Full Form of AER: Agranular Endoplasmic Reticulum

Agranular Endoplasmic Reticulum (AER)

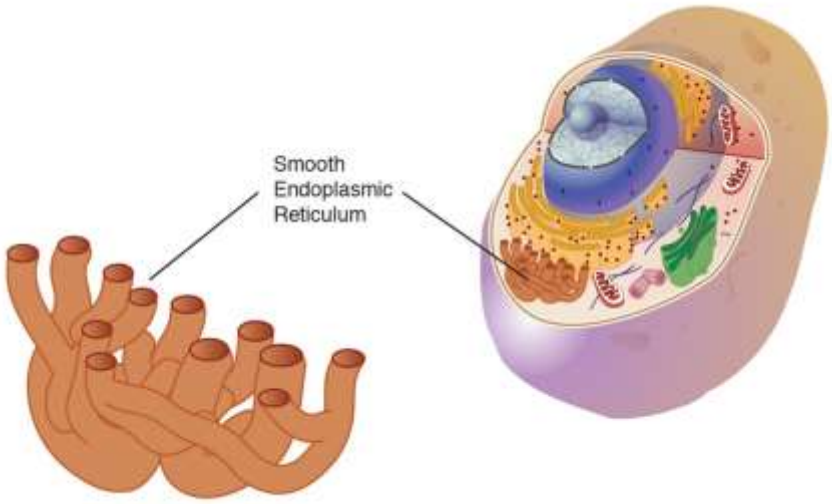
Agranular endoplasmic reticulum refers to the type of ER that do not have any ribosomes over their surface or embedded in it. Hence, it has a smooth appearance and mostly appears in a tubular form. These tubules have a diameter of about 500-1000 Å. Another name for them is Smooth Endoplasmic Reticulum (SER).

Functions:

- The agranular endoplasmic reticulum is the main intracellular storage depot for Ca^{2+}.
- They are mostly found in those cells that are concerned with steroid or lipid synthesis (like the sebaceous and adrenal glands), carbohydrate metabolism (liver cells), conduction of impulses (muscle cells) and cells involved in pigment production (retinal pigment cells).
- They are also involved in the synthesis of complex fatty acids and membrane lipids including both phospholipids and cholesterol.
- Steroid hormones synthesis is another aspect where AER takes part.
- The SERs in the hepatic cells are the major sites for the removal of xenobiotics (synthetic compounds not found in nature); catalysed by the Cytochrome P-450 monooxygenase family members present in SER, like in the hepatic cells.

$$RH + O_2 + 2\,e^- \rightarrow ROH + H_20$$

Here, RH- Xenobiotic compound



The IP_3/DAG pathway and the elevation of cytosolic Ca^{2+}:

i. The opening of the endoplasmic reticulum Ca^{2+} channels can be triggered by ligand binding to GPCRs that activate either the $G_{\alpha o}$ or $G_{\alpha q}$ subunit.
ii. This leads to activation of Phospholipase C.
iii. The cleavage of PI (4,5)P_2 by Phospholipase C yields IP_3 and DAG.
iv. IP_3 is a water-soluble molecule that leaves the plasma membrane and rapidly diffuses through the cytosol.
v. After diffusing through the cytosol, IP_3 interacts with and opens the IP_3-gated Ca^{2+} channels in the ER membrane.

vi. This results in the release of the stored Ca^{2+} ions into the cytosol.
vii. The rise in cytosolic Ca^{2+} levels results in recruitment of Protein Kinase C (PKC) to the plasma membrane.
viii. PKC is present as a soluble cytosolic protein that is catalytically inactive.
ix. A rise in cytosolic Ca^{2+} level causes PKC to translocate to the cytosolic leaflet of the plasma membrane, where it interacts with membrane-associated DAG.
x. PKC is then activated by DAG.
xi. The activated membrane-associated kinase can phosphorylate various enzymes and receptors, thereby altering its activity.
xii. In many cells, PKC phosphorylates transcription factors that are localized in the cytosol, triggering their movement into the nucleus; where they activate the genes necessary for cell division.
xiii. In liver cells, PKC regulate glycogen metabolism by phosphorylating and inhibiting glycogen synthase.

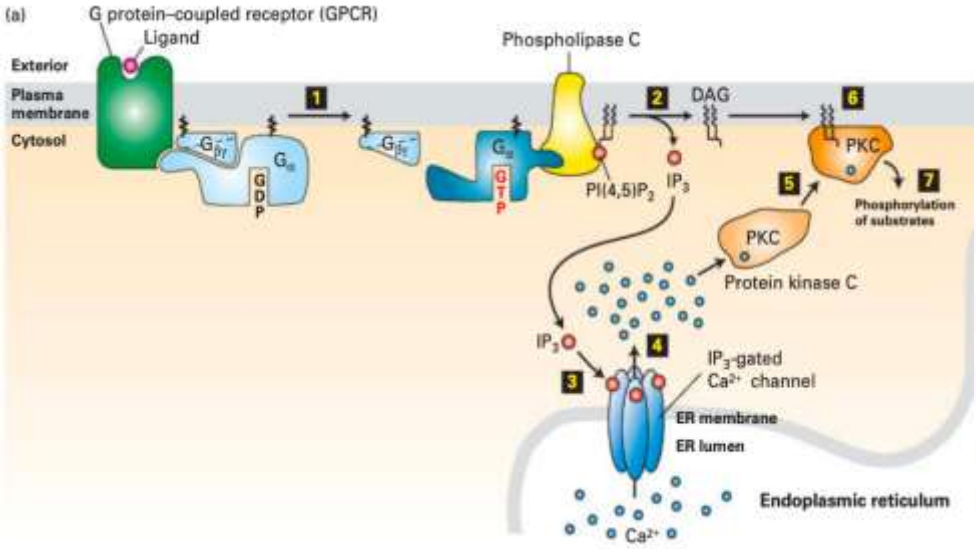


Fig: The IP_3/DAG pathway and elevation of cytosolic Ca^{2+} ions

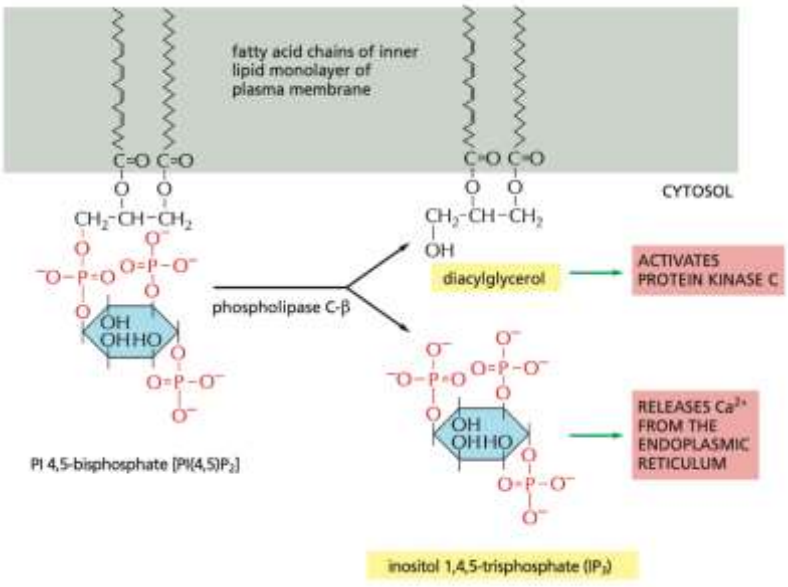


Fig : The hydrolysis of $PI(4,5)P_2$ by PLC to release IP_3 and DAG

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