21/10/23
Saturday

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Date

• Drosophilia –
- There are three function of organizer :–
1) The organizer activate or deactivate the surround cell to differentiate and start morphogenesis.
2) Three germ layers of the developing embryo are signal & affected by the orgenells.
3) Three germ layers will respond to the organizers signal.

- The egg of drosophilia is about 0.5 mm long & 0.15 mm in diameter with a clearly define polarity.
- A series of nuclear division without cell division creates a syncytium.
- The 1st nine division generate cloud of nuclei most of which migrate from the middle of the egg towards the surface were they form a monolayer called the syncytial blastoderm.
- After another 4 rounds of nuclear division plasma membrane grow inwards from the egg surface to enclose each nucleus. there by convert in syncytial blastoderm into cellular blastoderm.
- After cellularisation cell division continuous & gastrulation begins. little while before cellularisation complete.
- When part of the cells forming the exterior of the embryo start the tuck into the interior to form the gut, the musculature & associated internal tissue &

- The little later in another region of the embryo a separate set of cell move from the surface epithelium into the interior to form the central nervous system by marking & following the cells through various movements one can draw fate map for the monolayer of cells on the surface of the blastoderm.
- As gastrulation near competition a series of identation & buldges appears in the surface of the embryo marking the subdivisions of body into segments along it anterior - posterior axis.
- Soon a fully segmented larva emerges, ready to start eating & growing within the cells of larva a small group of cells remain apperately undifferentiating forming structures called imaginal disk. These will grow as the larva grows & eventually they will give rise to the most of the structures of the adult body.
- a head end & tail end ventral side dorsal side gut nervous system a series of body segment these are on features of the basic body plane that drosophilia share with the many other animal including yourself.

Anterior - posterior axis :—
- The future anterior end of the embryo contains a high concentration of MRF for the gene regulating protein called bicoid. This mRNA translated to produced bicoid

- These create 4 protein gradient in early embryo
1) Anterior to posterior gradient of bicoid protein
2) Anterior to posterior gradient of Hunchback protein
3) posterior to an anterior gradient of Nanos protein.
4) posterior to anterior gradient of Caudal protein.

- Which diffuses away from which with source to form concentration gradient. which is maximum at the anterior end of the egg.

- The future posterior end of the embryo contains a high concentration of m-RNA for a regulator of translation for nanos which set up the posterior gradient in the same way.

- The third signal with which generated symmetrical at both ends of the egg by local activation of trans-membrane tyrosine kinase receptor called Torso.

- The activator receptor exert it defect over a shorter range marking a sites of specialized terminal structure that will form at the head & tail ends of the future larva. & also define the rediments of the future gut.

- The three sets of the genes responsible for localized determinits are referred to as the anterior-posterior & terminal sets of egg polarity.

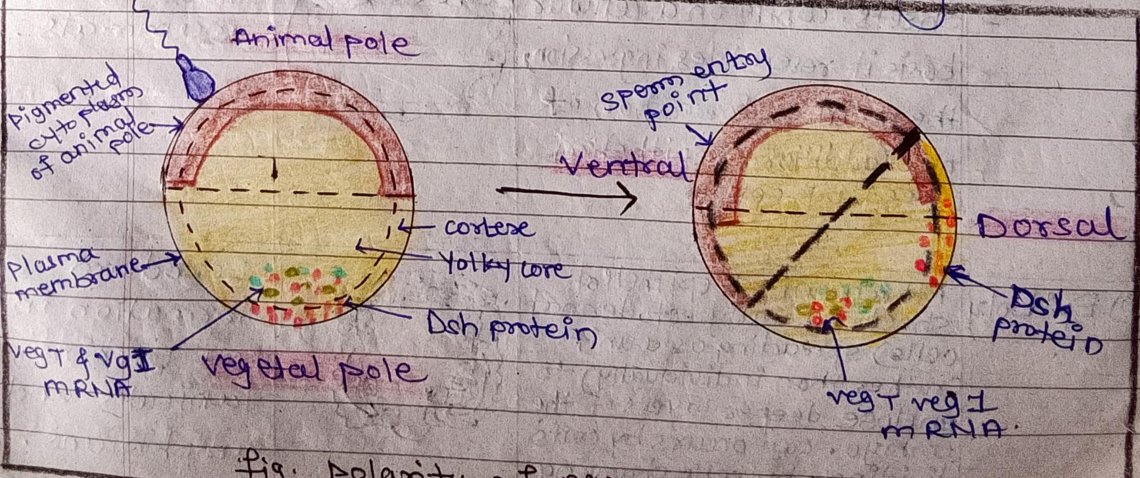
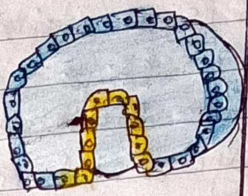
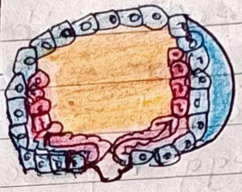
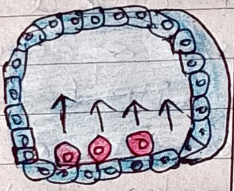
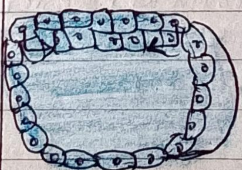
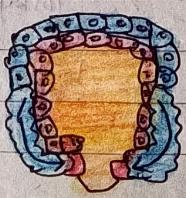
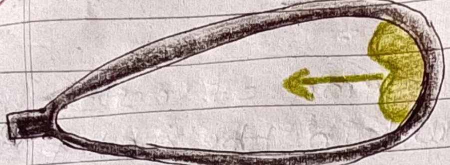


fig. polarity of egg

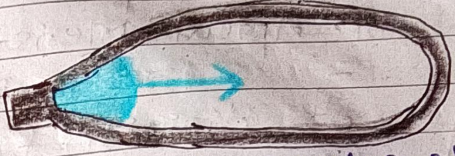
Type of Movement	Description	Illustration	Example
1) Invagination	Infolding of a sheet (epithelium) of cells, much like the ~~iden~~ indention of a soft rubber ball when it is pocked.		Sea urchin endoderm.
2) Involution	Inward movement of an expanding outer layer so that it spreads over internal surface of the remaining external cells.		Amphibian mesoderm
3) Ingression	Migration of individual cells from the surface into the embryo's interior. Individual cells become mesenchymal (i.e. separate from one another) & migrate independently.		Sea urchin mesoderm, Drosophila neuroblasts.
4) Delamination	Splitting of one cellular sheet into two more or less parallel sheets. while on a cellular basis it resembles ingression, the result is formation of new (additional) epithelial sheet of cells.		Hypoblast formation in birds & mammals.
5) Epiboly	Movement of epithelial sheets (usually ectodermal cells) spreading as a unit (rather than individually) to enclose deeper layers of the embryo. Can occurs by cells dividing, by cells changing their shape, or by several layers of cells intercalating into fewer layers.		Ectoderm formation in sea urchins, tunicates and amphibians.

Posterior system



Localized mRNA (nanos)

Anterior system



Localized mRNA (bicoid)

Terminal system

transmembrane receptors (Torso)

Dorsoventral system

Transmembrane receptors (Toll)

- Anterior - posterior system :-

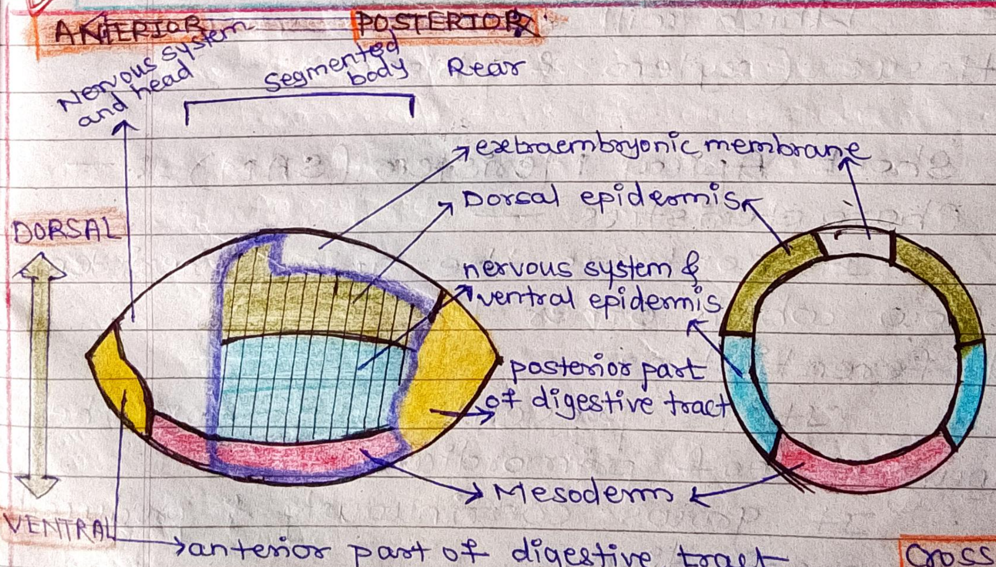
* Determining -

- germ cells Vs. somatic cells.
- head Vs. rear
- body segments

- Terminal - Dorsoventral system —

* Determining —

- ectoderm Vs. mesoderm Vs. endoderm
- terminal structures.



Side view

Cross Section Through center

3/11/2023
Friday

* ~~Root Apical Meristem.~~
* Apical Meristem :—
- It is the region of cells capable of division & growth in the root & shoot tips in plants.
- Apical meristem give rise to the primary plant body & are responsible for the extension of the roots & shoots.
- Cells in the meristematic regions are small nearly spherical, dense cytoplasm & relatively few small vacuole.
-
• There are three primary meristem —
1) Protoderm —
- Which will become the epidermis
2) Ground Meristem —
- Which will form the ground tissue.
i.e. parenchyma, collenchyma and sclerenchyma cell.
3) Procambium —
- Which will become a vascular tissue (xylem & phloem)

* Shoot Apical Meristem (SAM) :—
• Characteristics —
- It contains the apical meristem below which other tissues are differentiating.
- It is present just above the youngest leaf primordian.
- It grows continuously & produced leaf premordian.
- When shoot apex forms & inflorence or flower the growth become determinate

- The growth also become determinate or limited when the stem is modified to tendril or thorns.
- The shoot apical meristem consists of 4 types of cells —
  (i) Stem cells
  (ii) Daughter stem cell
  (iii) founder cells : That initiate organ
  (iv) development & an organising centre.

* Root Apical Meristem (RAM) :—
- It is the small region at the tip of a root in which all cells are capable of repeated division & from which all primary root tissues are derived.

(i) Root cap →
- Root apical meristem is protected as it passess through the soil by an outer region of living parenchyma cells called G-B root cap.

ii) Root Hairs →
- Root hairs also begin to develop as simple extension of cells near the root apical meristem.

(iii) There are the three distinct zones in which certain specific growth pattern dominate :-
  (a) cell elongation
  (b) Cell Differentiation
  (c) Tissue Maturation

Totipotent cell ⇒ Ability to repeated division.

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• ~~Root Apical Meristem~~ —

- The region of cell divisions includes the apical meristem & the primary meristem (protoderm, ground meristem & procambium)
- Exception in plants with woody roots (i.e. those of ~~pre~~ perennial dicotyledons).
- Secondary growth includes secondary xylem & phloem as well as periderm are developed & add ~~gr~~ girth to the plant.

* Cell cycle —

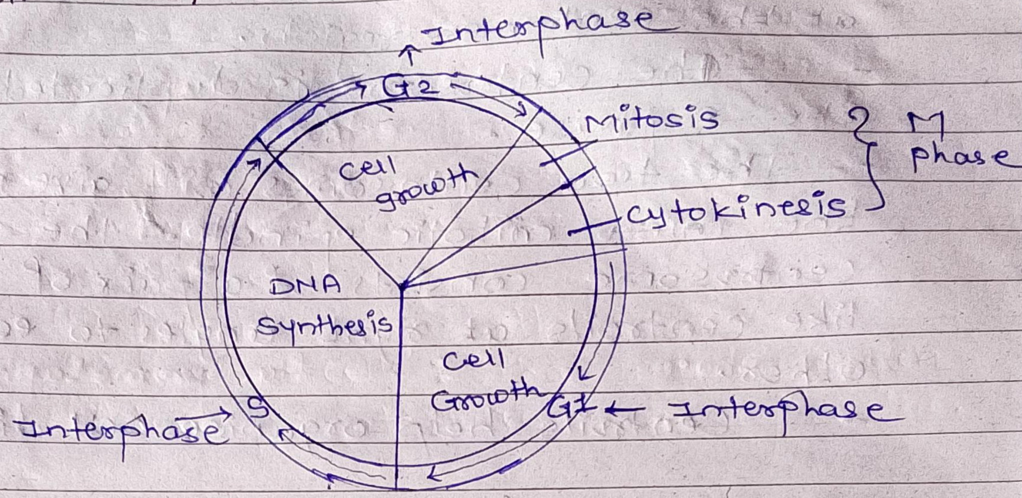


fig: cell cycle

* cell cycle

- It has a two major phases :

(1) Interphase —

It is a preparatory phase & it has three stages :

(i) G1 phase (first Gap phase) —

- It is a biochemically active phase.
- In this phase there is a accumulation of building blocks of chromosomal DNA & the associated proteins of DNA replication or DNA synthesis. (eg. Helicase, DNA polymerase, RNA polymerase, topoisomerase) as well as accumulating enough energy reserves to complete the task of replication.

(ii) S phase (synthesis phase) —

- There is a formation of two identical copies of each chromosome — sister chromatids that are firmly attached

Intermediate filaments
Microfilaments
Macrofilaments } cytoskeleton

at the centromere region.

- The centrosome is duplicated during the S-phase.
- The two centrosomes will give rise to the ~~micro~~ mitotic spindle. the centrosome consists of a pair of rod like centroils at right angles to each other.
- Centroils help organise cell divisions

(iii) G2 phase (second Gap phase) —

- In this phase cell repleinishes its energy stores & synthesize the proteins necessary for chromasome manipulation.
- Some cell organelles are duplicated & the cytoskeleton is dismantled to provide resources for the mitotic spindle.
- There may be additional cell growth during G2 phase.

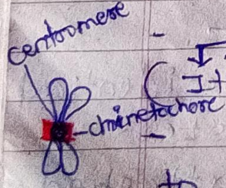
② Mitosis Phase —

(i) Prophase —

- chromosome condensed & become visible.
- spindle fibres emerges from the centrosomes
- Nuclear envelop breaked down.
- Centrosomes move towards opposite poles.

(ii) Pro-metaphase →

- chromosomes continues to condense
- Kinetochores ~~chinetochores~~ appears at the centromere (It is site where spindle fibres get attached)
- Mitotic spindle, microtubules attach to ~~chinetochores~~ Kinetochores



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(iii) Metaphase –

- chromosomes are aligned up at the metaphase plate. (equatorial plane)
- Each sister chromatid ~~ar~~ is attach to spindle fibre originating from opposite poles

(iv) Anaphase –

- Centromeres splits into two.
- sister chromatids (Now called chromosomes) are pull towards opposite poles.
- Certain spindle fibres begin to elongate the cell.

(v) Telophase –

- Chromosomes arrived at opposite poles & begin to decondense
- Nuclear envelope materials surrounds each set of chromosome.
- The mitotic spindles break down.
- spindle fibres continue to push poles apart.

• Cytokinesis :–

• In Animal cells ⟶

- A cleavage furrow separates the daughter cells.

• plant cells ⟶

a cell plate, the precursor to new cell wall separates the daughter cells.

Intr

fig. Mitosis

fig. prophase

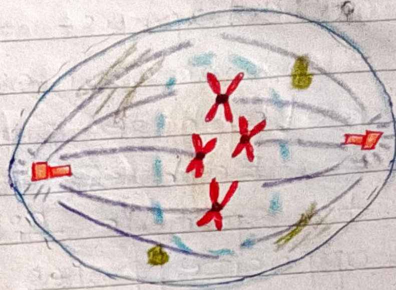

fig. prometaphase.

fig. Metaphase

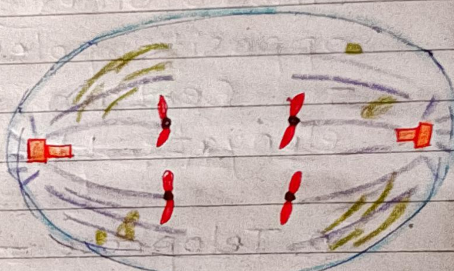

fig. Anaphase

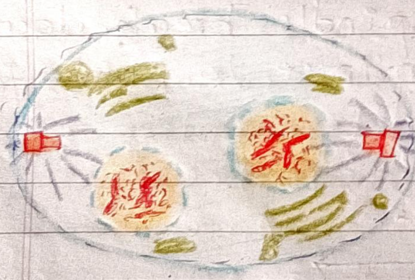

fig. Telophase

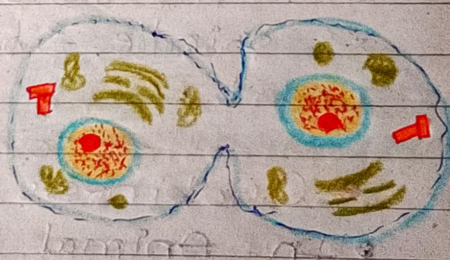

fig. cytokinesis

Date

* Regulation of cell cycle :—
i) At the end of G1
ii) G2 - M transition
iii) At Metaphase

(i) The G1 check point —
- It Determines whether all conditions are favourable for cell division to proceed.
- It is also called restriction point, is the point at which cell irreversibly commits to the cell division process.
- In addition to adequate result & cell size there is a check for damage to the genomic DNA at the G1 check point.
- A cell that does not make all the requirement will not be released in the S phase.

(ii) The G2 check point —
- It is ensured that all the chromosome have been replicated & that the replicated DNA is not damaged.

(iii) The M check point —
- It occurs near the end of metaphase stage of mitosis, It is also known as spindle check point, because it determines if all the sister chromatids are correctly attach to the spindle microtubule.
- Because the separation of sister chromatids during anaphase is an irreversible step.

- The cycle will not proceed until kinetochore of each of sister chromatid are firmly anchored to spindle fibres arising from opposite pole of the cell.