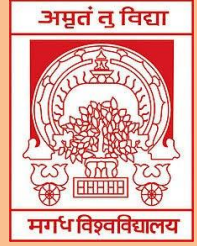




# DAUDNAGAR COLLEGE

MAGADH UNIVERSITY



**Topic**

**PHYLUM – CNIDARIA**

**METAGENESIS**

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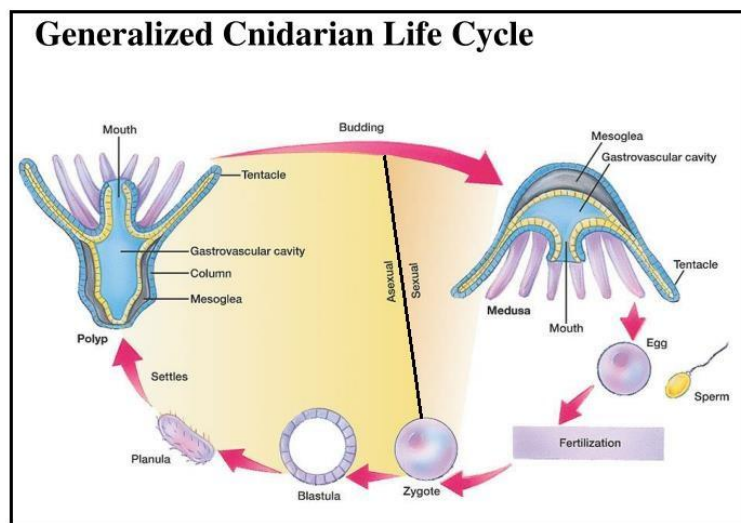
# Metagenesis

## Introduction

- Most of the hydrozoan coelenterates exist in two forms of individuals in its life history; these variable forms of organisms are called **zooids**.
- The two main forms are: - **solitary polyp** and **colonial medusa forms**.
- In many of the medusoid colony, there are many different structures of coelenterates called individuals and are structurally and functionally specialised for different specialised functions. This coexistence of different forms of individuals with specialised structure and function in the medusoid colony is called **polymorphism**.

**Life history and dimorphisms:** In the life history of cnidarians, there is an alternation of generation between asexual polyps and sexual medusa forms; this is also known as **Metagenesis**.

- Thus, it is a phenomenon whereby, in the life history of an organism, a **diploid asexual phase** and a **haploid sexual phase** regularly **alternate** with each other.
- This type of true alternation of generation is **present in plants** like mosses and ferns. In mosses and ferns the asexual diploid saprophytic generation and sexual haploid gametophytic generation alternate regularly with each other. The diploid saprophytic plant produces haploid spores which develop into flat, green, heart shapes haploid gametophytes.
- Haploid gametophytes produce haploid ova and sperms. After fertilization, they give rise to a new diploid saprophyte. This completes one life cycle.



## Alternation of generation in Cnidarians

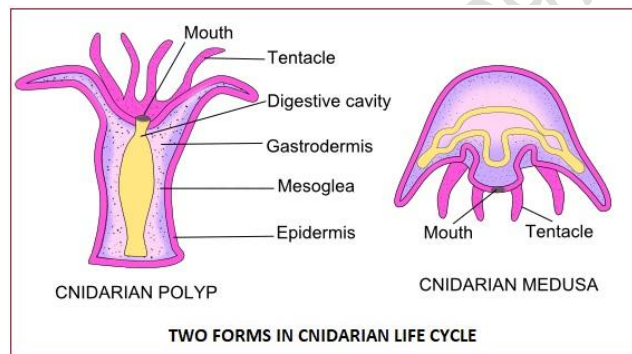
Similarly in Coelenterates, two types of individuals exist namely a polyp and a medusa alternates in their life cycle.

**Polyp:** The tube like zooid is called **polyp**. The polyp **reproduces asexually**.

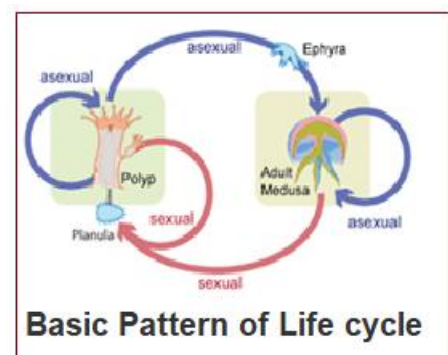
- It is **sessile and attaches to a substrate** at the **aboral end**.
- It has a **cylindrical body** called the **column**.
- Its **mouth is surrounded by food-gathering tentacles**.
- The body structure of polyp form is simple with simple muscles and nervous system.
- **Velum is absent**.
- Mouth is circular without oral lobes. Also its gastro vascular cavity is simple without radial circular canals.
- **Sensory organs are absent** in this form.
- This form reproduces asexually by budding.

**Medusa:** The umbrella like zooid is called medusa.

- The medusa is **dioecious and free swimming**.
- Its shape is like an **inverted bowl**.
- The tentacles hang from its margins.
- The mouth opening is centrally located at lower side.
- The medusa swims by its umbrella shaped body. It gives the medusa a jellylike appearance.
- The **body structure** of medusa form is **complicated with well-developed muscles and nervous system**.
- **Velum is present** around the margins of the umbrella shaped body.
- Also its **gastro vascular cavity is well-developed** with radial and circular canals.
- **Sensory organs** called as **statocysts** are present on the margins of the tentacles.
- These forms **reproduce sexually** through **gametes**.



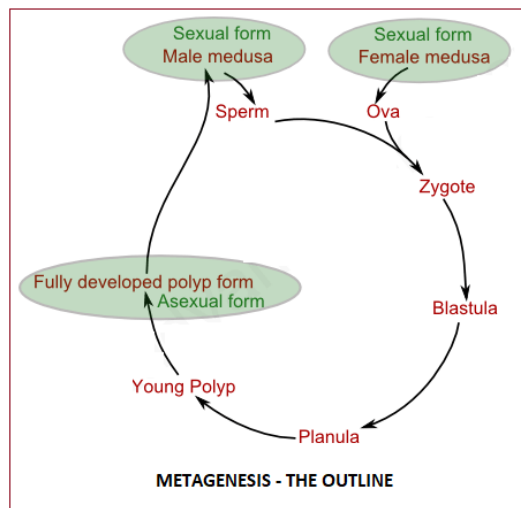
**Conclusion:** These two forms i.e. polyp and medusa alternate successively where the polyps reproduce asexually to form a large number of medusa. Each medusa reproduces sexually by the union of eggs and sperms to form zygote. The zygote grows into larva (planula), which fix itself to a substrate and finally form a new polyp (scyphistoma). The scyphistoma gives rise to new individual ephyra which develops to medusa.



## Metagenesis in Cnidarians - occurrence

This alternation of generations is characteristic for class Hydrozoa. In class Scyphozoa the medusoid stage is dominant and the polypoid stage is very much reduced. In class Anthozoa the medusoid stage is absent and the polypoid stage has become the sexual generation.

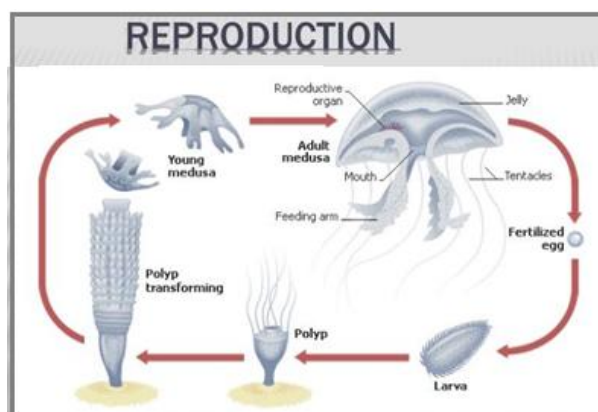
- In hydrozoans like **Obelia**, the life cycle includes **two clearly defined phases or forms**, a **fixed polypoid phase** also called as hydroid colony and a **pelagic medusoid form**.
- Hydroid colonies produce **no gonads** and reproduce asexually through budding to give rise to medusa forms.
- On the other hand, **medusa** reproduces only by sexual method and produces ova and sperms. These ova and sperm in turn give rise to **new hydroid colonies**.
- This kind of alternation of generation in Cnidaria, in which an asexual polypoid generation appears to alternate regularly with a sexual medusoid generation is also known as metagenesis.



## Comparison of polyp and medusa forms:

The following are the similarities between the polyp and medusa forms:

- Body is **radially symmetrical**
- Both the forms are **diploblastic** as they are derived from two germ layers namely ectoderm and endoderm
- Mouth is homologous in both the forms. In both the forms the mouth bears processes called as **manubrium**.
- **Anus is absent** in both of them.
- Exumbrellar surface of the medusa form corresponds to the base of the polyp.
- Stomach, radial canals and circular canals of medusa correspond to the gastro vascular cavity of the polyp form. The gastro vascular cavity is lined by gastrodermis in both the forms and this serves in the digestion of the food.



- Both the forms are **carnivorous** and capture their food with the help of the tentacles.
- **Digestion** in both the cases is **extracellular as well as intracellular**.

The following are the **differences between the polyp and medusa** forms:

<b>Polyp form</b>	<b>Medusa form</b>
<b>Fixed</b> and rarely free form	<b>Free swimming</b> form
Body is <b>cylindrical in shape</b> and is elongated	Body is <b>umbrella-shape</b>
Base is attached to the substratum exposing the manubrium upwards	Base is always above hanging the manubrium downwards
Tentacles are usually 24 in number	16 tentacles in young medusa & numerous in adult
Mesoglea is poorly developed	Mesoglea is well-developed
Velum is absent	Velum is present around the margin of the umbrella
Mouth is circular without oral lobes	Mouth is rectangular with oral lobes
Gastro vascular cavity is simple without radial and circular canals	Gastro vascular cavity is represented by stomach. It has 4 radial canals and one circular canal
Sense organs are absent	Sense organs called as statocysts are present at the margins of the tentacles
No gonads	4 Gonads are present on the radial canals
Reproduces asexually by budding	Reproduces sexually by gametes

**REVISION EXERCISES:**

1. What is mean by metagenesis. Discuss its importance in Phylum Cnidaria
2. Describe the alternative phases in phylum Cnidaria.
3. Differentiate between polyp and medusa forms.

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