

Neurovascular Coupling

Prelims - Current events for National and International Importance | Science & Technology.

Why in News?

Recently, a study found that the brain's energy efficiency relies not just on responsive neurons, but also on a hidden vascular network.

- **Concept** - It is the process within the brain, precisely linking the activity of brain cells (neurons) to the local blood supply.
- **Role** - This intricate connection ensures that active brain regions receive the necessary resources to function efficiently.
- **Process** - When neurons fire, nearby blood vessels rapidly widen to deliver glucose and oxygen, ensuring the brain's energy demands are met instantaneously.
- Messages travel 'upstream' from smaller vessels to larger vessels and the known chemical messengers moved too slowly to account for the brain rapid responses.
- Cells lining the brain's blood vessels are linked by gap junctions, that let neighbouring cells exchange ions and small molecules.
- Gap junctions enable rapid, direct communication between cells in the blood vessel walls, bypassing the need for slower chemical messengers.
- **Working in blood vessels**
 - **Arteries** - It has strong gap junction connectivity involving with connexion proteins allowing for rapid signals.
 - **Veins** - It has weaker networks, suggesting less involvement in immediate neurovascular response.
 - **Capillaries** - It serves as the local sensors of brain activity.

***Arteries** transfer blood from the heart to the tissues. **Veins** transfers the blood from the different body parts into the heart. **Capillaries** help in the exchange of nutrients in the tissues and they also connect the veins and arteries.*

Connexin proteins

- It is a group of proteins that *allow cells to communicate directly with their neighbours*.
 - Example: Cx37 and Cx40
 - **In arteries** - Both connexin proteins, were *especially abundant* that may be responsible for the rapid call to action.
 - Its signals travel along vessel walls to widen upstream arteries, boosting blood flow to active brain areas.
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- **Significance of discovery** - Gap junctions acted as a “*scaling mechanism*” that let blood delivery grow to match bursts of brain activity.
 - It could *help develop drugs to activate connexins* as well as discover brain’s 20-plus connexin protein types combine into mosaic junctions that fine-tune messages from cell to cell.

Reference

[The Hindu| Neurovascular Coupling](#)

