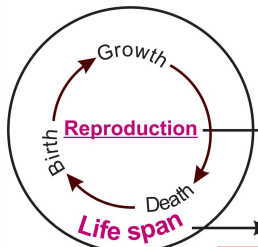


Reproduction in Organisms

1 INTRODUCTION



- Process in which an organism gives rise to offspring(s) similar to itself
- Biological process ensuring continuity of species on Earth, generation after generation

Mechanism depends on

- Organism's habitat
- Diversity in structure
- Internal physiology
- Environmental factors

Not linked to **size** of organism

Organism
Butterfly
Crow
Tortoise
Parrot

Life span
1-2 weeks
15 year
100-150 years
140 years

- No individual is **immortal** except single-celled organisms.

2 TYPES OF REPRODUCTION

Parameters

- Number of parents**
- Gamete formation**
- Gamete fusion**
- Type of cell division**
- Conditions for occurrence**
- Nature of offsprings**
- Examples**

Advantages

Disadvantages

Asexual

- One (uniparental)
- Yes
- No**
- Mitotic
- Mostly favourable
- Identical to parent
- Hydra, Planaria*

Advantages

- Simple process
- Rapid/faster
- No contribution to evolution as genetic recombination/crossing over is absent
- Low adaptability

Sexual

- One (Uniparental) - *Taenia* or Two (Biparental) - *Periplaneta*
- Yes
- Yes
- Meiotic and mitotic
- Both favourable and unfavourable
- Mostly non-identical offsprings
- Pheretima*

Advantages

- Contributes to evolution significantly through genetic recombination
- High adaptability
- Complex
 - Elaborate
 - Expensive
- Slower process

3 TYPES OF ASEYUAL REPRODUCTION

a. Fission

- Process in which an individual forms 2 or more daughter individuals

Types

Parameter

- Operational conditions**
- Number of daughters**
- Spindle formation**
- Example**

b. Fragmentation

- The body of the organism breaks into distinct pieces/fragments and each fragment grows into an adult capable of producing offsprings

Example - Hydra

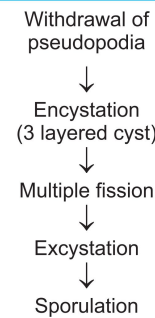
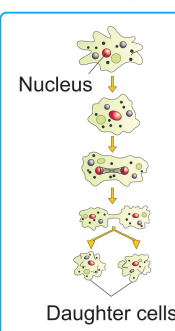
I. Binary fission

- Favourable
- 2
- Yes
- Amoeba*

II. Multiple fission

- Favourable and unfavourable
- Multiple
- No
- Amoeba*

Mechanism



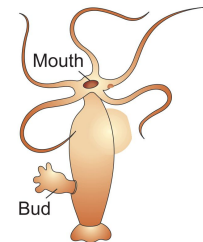
c. Budding

Types

I. External budding

- As small bulge (unequal division) from the parent body that develops externally and eventually separates from the parent

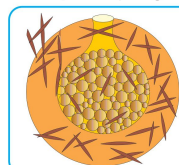
Example - Hydra



II. Internal budding

- Internal buds called **gemmules** that are aggregates of archaeocytes protected by spicules.

Example - Sponges



A gemmule

4 PARTHENOGENESIS

- Absence of gamete fusion/syngamy
- Female gamete develops into new organism without fertilisation
- Examples:** Rotifers, honey bees, some lizards, birds (turkey).

5 SEXUAL REPRODUCTION

- **Remarkable fundamental similarity** occur in process of sexual reproduction among different organisms **despite different structures** for reproduction.
- Reproductive processes and associated behaviors are regulated by **hormones** and **environmental factors**.

Events associated

A. Pre-fertilisation events: → Gametogenesis
→ Gamete transfer

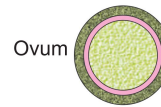
a. Gametogenesis: Formation of gametes

- **Meiocytes:** Gamete forming diploid cells/gamete mother cells
- **Gametes are haploid** in nature i.e. receive only one set of chromosomes at the end of meiosis
- A **haploid parent** produces gametes by **mitotic divisions**
- A **diploid parent** produces haploid gametes by **meiosis**

Name of organism	Chromosome number in meiocyte (2n)	Chromosome number in gamete (n)
Humans	46	23
House fly	12	6
Rat	42	21
Dog	78	39
Cat	38	19
Fruit fly	8	4
Butterfly	380	190

Parameters

	Female	Male
◦ Size	Big	Small
◦ Motility	⊖	⊕
◦ Chromosome number	Same	Same
◦ Food storage	⊕	⊖
◦ Number	Less	More



Types of organisms

Bisexual (Hermaphrodite)	Unisexual
Leech Earthworm Sponges	Cockroach

Types of gametes (Basis: Morphological and physiological difference)

Heterogametes

- Different

Types

	Female	Male
◦ Size	Big	Small
◦ Motility	⊖	⊕
◦ Chromosome number	Same	Same
◦ Food storage	⊕	⊖
◦ Number	Less	More



Homogametes/Isogametes

- Same

b. Gamete transfer: Enables bringing together of ♂ and ♀ gametes physically leading to fertilisation.

Internal fertilisation

- Fertilisation occurs inside ♀ reproductive tract
- Mostly terrestrial organisms e.g. Reptiles, mammals

External fertilisation

- Fertilisation occurs in water
- Mostly aquatic organisms e.g. Bony fishes and amphibians

Disadvantages

- Limited number of progeny
- Offsprings are extremely vulnerable to predators threatening their survival to adulthood
- Great **synchrony** required between ♀ and ♂ during external fertilisation to enhance chances of fertilisation.
- Heterogametes are present in majority of sexually reproducing organisms.

Pre-reproductive Phase
Birth
↓
Juvenile
↓
Puberty

Reproductive Phase

Post-reproductive Phase
Death

B. Fertilisation

Most vital event of sexual reproduction is fusion of gametes called **syngamy** resulting in formation of **diploid, single celled structure**

C. Post-fertilisation

- **Embryogenesis:** Process of development of embryo from the zygote through **mitotic cell divisions** help increase number of cells and **cell differentiation** helps in formation of specialised tissues and organs

- End of reproductive phase is a parameter of senescence
- Slowing of metabolism
- Ultimately leads to death

ZYGOTE

→ Vital connecting link ensuring continuity of species between generations.

Location of development of zygote

Oviparous animals

- Outside the ♀ body
- Protected by calcareous shell
- Lesser parental care

Viviparous animals

- Inside the ♀ body
- Absent
- Greater parental care

The chances of survival of young ones is greater in viviparous organisms

6 BREEDING SEASON

Basis: The time duration when mating occurs

Parameters

	Continuous breeders	Seasonal breeders
◦ Breeding time	Throughout the year	Specific breeding season
◦ Examples	Primates, Hens (poultry birds in captivity)	Elephant, Birds in wild, Horse, Cow, Goat

7 REPRODUCTIVE CYCLES IN PLACENTAL MAMMALS

- Cyclical changes during reproduction

Parameters

	Oestrous cycle	Menstrual cycle
◦ Characteristic of	Non-primate mammals	Primates
◦ Examples	Cows, deer, sheep, rats, dogs, tiger	Humans, apes, monkeys