

MUSCLE FIBRE TYPES - REVIEW



MUSCLE FIBRE TYPES REVIEW

- Certain muscles and groups of muscles are more adapted to one energy system than another.
- The difference in fibre type is mainly due to the extent to which a muscle relies on oxygen in the production of energy.

MYOGLOBIN

- **MYOGLOBIN** is the oxygen storage unit that delivers oxygen to the working muscles

Which one has more Myoglobin?



No myoglobin

Lots of myoglobin

SLOW TWITCH MUSCLE FIBRES

- Slow twitch muscle fibres are **red** or dark in colour and generate and relax at a slower pace
- maintain a lower level of **tension** for a longer period of time.

- These fibres are most active during long distance swimming, cycling and running.



SLOW TWITCH MUSCLE FIBRE

- Slow twitch muscle fibres are **HIGH** in **MYOGLOBIN** but low in **ATPase**, which the body uses to produce instant energy for muscular contraction.

FAST TWITCH MUSCLE FIBRES

- Fast twitch muscle fibres are pale in colour and have the ability to tense and relax quickly
- – they can generate large amounts of tension with relatively low endurance levels. They can activate at a rate of two to three times faster than slow twitch fibres.

FAST TWITCH MUSCLE FIBRES

- These fibres are adapted for shorter bursts of effort and have **LOWER** concentrations of **MYOGLOBIN**.
- Fast twitch fibres have higher levels of **ATPase** and have higher levels of glycolytic enzymes.

FAST TWITCH MUSCLE FIBRES

- These fibres are most suited for short sprints and explosive jumping.





THREE TYPES OF MUSCLE FIBRES

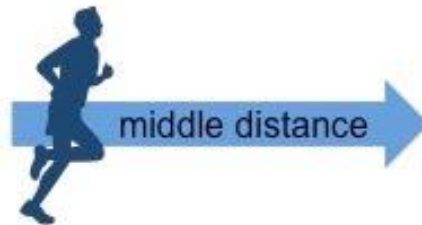
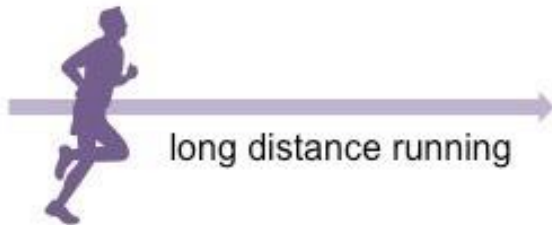
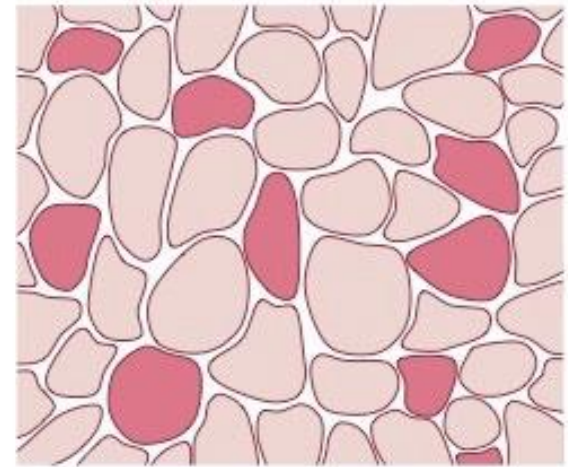
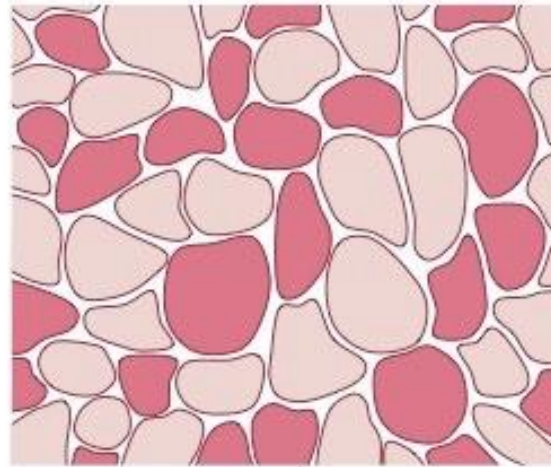
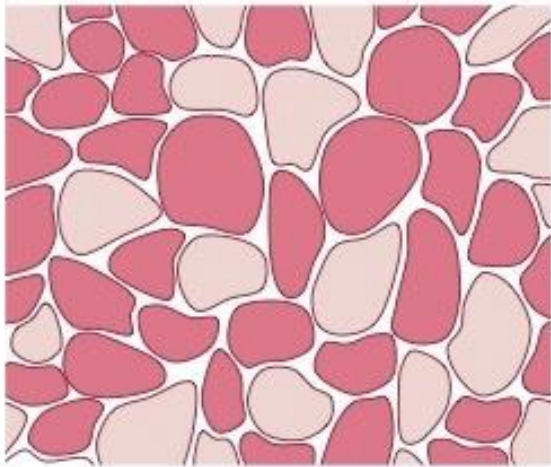
- **TYPE I OR SLOW OXIDATIVE** – generate energy slowly, are more fatigue resistant and primarily depend on aerobic processes.
- **TYPE IIA OR FAST OXIDATIVE GLYCOLYTIC** – intermediate-type muscle fibres which allow for high-speed energy release as well as glycolytic capacity.
- **TYPE IIB OR FAST GLYCOLYTIC** – these muscle fibres are capable of storing a lot of oxygen and sufficiently high level of enzymes necessary for quick contraction without requiring oxygen.

CHARACTERISTICS OF MUSCLE FIBRES

Characteristic	Type I Slow Oxidative	Type IIA Fast Oxidative Glycolysis	Type IIB Fast Glycolysis
COLOUR	Red	Red/white	White
CONTRACTION SPEED	Slow	Fast	Very fast
FORCE PRODUCTION	Low	Intermediate	High
ENERGY EFFICIENCY	High	Low	Low
MYOGLOBIN CONTENT	High	Moderately high	Low
MYOSIN ATPase	Low	High	High
FATIGUE RESISTANT	High	Moderate	Low
AEROBIC CAPACITY	High	Moderate	Low
ANAEROBIC CAPACITY	Low	High	High

 **Slow twitch** muscle fibres (*red*)

 **Fast twitch** muscle fibres (*white*)



Muscle Fibre Types



Long Distance

Type 1

Slow twitch



400m / 800m

Type 2A

Fast twitch oxydative



Short Sprints

Type 2B

Fast twitch glycolytic

Low



High

Fatigue rate

TONIC VERSUS PHASIC MUSCLE FIBRES

- A muscle's fibre make up determines it's function.
- TONIC muscles assist the body with maintaining posture and stability. These muscles are primarily slow twitch with little ability to function explosively. They do function with considerable capacity.
- PHASIC muscles have a higher percentage of type IIA and IIB fibres.
- The only way to know the percentage of muscle fibres found in tonic or phasic muscles is to conduct a biopsy.
- In elite athletes, differences in muscle fibre types are often less pronounced.

TONIC VERSUS PHASIC MUSCLE FIBRES

- While every sport involves a mix of power and endurance, most sports can be located on a continuum as involving predominantly one muscle fibre type over another; some emphasize rapid energy bursts while others need to be fatigue resistant.
- To maximize performance, an athlete should match training methods to energy needs.



TONIC VERSUS PHASIC MUSCLE FIBRES

- In training for strength, the goal is to increase the load-bearing capacity or explosiveness of the muscle.
- Short, powerful training exercises lasting a few seconds will result in increased creatine phosphate in the muscle fibres.
- Intense training lasting for up to 90 seconds will increase glycogen stores and enhance the ability of enzymes to convert glucose quickly.
- Both of these training methods will delay the point at which lactic acid build up begins to impede performance.



TONIC VERSUS PHASIC MUSCLE FIBRES

- For endurance training, training will involve working to improve oxygen-processing capacity of the lungs and blood.
- Aerobic training will increase the number of mitochondria in the muscle cells.

