

LOCOMOTION OF CELL

The most important type of movement that occurs in the body is that of the muscle cells in skeletal, cardiac, and smooth muscle, which constitute almost 50 percent of the entire body mass.



TYPES OF CELLULAR MOVEMENTS

AMEBOID MOVEMENT

CILIARY MOVEMENT

AMEBOID MOVEMENT

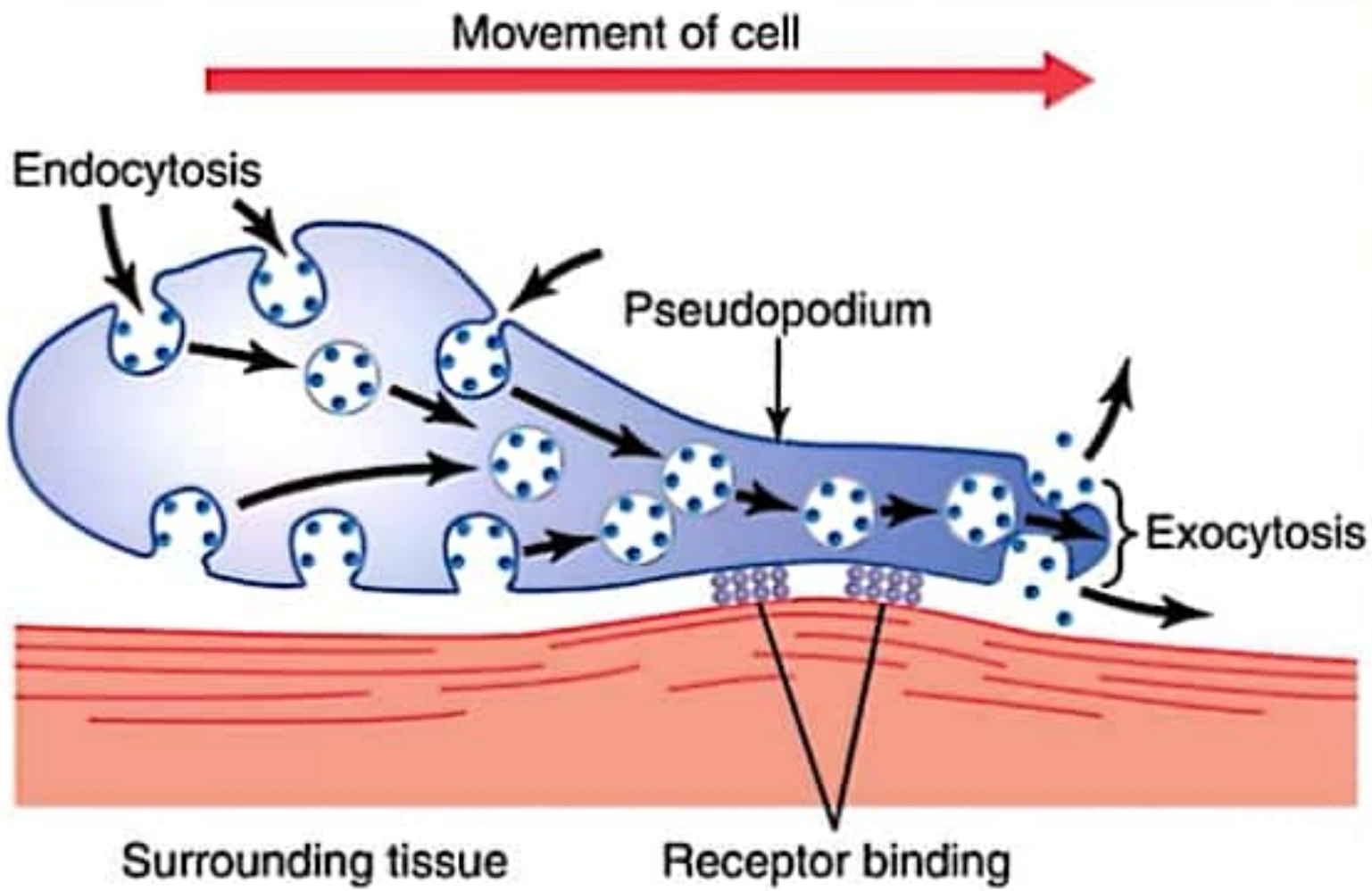
Ameboid movement is movement of an entire cell in relation to its surroundings. It receives its name from the fact



that amoebae move in this manner and have provided an excellent tool for studying the phenomenon.

GENERAL MOVEMENT

- Ameboid locomotion begins with protrusion of a *pseudopodium* from one end of the cell.
- partially secures itself in a new tissue area.
- Then the remainder of the cell is pulled toward the pseudopodium.
- The membrane of this end of the cell is continually moving forward, and the membrane at the left-hand end of the cell is continually following along as the cell moves.
- Basically, it results from continual formation of new cell membrane at the leading edge of the pseudopodium and continual absorption of the membrane in mid and rear portions of the cell.



MECHANISM

Two effects are essential for forward movement of the cell.

- The first effect is attachment of the pseudopodium to surrounding tissues so that it becomes fixed in its leading position, while the remainder of the cell body is pulled forward toward the point of attachment.
- The second essential effect for locomotion is to provide the energy required to pull the cell body in the direction of the pseudopodium.

FIRST EFFECT

- This attachment is effected by *receptor proteins* that line the insides of exocytotic vesicles. When the vesicles become part of the pseudopodial membrane, they open so that their insides evert to the outside, and the receptors now protrude to the outside and attach to ligands in the surrounding tissues.
- At the opposite end of the cell, the receptors pull away from their ligands and form new endocytotic vesicles. Then, inside the cell, these vesicles stream toward the pseudopodial end of the cell, where they are used to form still new membrane for the pseudopodium.

SECOND EFFECT

- In the cytoplasm of all cells is a moderate to large amount of the protein *actin*.
- Much of the actin is in the form of single molecules that do not provide any motive power; however, these polymerize to form a filamentous network, and the network contracts when it binds with an actin-binding protein such as *myosin*.
- The whole process is energized by the high-energy compound ATP.
- A network of actin filaments forms anew inside the enlarging pseudopodium.
- Contraction also occurs in the ectoplasm of the cell body, where a preexisting actin network is already present beneath the cell membrane.

TYPES OF CELLS EXHIBITING AMEBOID MOVEMENT

- **White blood cells (WBCs):** when they move out of the blood into the tissues to form *tissue macrophages*.
- **Fibroblasts:** move into a damaged area to help repair the damage and even the germinal cells of the skin, though ordinarily completely sessile cells, move toward a cut area to repair the opening
- **Embryonic cells:** migrate long distances from their sites of origin to new areas during development of special structures.

CONTROL OF AMEBOID LOCOMOTION-CHEMOTAXIS

- The most important initiator of ameboid locomotion is the process called *chemotaxis*. This results from the appearance of certain chemical substances in the tissues.
- Any chemical substance that causes chemotaxis to occur is called a *chemotactic substance*.
- Most cells that exhibit ameboid locomotion move toward the source of a chemotactic substance—that is, from an area of lower concentration toward an area of higher concentration—which is called *positive chemotaxis*. Some cells move away from the source, which is called *negative chemotaxis*.
- But how does chemotaxis control the direction of ameboid locomotion? Although the answer is not certain, it is known that the side of the cell most exposed to the chemotactic substance develops membrane changes that cause pseudopodial protrusion.