CONCEPT: CILIA AND FLAGELLA

● There are two main organelles responsible for _____ cell movement

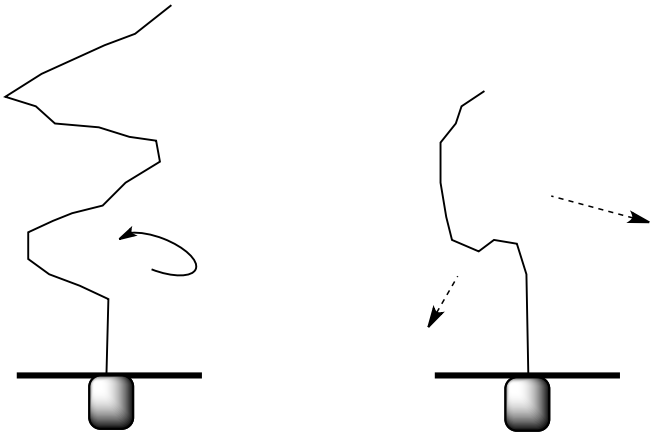
□ Multiple **cilia** are found on the plasma membrane and beat back and forth

- Beating results in fluid movement or in propelling cells through fluid

□ A single **flagellum** is found on the plasma membrane, and movements in a wavelike beating pattern

- Results in propelling sperm or protozoa cells

EXAMPLE: Flagellum vs. Cilia



Flagellum

Spins like a propellar

Cilia

Beats back and forth

● Cilia and Flagella have a similar structure

□ Microtubules are arranged in a **9 +2 axoneme**

- **Outer doublets**: There are 9 doublets, equally spaced around the outside

- **Central pair**: There are 2 doublets, placed in the center

- *Axoneme* includes the microtubules and all associated proteins

□ Each microtubule filament of each doublet is _____

- **A tubule** has 13 microtubule protofilaments

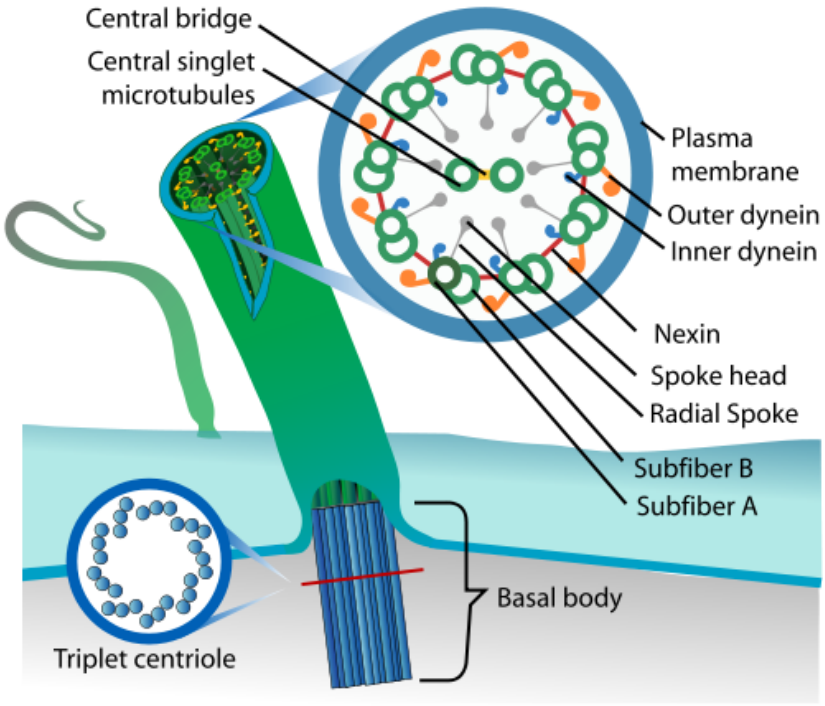
- **B tubule** has 10 or 11 microtubule protofilaments and fuses to the A tubule

● Connecting each of the 9 doublets together occurs through a variety of structures

□ **Interdoublet links** connects two adjacent doublets together

- **Nexin** is the protein responsible for this connection

EXAMPLE:



□ A **basal body** is the region out of which the microtubules grows

- Similar to a centriole

- Composed of 9 triplets of microtubules

Movement

● The **sliding microtubule model** describes how cilia and flagella _____

□ **Dynein** is the motor protein responsible for this movement

- Dynein bind to B tubules with its head groups

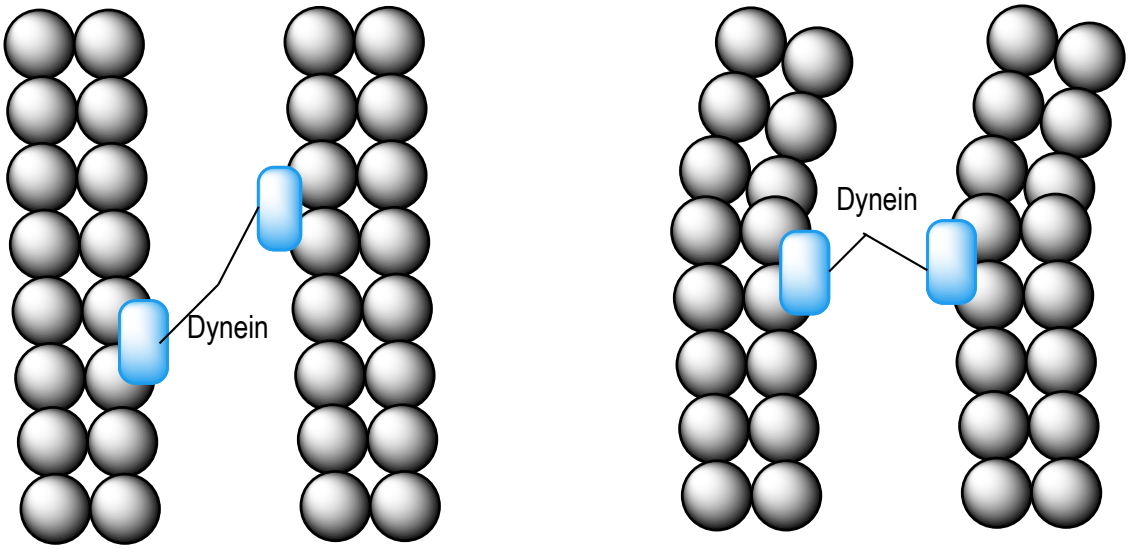
- It move towards the minus end on B tubules with energy from ATP hydrolysis

- As it moves towards the minus end on the B tubule It slides the A tubule down (bending)

□ *Sliding microtubule model* is a model of movement based on core bending due to sliding microtubules

□ **Intraflagellar transport** is the movement of molecules to and from the tips of the flagella

EXAMPLE: Sliding microtubule model



PRACTICE:

1. Microtubules are arranged in which of the following arrays?
    a. 9 + 3
    b. 9 + 2
    c. 8 +3
    d. 8 +2

2. What is the name of the structure from which cilia and flagellum grow?
    a. Outer doublet
    b. Nexin
    c. Basal Body
    d. Central Pair

3. The structure of the basal body differs from the structure of the cilia in which of the following ways?
    a. It has a 9+3 structure instead of a 9+2 structure
    b. It is composed of 9 triplets of microtubules instead of the 9+2 structure
    c. It has an 8+2 structure instead of a 9+2 structure
    d. It is composed of only A tubules