# Article information:

Peroxisome biogenesis initiated by protein phase separation | Nature
<https://www.nature.com/articles/s41586-023-06044-1>

# Article summary:

1. Peroxisome biogenesis is initiated by protein phase separation, with peroxins forming a biomolecular condensate through liquid-liquid phase separation (LLPS) and creating a transient conduit for cargo transport across the peroxisomal membrane.

2. The YG repeats within the prion-like domains of Pex13 are essential for PTS1 protein transport, and their substitution disrupts peroxisomal protein import.

3. The study provides a natural explanation for protein import into peroxisomes, with peroxins forming a primitive and transient nuclear pore complex-like assembly through LLPS.

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article "Peroxisome biogenesis initiated by protein phase separation" published in Nature discusses the mechanism of peroxisomal protein transport through biomolecular condensates formed by peroxins Pex5, Pex13, and Pex14. The authors propose that these proteins undergo liquid-liquid phase separation (LLPS) to create a transient conduit for cargo transport across the peroxisomal membrane. The hypothesis is based on the sequence characteristics of intrinsically disordered regions (IDRs) in these proteins that resemble those of nucleoporin proteins of nuclear pore complexes (NPCs).

The article provides compelling evidence for the proposed mechanism, including in vitro studies showing Pex5-cargo-dependent ion conductance and precipitation of peroxisomal proteins as large complexes under ATP depletion. However, some points require further investigation and consideration.

Firstly, the article does not provide a physical model of transport or direct observation of channels formed during LLPS. While the authors suggest that peroxins form a primitive and transient NPC-like assembly, this remains speculative without experimental validation.

Secondly, the article does not explore potential counterarguments or alternative hypotheses for peroxisomal protein transport. For example, it is possible that other mechanisms such as vesicular transport or membrane fusion also contribute to protein import into peroxisomes.

Thirdly, while the article notes similarities between IDRs in peroxins and nucleoporin proteins, it does not discuss differences in their functions or structures. Nucleoporins form a selective-permeability filter in NPCs with distinct FG motifs arranged in a specific pattern, whereas peroxins do not have such motifs and may form different types of condensates.

Finally, the article does not address potential risks associated with LLPS-mediated protein transport. It is possible that aberrant LLPS could lead to mislocalization or aggregation of cargo proteins and disrupt normal cellular processes.

In conclusion, the article provides a novel hypothesis for peroxisomal protein transport through LLPS-mediated biomolecular condensates formed by peroxins. While the evidence presented is compelling, further investigation and consideration of alternative hypotheses and potential risks are necessary to fully understand the mechanism of peroxisomal protein transport.

# Topics for further research:

* Alternative mechanisms for peroxisomal protein transport
* Direct observation of channels formed during LLPS
* Differences between IDRs in peroxins and nucleoporin proteins
* Risks associated with LLPS-mediated protein transport
* Vesicular transport and membrane fusion in peroxisomal protein import
* Selective-permeability filter in nuclear pore complexes

# Report location:

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