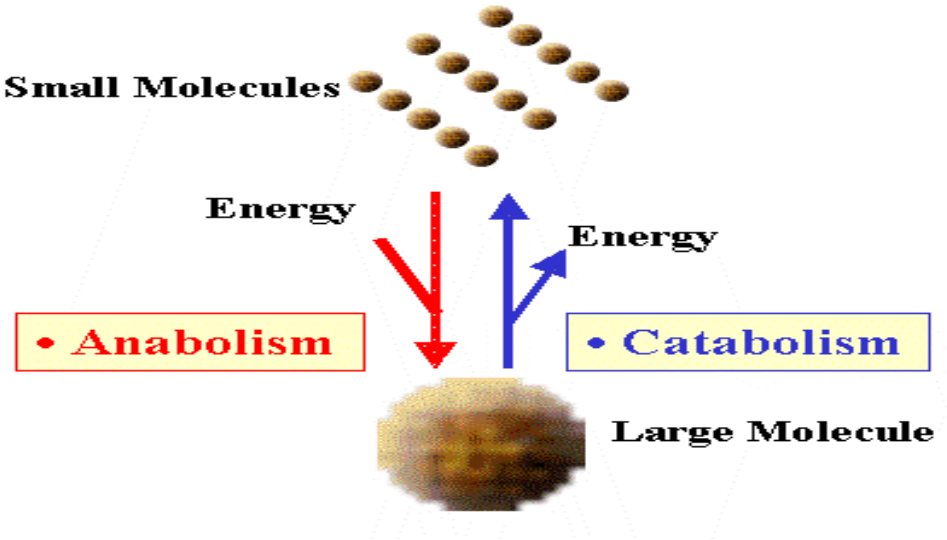
Metabolism :

is a term that is used to describe all chemical reactions involved in maintaining the living state of the cells and the organism.

Metabolism is usually divided into two categories: catabolism, the *breaking down* of organic matter, for example, by cellular respiration, and anabolism, the *building up* of components of cells such as proteins and nucleic acids. Usually, breaking down releases energy and building up consumes energy.



Primary metabolites: are essential compounds for growth to occur and include proteins, carbohydrates, nucleic acids and lipids. these primary products must be synthesized if they cannot be obtained from the growth medium. These primary metabolites have essential and obvious roles to play in the growth of the fungus. Typically, primary metabolites are associated with the rapid initial growth phase of the organism and maximal production occurs near the end of this phase. Once the fungus enters the stationary phase of growth, however, primary metabolites may be further metabolized. Examples of primary metabolites produced in abundance: enzymes, fats, alcohol and organic acids as well as, low molecular weight compounds.

Primary metabolism is used for:

1 Growth and development of hyphal structure
2 Energy metabolism
3 Regulation of metabolism
4 Intermediate in biosynthesis of compound.

Secondary metabolites; Organic compounds , with low molecular weight ,which are not essential for fungal growth but their natural production have certain significances. Furthermore, secondary metabolites are derived from a few common biosynthetic pathways which branch off the primary metabolic pathways and are often produced as families of related compounds, often specific for a group of organisms. Fungi are a rich source of secondary metabolites and have been of interest for humans for thousands of years.

Secondary metabolism is used for:

1 -competition

2 -antagonism

3 -self-defense mechanisms against other living organisms to allow the fungus to occupy the niche and utilize the food.

Types of Fungal secondary metabolites

1. Strobilurin (antifungal)

Strobilurins are a group of chemical compounds used in agriculture as fungicides.

2. Gibberellins (growth Hormons)
   Gibberellins : are plant hormones from fungal strain (*Gibberella fujikuroi*) that regulate growth and influence various developmental processes, including stem elongation, germination, dormancy, flowering, sex expression, enzyme induction, and leaf and fruit senescence.
3. Mycotoxins (poisneous)

Mycotoxins : is a toxic secondary metabolite produced by organisms of the fungus kingdom. The term 'mycotoxin' is usually reserved for the toxic chemical products produced by fungi that readily colonize crops. One mold species may produce many different mycotoxins, and several species may produce the same mycotoxin.

Examples of common Mycotoxins

- **Aflatoxins** :are a type of mycotoxin produced by *Aspergillus* species of fungi.
- **Ergot Alkaloids** :are compounds produced as a toxic mixture of alkaloids in the sclerotia of species of *Claviceps purpura* .
- **Patulin** is a toxin produced by the *P.expansum*, *Aspergillus*, and *Paecilomyces* fungal species

4. Herbicides (control weeds)

The fungi species most commonly used as herbicides in North America are *Phytophthora palmivoraa*

5. Insecticides (control insects)
   The fungi species most commonly used to kill insects *are Beauveria bassiana*
6. Antibiotics (drugs)

the fungus *Penicillium chrysogenum* was first used successfully to treat an infection caused by a bacterium