ORGANOGENESIS

 **Organogenesis** means the development of adventitious organs or primordial from undifferentiated cell mass in tissue culture by the **process of differentiation**. This is the process by which cells and tissues are forced to undergo changes which lead to the production of a unipolar structure, namely a shoot or root primordium, whose **vascular system is often connected to the** **parent tissue**. Morphological changes in the callus leading to the *denovo* organ formation from undifferentiated tissues are termed as **organogenesis.**

 .This system is commonly produced in callus cultures, but can be produced directly from the *explant.* It is effected through a balance between the **levels of auxins and cytokinins**. A relatively a higher proportions of **auxins are required for root induction** and for the **shoot induction** **a higher level of cytokinins** are required. It is usual to induce shoot formation by increasing the cytokinin to auxn ratio of the culture medium. These shoots can then be rooted in auxin rich medium.

 Organic connection between shoot and root primordial is essential for the regeneration of complete plantlet from the same culture. Shoot formation followed by rooting is the general characteristic of organogenesis . **Organogenesis is unipolar** in structure and there is vascular connection with explant and not easily separated unless cut off.

***de novo***

It literally means “arise a new”. New plants arising from unorganized cells or tissues to form unorganized cells and tissues

Cytodifferentiation

 In plant tissue culture during growth and maturation of the callus tissue or free cells in suspension culture few dedifferentiated cells undergo cytosenescence and redifferentiated to vascular tissues. The development process is termed as cytodifferentiaton.

 Caulogenesis

 It is a type of organogenesis by which only adventitious **shoot bud initiation** takes place in the callus culture

Rhizogenesis

 It is a type of organogenesis by which only adventitious root formation takes place in the callus tissue

Organoids

 In some cultured tissues, an error occurs in the development programming for organogenesis and an anomalous structure is formed. Such anomalous organ like structures are called organoids

Meristemoids

 Meristemoid is a localized group of meristamic cells that arise in the callus tissue and may give rise to shoots and or roots

Explant

 The tissue taken from a plant or seed and transferred to a culture medium to establish a tissue culture system or regenerate a plant

Precocious germination

 Premature germination of the embryo radicle prior to completion of embryogenic development.

Dedifferentiation

 The phenomenon of the conversion of mature cells into the meristematic state leading to the formation of callus is called dedifferentiation

**Protocom**

 In nature, little differentiated structures developing naturally on orchid embryo which help in propagating the orchids. Through *in vitro* culture also, from cymbidium shoot tip cultures , protocoms could be produced which again could be sectioned into quarters and subculutred, each section regenerating a new protocom, within a few weeks which, in turn , could be divided. The so obtained protocom subsequently evolved in to young plantlets.

Adventitious buds:

Shoot buds originating from other than existing meristem are known as adventitious shoot buds.

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Differentiation

 The process of biochemical and structural changes by which cells especially the unroganised cells becoming specialized in form and function

Redifferentiation

 The component cells of callus have the ability to form a whole plant is called redifferentiation

 These two phenonmenons of dedifferentiation and redifferentiation are inherent in the capacity described as cellular totipotency . This property is found only in plant cells and not in animal cells

Xylogenesis

 It is the differentiation of parenchyma into cells that have localized secondary wall thickeninings as seen in the xylem and vascular plants

Factors affecting Regeneration

* source of explant
* nutrient media and constituents
* plant growth regulators