4.5A: Microfilaments

Microfilaments, which are the thinnest part of the cytoskeleton, are used to give shape to the cell and support all of its internal parts.

Learning Objectives

• Describe the structure and function of microfilaments

Key Points

• Microfilaments assist with cell movement and are made of a protein called actin.
• Actin works with another protein called myosin to produce muscle movements, cell division, and cytoplasmic streaming.
• Microfilaments keep organelles in place within the cell.

Key Terms

• actin: A globular structural protein that polymerizes in a helical fashion to form an actin filament (or microfilament).
• filamentous: Having the form of threads or filaments
• myosin: a large family of motor proteins found in eukaryotic tissues, allowing mobility in muscles
Microfilaments

If all the organelles were removed from a cell, the plasma membrane and the cytoplasm would not be the only components left. Within the cytoplasm there would still be ions and organic molecules, plus a network of protein fibers that help maintain the shape of the cell, secure some organelles in specific positions, allow cytoplasm and vesicles to move within the cell, and enable unicellular organisms to move independently. This network of protein fibers is known as the cytoskeleton. There are three types of fibers within the cytoskeleton: microfilaments, intermediate filaments, and microtubules. Of the three types of protein fibers in the cytoskeleton, microfilaments are the narrowest. They function in cellular movement, have a diameter of about 7 nm, and are made of two intertwined strands of a globular protein called actin. For this reason, microfilaments are also known as actin filaments.

Figure 1: Microfilaments are the thinnest component of the cytoskeleton. Microfilaments are made of two intertwined strands of actin.

Actin is powered by ATP to assemble its filamentous form, which serves as a track for the movement of a motor protein called myosin. This enables actin to engage in cellular events requiring motion such as cell division in animal cells and cytoplasmic streaming, which is the circular movement of the cell cytoplasm in plant cells. Actin and myosin are plentiful in muscle cells. When your actin and myosin filaments slide past each other, your muscles contract.

Microfilaments also provide some rigidity and shape to the cell. They can depolymerize (disassemble) and reform quickly, thus enabling a cell to change its shape and move. White blood cells (your body’s infection-fighting cells) make...
good use of this ability. They can move to the site of an infection and engulf the pathogen.