Lecture 73:

Approach to Athletes with Neuromuscular Disorders

Copyright Protection:

Three Common NMDs:

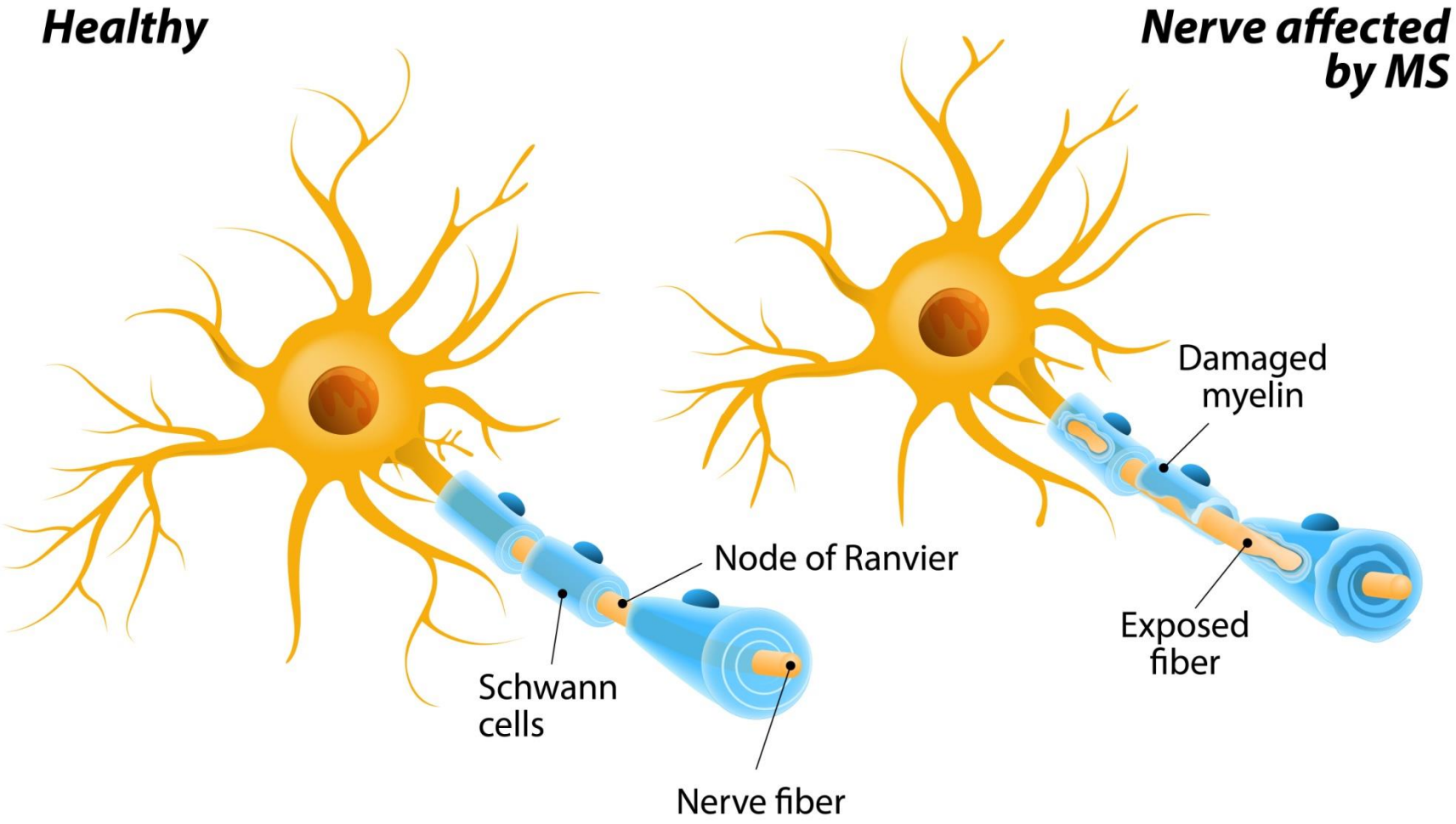
- MS (Multiple Sclerosis)
- ALS (Amyotrophic Lateral Sclerosis)
- DMD (Duchenne`s Muscular Dystrophy)

MS (Multiple Sclerosis):

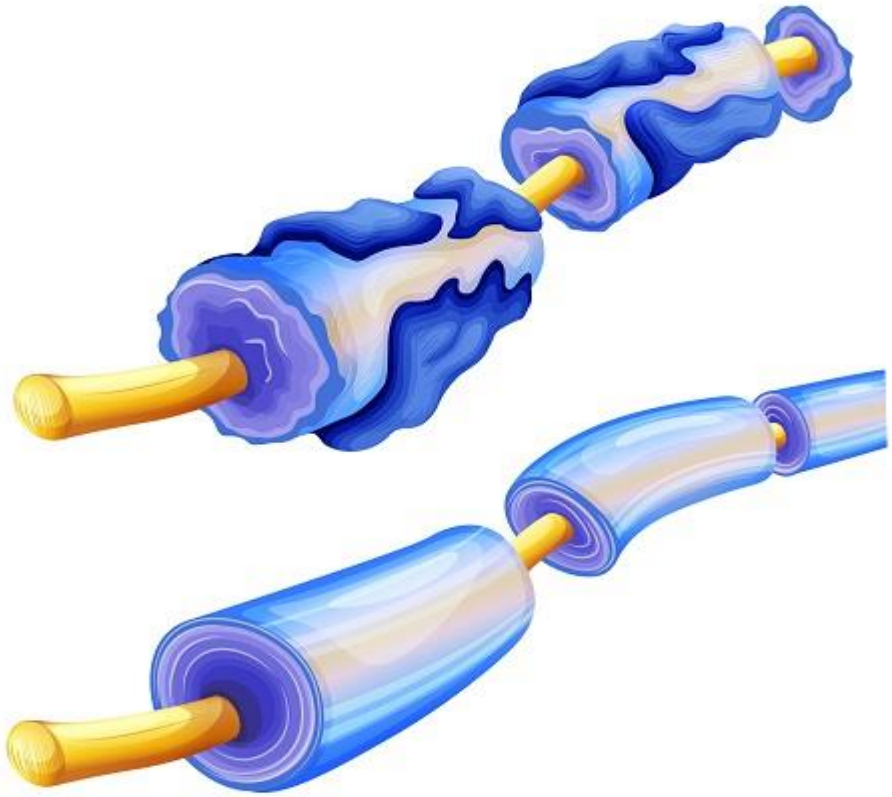
- **Multiple sclerosis (MS) is an inflammatory, slowly progressing, and degenerative disease of the central nervous system (brain and spinal cord) in which the myelin sheaths around the nerves are damaged.**

- **The process is called "*demyelination*" in medicine.**

MULTIPLE SCLEROSIS



- **The loss of myelin is not in continuous form; it is segmental, which means some parts of the nerves have still myelin covers and some parts do not.**



- **It is a demyelinating disorder. They are immune – mediated conditions characterized by destruction of CNS myelin.**

- **The PNS (peripheral nervous system) is spared.**

- **After head trauma, MS is the second most common cause of neurologic disability.**

- **MS affects females twice more than males mostly in their thirties and forties.**

- **MS has a relapsing-remitting course, and signs and symptoms are dissipated in time and place.**

- **Depending on which part of the brain or spinal cord has been involved, neurological symptoms vary.**

Though the exact cause of MS is unknown, few possible risk factors have been postulated:

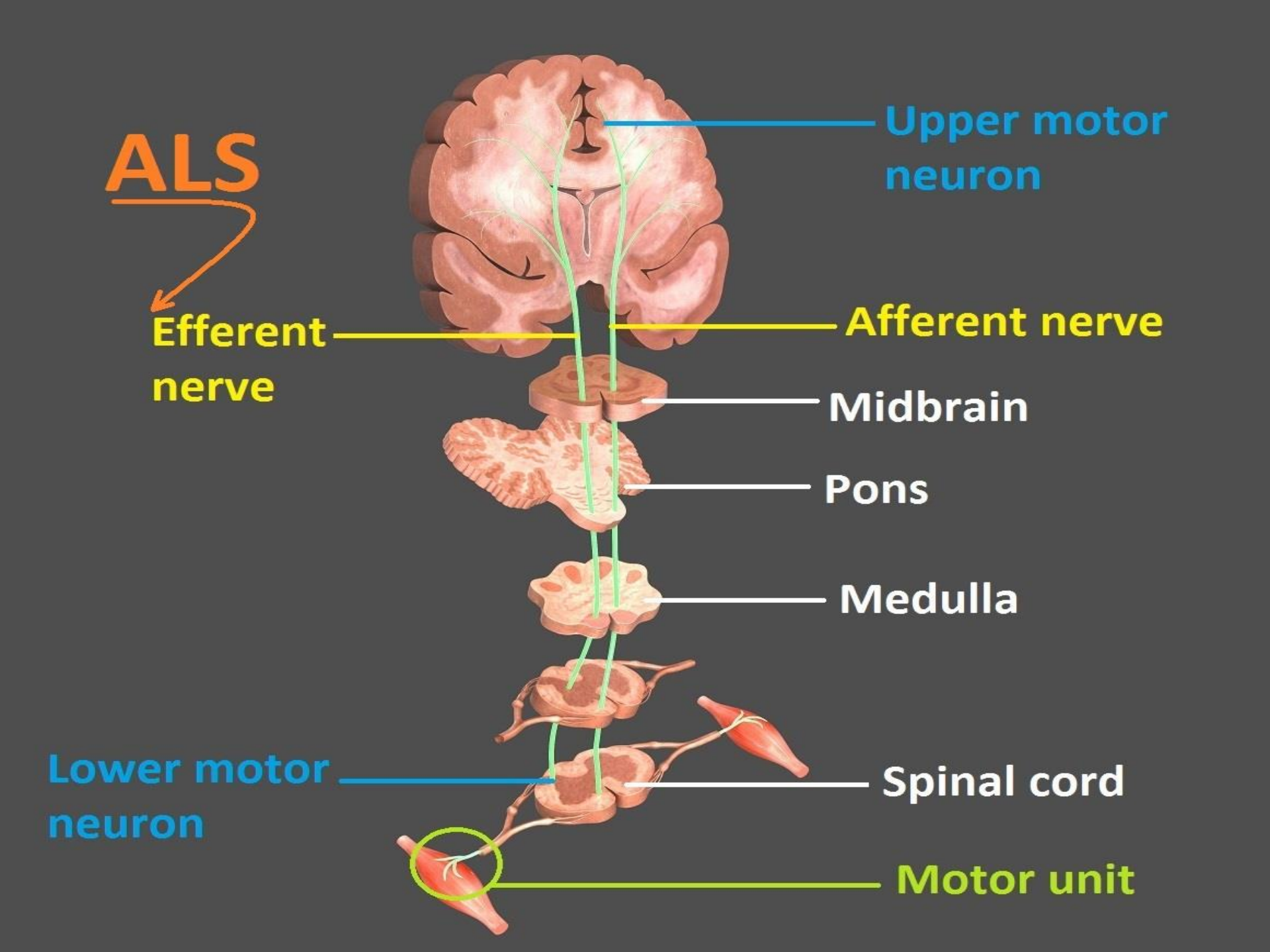
- **Genetics.**
- **Environmental factors (more common among people who live farther from the equator).**
- **Decreased sunlight exposure.**
- **Nutritional deficiencies (especially vitamin D).**

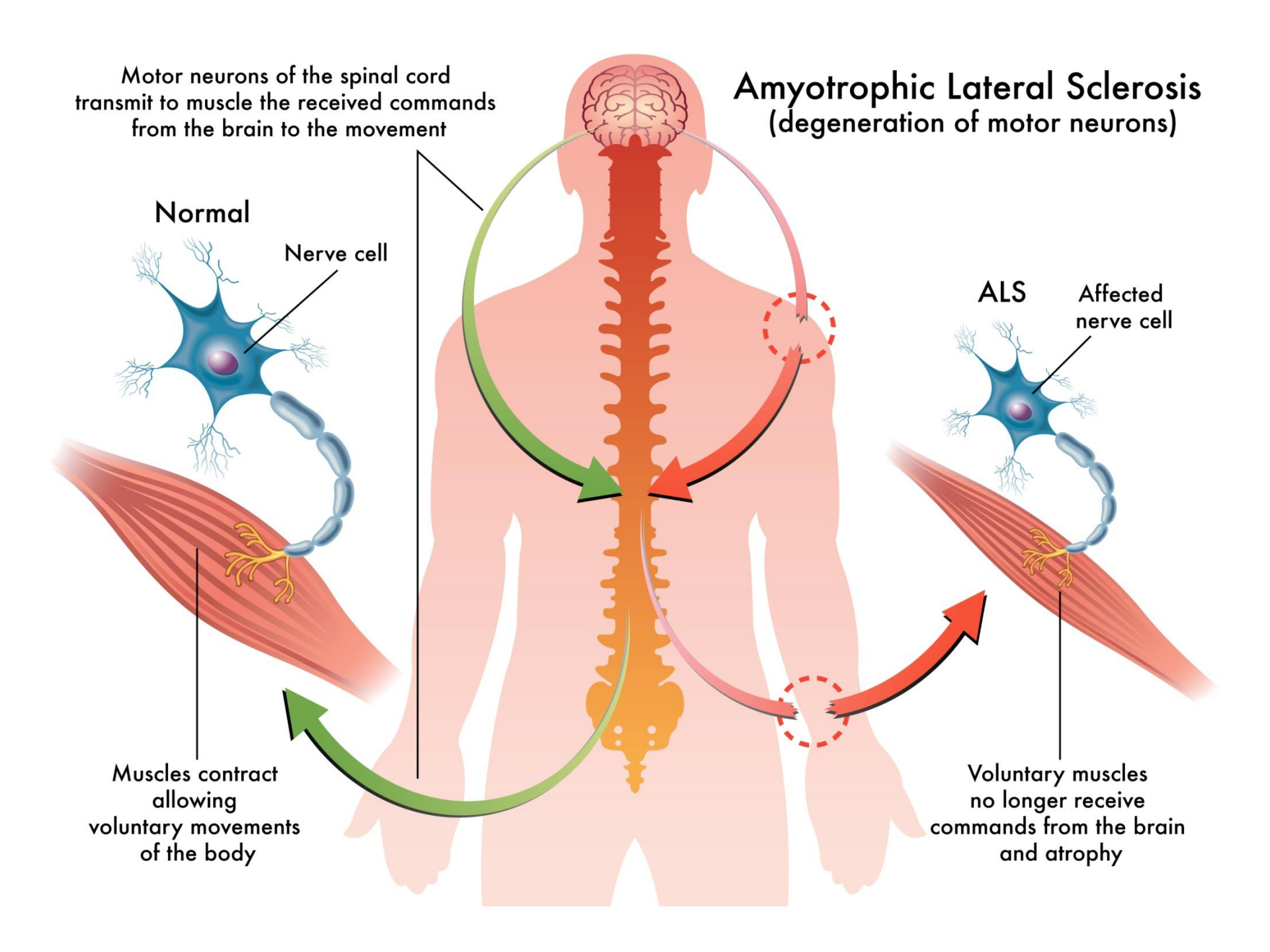
- **Infectious agents (Epstein-Barr virus, meals virus, mumps, rubella and herpes virus).**
- **Autoimmune disease.**
- **Oxidative stress damage.**
- **Food allergies.**
- **Heavy metals.**

ALS (Amyotrophic Lateral Sclerosis):

- **ALS (Amyotrophic Lateral Sclerosis) is a progressive motor neuron disease and a devastating neurodegenerative disorder.**

- **It is the disease for which "*ice bucket challenge*" went viral worldwide to increase public awareness in 2014. For this reason, I call it "Ice Bucket Challenge Disease".**


ALS
Upper motor neuron
Efferent nerve
Afferent nerve
Midbrain
Pons
Medulla
Lower motor neuron
Spinal cord
Motor unit


Amyotrophic Lateral Sclerosis
(degeneration of motor neurons)
Motor neurons of the spinal cord transmit to muscle the received commands from the brain to the movement
Normal
Nerve cell
ALS
Affected nerve cell
Muscles contract allowing voluntary movements of the body
Voluntary muscles no longer receive commands from the brain and atrophy

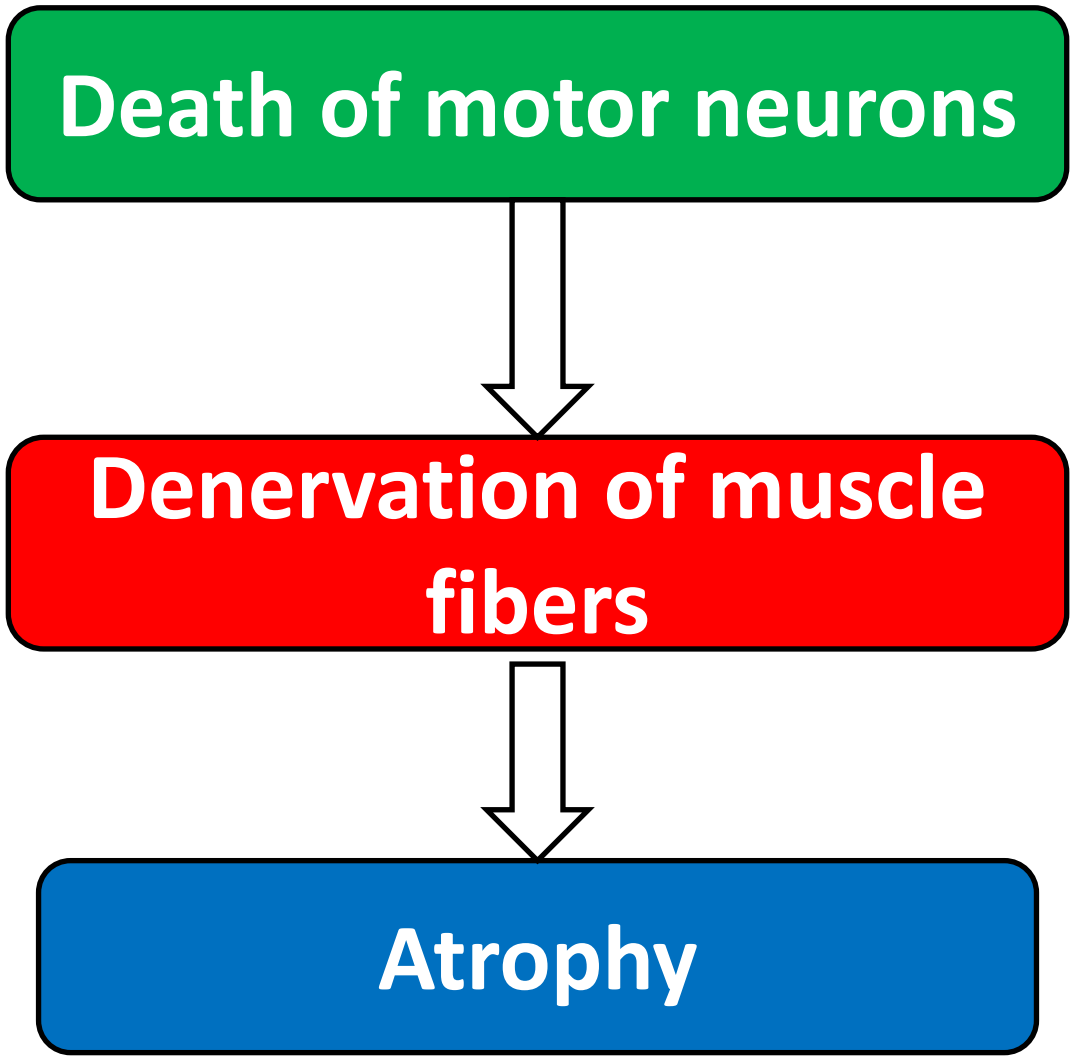
- **The exact cause is unknown. However, there are few risk factors.**

- **Approximately 20% of cases are familial and 80% of cases are sporadic. In people with familial ALS, there are mutations in the genes encoding Superoxide Dismutase (SOD).**

- **SOD is a manganese-zinc-copper containing enzyme and one of the naturally found antioxidants in the body. Along with catalase and glutathione peroxidase, it is the first line of defence of the body against damages caused by free radicals.**

- ***According to Harrison`s Principles of Internal Medicine, edition 18th*** **(the most valid reference textbook in medicine), nutritional deficiencies of copper, manganese, zinc, folic acid, vitamin B12, and vitamin E may increase the risk of developing sporadic forms of ALS.**

- **Based on this medical textbook, another etiologic factor is toxicity with heavy metals, especially lead and aluminum.**


Death of motor neurons
Denervation of muscle fibers
Atrophy

DMD (Duchenne`s Muscular Dystrophy):

It is also called "Pseudohypertrophic muscular dystrophy".

It is X – linked recessive disorder.

It is the most common form of MD.

Pathogenesis:

- **Lack of Dystrophin protein due to mutation of the gene that encodes dystrophin.**

- **Dystrophin complexes with two transmembrane proteins, dystroglycans and sarcoglycans. The complex is responsible to maintaining the integrity of the muscles.**

Clinical Features:

- **Present at birth, but the disorder usually becomes apparent between ages 3 and 5 years.**
- **The boy falls frequently and have difficulty keeping up with friends when playing.**
- **Running, jumping and hopping are abnormal.**

By age 5:

muscle weakness becomes obvious on testing.

- **Calf hypertrophy.**
- **Waddling gait.**
- **Gower`s sign.**

- **By age 12 year old:**

- **Rapid progression of muscle weakness leads to confinement of the body to wheel chair.**

- **They often develop a progressive scoliosis which impairs lung function.**

By age 16 – 18 years old:

- **Severe muscle weakness in arms and legs.**
- **are prone to serious fatal pulmonary infections.**

Mostly, death occurs in their thirties due to respiratory failure.

Cardiac cause of death is uncommon.

Their IQ is lower than normal.

Nutritional Supports:

- **Restricted Foods.**
- **Recommended Foods.**
- **Recommended Supplements.**

Restricted Foods:

- Foods high in saturated fats and Trans-fat.
- Butter.
- Hydrogenated oils.
- Shortenings.
- Artificial flavors, food colorings, additives, and preservatives.
- Processed foods.
- Canned foods.
- Fried foods.

- **Allergenic foods.**
- **Inflammatory foods (red meats, and dairy products).**
- **Sugars and sweets.**
- **Alcohol.**
- **Too much caffeine.**
- **Soft drinks.**
- **Any food items that contain aspartame.**

Recommended Foods:

- Whole grains.
- Legumes.
- Fish.
- Avocado.
- Flaxseeds.
- Chia seeds.
- Hemp seeds.
- Walnuts.
- Fresh and colourful fruits and vegetables.

- **Fruits high in flavonoids: berries.**

- **Foods high in apigenin: artichoke, parsley, celery, and chamomile tea. *It is claimed that apigenin might stimulate neurogenesis (growth of the nerve cells).***

- **Foods high in lecithin: soy products, tofu, Brussels sprouts, broccoli, legumes, sunflower seeds, cottonseeds, rapeseeds, and peanut butter.**

- **Foods high in folic acid: green leafy vegetables.**

- **Vegetables high in chlorophyll particularly spirulina, parsley, and coriander.**

Recommended Supplements for MS:

- 1) **Omega-3 (high doses):** 5 – 20 grams day.
- 2) **Vitamin D**: 2000 – 5000 IU a day.
- 3) **Alpha-Lipoic Acid (ALA):** 600 – 1200 mg a day.
- 4) **French Maritime Pine Bark Extract:** 100 – 200 mg a day.

- **5) Grape seeds extract: 100 – 200 mg a day.**

- **6) Fumaric acid: 100 – 120 mg a day, and gradual increase to 500 mg a day over several weeks. It is naturally produced in the skin upon exposure to sun and may improve MS symptoms.**

- **7) Lecithin: 2400 – 9600 mg a day.**

- **8) Ginkgo Biloba: 240 – 480 mg a day. This adaptogen has antioxidant activity and also improves blood flow. It may ease symptoms of MS.**

- **9) Inosine: 2000 – 3000 mg a day.**

- **10) Spirulina: as a tablet: 2000 – 3000 mg a day, as a powder: 2 – 3 teaspoons a day.**

- **11) Multivitamins – Multiminerals: A high potency product.**

- **12) Digestive Enzymes: A full spectrum product.**

- **13) Liver detoxification.**

Recommended Supplements for ALS:

- **Superoxide Dismutase (SOD):** 500 – 750 mg a day.
- **Folic acid:** 1 – 2 mg a day.
- **Vitamin B12:** 1 – 2 mg a day.
- **Vitamin E:** 400 – 800 IU a day.
- **Zinc:** 50 – 100 mg a day.
- **Copper:** 2 – 3 mg a day.

- **Manganese: 10 – 45 mg a day.**
- **Alpha-Lipoic Acid (ALA): 600 – 1200 mg a day.**
- **French Maritime Pine Bark Extract: 100 – 200 mg a day.**
- **Liver detoxification.**

- **The two commonly used sports supplements Glutamine and BCAAs (branched – chain amino acids) may increase the risk of ALS or aggravate the symptoms by increasing the excitability of the nerve cells.**

- ***Therefore, it is strongly recommended that people with ALS or family history of ALS avoid taking these two sports supplements.***

Recommended Supplements for DMD:

- **Creatine monohydrate : 3 – 5 grams a day.**
- **BCAAs: 3 – 5 grams a day.**
- **Alpha-Lipoic Acid (ALA): 600 – 1200 mg a day.**
- **L – Carnitine: 2 – 3 grams a day.**
- **Ribose: 5 – 10 grams a day.**
- **Vanadium sulfate: 10 – 20 mg a day.**
- **Calcium: 1000 mg a day.**

Homework:

- **1) Describe what kinds of food supplements may help people with MS.**

- **2) Describe what kinds of food supplements may help people with ALS.**