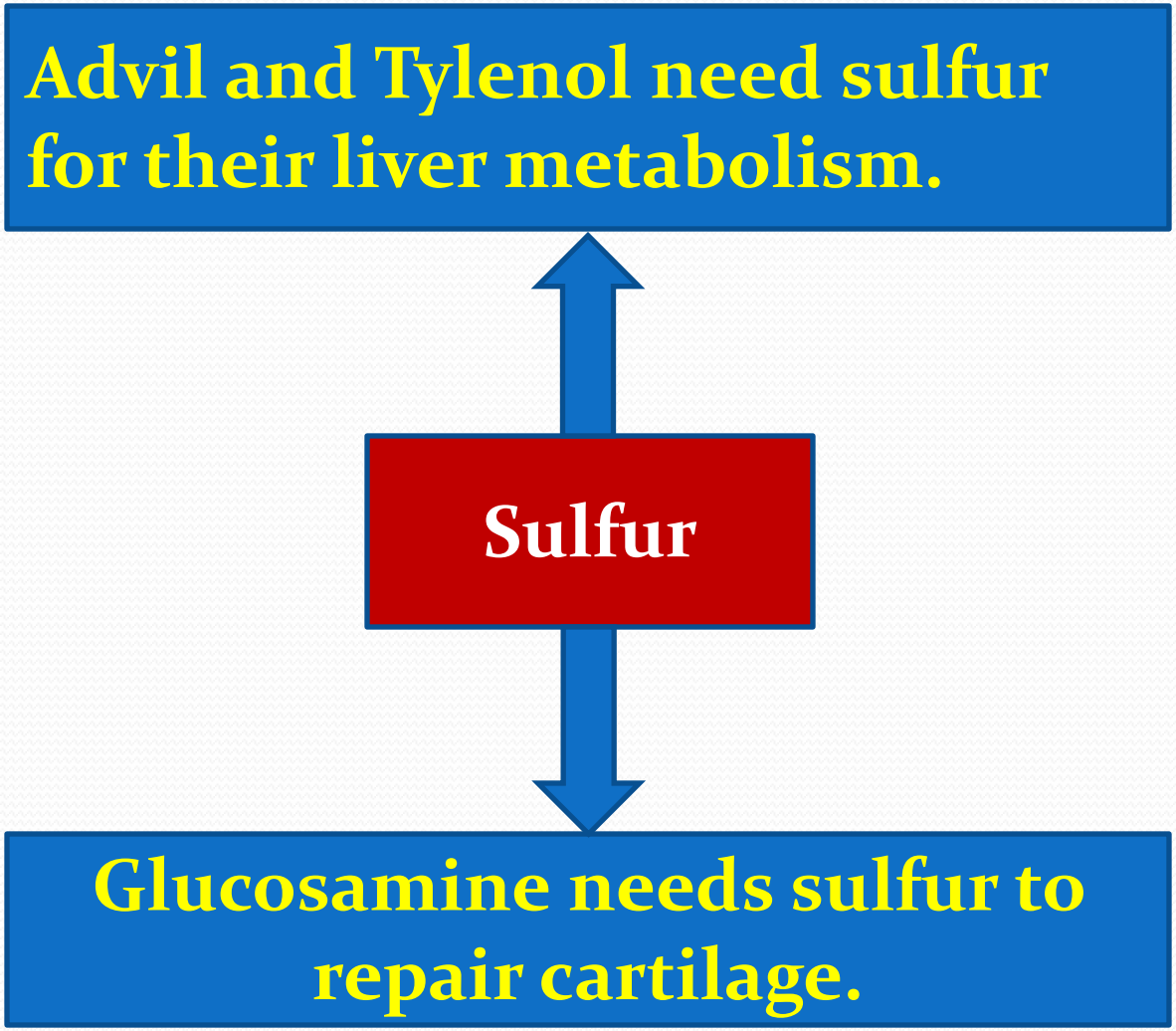
- **1) Stomach upset.**
- **2) Diarrhea.**
- **3) It might cause insulin-resistance, leading to increase blood sugar. Diabetic people should consult their doctors.**
- **4) If glucosamine has been stabilized in NaCl, it might increase blood pressure.**

5) People who have allergy to shrimps could take glucosamine, as allergy is usually to a protein found in the meat part.

6) Sulfur is an important part of Glucosamine. Advil and Tylenol require sulfation in their metabolism and in fact it has been shown to compromise glucosamine synthesis.

No Glucosamine and Advil or Tylenol at the same time!

Interaction of Glucosamine with Advil and Tylenol:



Chondroitin Sulfate:

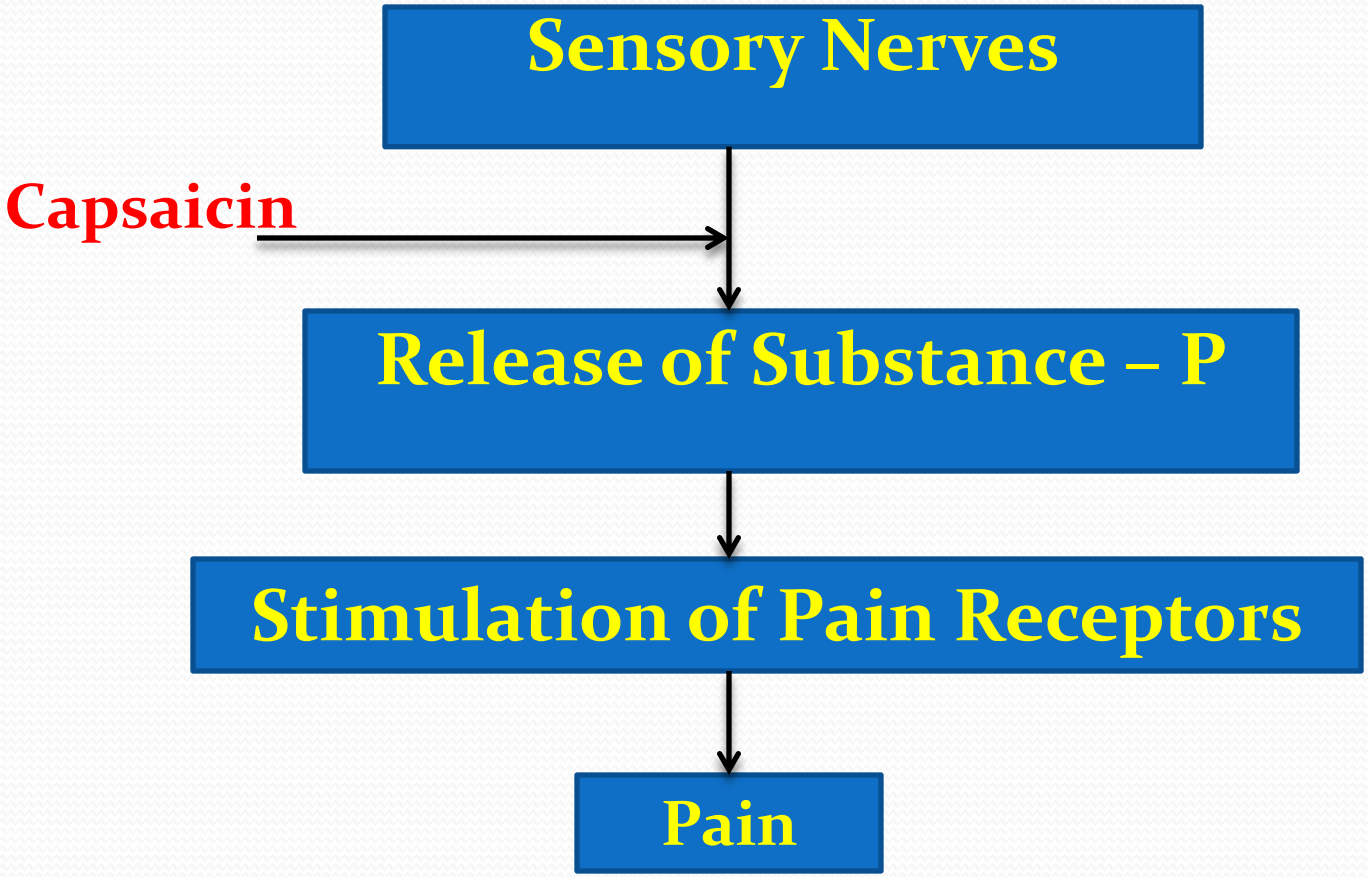
- 1) Naturally found in cartilage and tendons.
- 2) Reduces pain and inflammation.
- 3) Inhibits joint degradation (breakdown).
- 4) Made from cow`s cartilage or shark `s cartilage.
- 5) The dosage is 1200 mg daily.
- 6) Very high dose (more than 10 grams) may cause diarrhea.
- 7) Some studies show that it might prevent from heart attack and also kidney stones of oxalate type.

MethylsulfonylMethane (MSM)

1) Naturally found in the body and many foods especially green vegetables.
2) It is a good source of mineral sulfur (sulfur donor).
3) Reduces inflammation and pain.
4) Used in combination with Glucosamine.
5) The dosage is 250 to 500 mg daily.
6) Has a mild blood-thinning effect.

Capsaicin

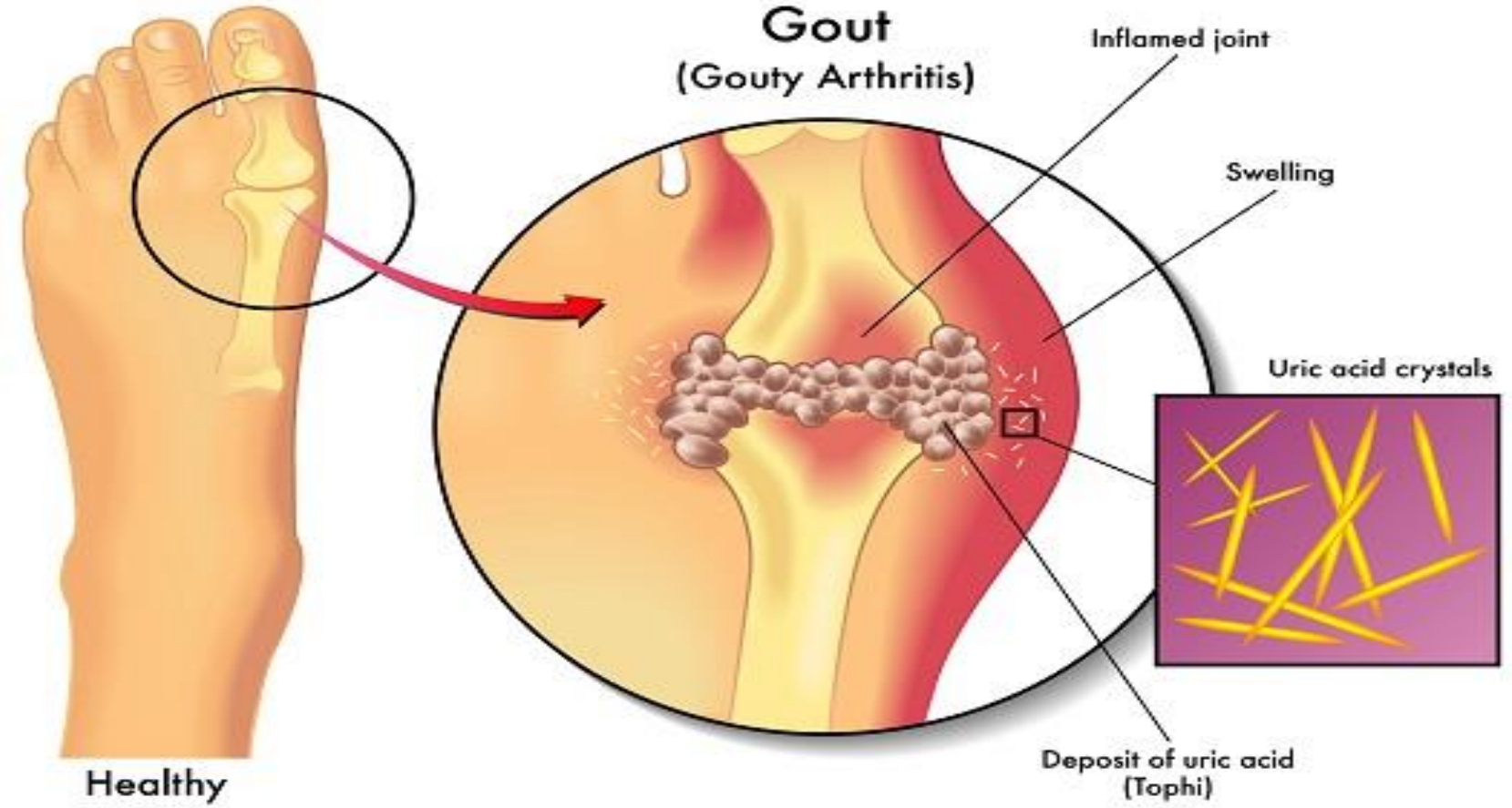
Used in the treatment of *joint pain* and *phantom pain*.
Active component of Chili pepper.
Blocks the release of "Substance – P".



Gout:

- **Known also as the "*disease of kings*" and "*rich man`s disease*", gout is a medical condition resulted from deposition of uric acid crystals in the joints.**
- **Uric acid comes from the metabolism of purines in the body.**
- **Gout is a metabolic disease characterized by recurrent acute arthritis.**

- **The big toe is the most commonly affected joint, which is called podagra.**

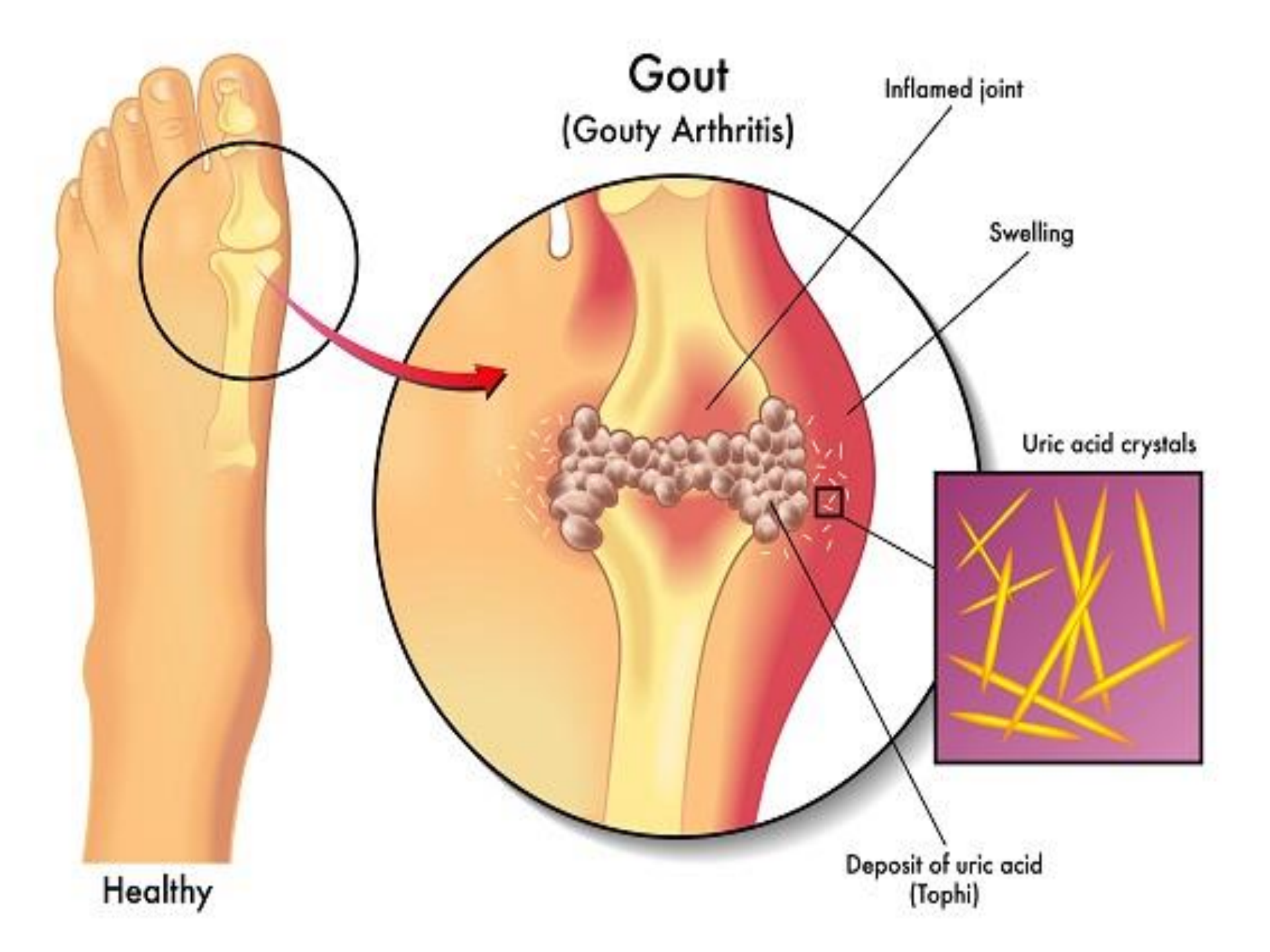


- **Other joints such as ankles and knees could be affected later.**
- **During a gouty attack, the joint becomes inflamed, red and swollen and painful.**
- **It is so painful that patients cannot tolerate even a sheet on it and they are unable to wear their shoes.**

- **Chronic gout could lead to kidney stones, osteoarthritis of the joint, and tophi (painless deposition of uric acid crystals in the joints, cartilages, bones, bursas and tendons).**

- **Gout affects men twice more than women. Most women with gouty arthritis are postmenopausal and elderly. Premenopausal gout is rarely seen.**

- **Though a high level of uric acid in the blood increases the risk of developing gout, not all cases of gout are associated with high levels of uric acid.**


Gout
(Gouty Arthritis)
Inflamed joint
Swelling
Uric acid crystals
Deposit of uric acid
(Tophi)
Healthy

Potential causes of high levels of uric acid are:

A) Decreased excretion of uric acid

- 1) Dehydration
- 2) Dysfunction of the kidneys.
- 3) Acidosis.
- 4) Low function thyroid.
- 5) Medications: diuretics, pyrazinamide, levodopa, ethambutol, niacin, cyclosporine, and low doses of salicylates (aspirin).
- 6) Obesity.

B) Increased production of uric acid

- **1) Genetics.**
- **2) Alcohol.**
- **3) Sickle cell anemia.**
- **4) Thalassemia.**
- **5) Psoriasis.**
- **6) Diabetes.**
- **7) Polycythemia.**
- **8) Lead poisoning.**
- **9) Metabolic syndrome.**
- **10) Glycogen storage diseases.**

Restricted Foods:

- **Foods high in purines: beef, pork, chicken, turkey and fish (sardines, herring, mackerel, anchovies).**
- **Foods high in uridine: sugar cane, tomatoes, yeast, and broccoli. Uridine could increase blood levels of purines followed by high levels of uric acid.**
- **Sweetbreads (animal thymus).**
- **Eggs.**

- **Organ meats: kidneys, brains and liver.**
- **Seafood (shellfish, scallops, shrimps, and mussels).**
- **Meat broths and gravies.**
- **Vegetables high in purines: legumes, spinach, rhubarb, mushroom, asparagus, and cauliflower.**

- **Beer.**
- **Alcohol.**
- **Refined sugars.**
- **Saturated fats, hydrogenated fats, and Trans – fats.**
- **Too much protein (more than 1 gram per kilogram of body weight).**

Recommended Foods:

- **Water: more than 3 liters a day.**
- **Whole gains.**
- **Berries, especially strawberries and blueberries.**
- **Cherries.**
- **Flaxseeds.**
- **Celery seeds and celery.**
- **Fish (salmon, cod, and halibut).**

- **Lime.**
- **Lemon.**
- **Vinegar.**
- **Soy products.**
- **Dairy products (low fat).**
- **Coffee.**

Recommended Supplements:

- **Omega – 3 fatty acids:** 2 – 3 grams a day. It reduces inflammation.

- **French Maritime Pine Bark Extract:** 200 – 300 mg a day. It is a powerful antioxidant that reduces inflammation and uric acid levels.

- **Grape seed extract**: 50 – 100 mg a day. It reduces inflammation.

- **Folic acid:** 10 – 50 mg a day. It lowers uric acid levels.

- **Vitamin C:** 1000 – 2000 mg a day. This vitamin increases excretion of uric acid via urine.

- **Nettle root extract:** 500 – 1000 mg a day. This herb increases excretion of uric acid via urine.

- **Celery seed extract** (with 85% of 3nB): 150 – 225 mg a day. The active ingredient in celery seed is 3 – n – Butylphthalide, which reduces both uric acid level and inflammation.

- **Quercetin:** 2000 – 3000 mg a day. It is a flavonoid and powerful antioxidant that decreases uric acid level and inflammation.

- **Bromelain:** 1500 mg a day. It reduces inflammation.

- **Cherry fruit extract:** 2000 – 3000 mg a day. It reduces both inflammation and blood levels of uric acid.

- **Miscellaneous Suggestions:**
- **Liver detoxification.**
- **Colon cleansing.**

Homework:

- 1) Describe the foods that may aggravate the symptoms of gout.
- 2) Describe the foods the may aggravate the symptoms of arthritis.