

The livelihood of each species in the vast and intricate assemblage of living things depends on the existences of other organisms.

This interdependence is sometimes subtle, sometimes obvious.

Perhaps the most straight forward dependence of one species on another occurs with parasites, organisms that live on or in other living things and derive nutrients directly from them.

The parasitic way of life is widespread.

A multitude of microorganisms(including viruses and bacteria) and an army of invertebrates - or creatures lacking a spinal column (including crustaceans, insects, and many different types of worms) -make their livings directly at the expense of other creatures.

In the face of this onslaught, living things have evolved a variety of defense mechanisms for protecting their bodies from invasion by other organisms.

Certain fungi and even some kinds of bacteria secrete substances known as antibiotics into their external environment.

These substances are capable of killing or inhibiting the growth of various kinds of bacteria that also occupy the area, thereby eliminating or reducing the competition for nutrients.

The same principle is used in defense against invaders in other groups of organisms.

For example, when attacked by disease-causing fungi or bacteria, many kinds of plants produce chemicals that help to ward off the invaders.

Members of the animal kingdom have developed a variety of defense mechanisms for dealing with parasites.

Although these mechanisms vary considerably, all major groups of animals are capable of detecting and reacting to the presence of "foreign" cells.

In fact, throughout the animal kingdom, from sponges to certain types of worms, shellfish, and all vertebrates (creatures possessing a spinal column), there is evidence that transplants of cells or fragments of tissues into an animal are accepted only if they come from genetically compatible or closely related individuals.

The ability to distinguish between "self" and "nonself", while present in all animals, is most efficient among vertebrates, which have developed an immune system as their defense mechanism.

The immune system recognizes and takes action against foreign invaders and transplanted tissues that are treated as foreign cells.