Microsome

In cell biology, **microsomes** are heterogenous vesicle-like artifacts (~20-200 nm diameter) re-formed from pieces of the endoplasmic reticulum (ER) when eukaryotic cells are broken-up in the laboratory; microsomes are not present in healthy, living cells.[1]

Microsomes can be concentrated and separated from other cellular debris by differential centrifugation. Unbroken cells, nuclei, and mitochondria sediment out at 10,000 g, whereas soluble enzymes and fragmented ER, which contains cytochrome P450 (CYP), remain in solution (g is the Earth's gravitational acceleration). At 100,000 g, achieved by faster centrifuge rotation, ER sediments out of solution as a pellet but the soluble enzymes remain in the supernatant. In this way, cytochrome P450 in microsomes is concentrated and isolated. Microsomes have a reddish-brown color, due to the presence of the heme. Because of the need for a multi-part protein-system, microsomes are necessary to analyze the metabolic activity of CYPs. These CYPs are highly abundant in livers of rats, mice and humans, but present in all other organs and organisms as well.

To get microsomes containing a specific CYP or for high amounts of active enzyme, microsomes are prepared from Sf9 insect cells or in yeast via heterologous expression. Alternatively expression in *Escherichia coli* of whole or truncated proteins can also be performed.[2][3] Therefore, microsomes are a valuable tool for investigating the metabolism of compounds (enzyme inhibition, clearance and metabolite identification) and for examining drug-drug interactions by *in vitro*-research. Researchers often select microsome lots based on the enzyme activity level of specific CYPs. Some lots are available to study specific populations (example: lung microsomes from smokers or non-smokers) or divided into classifications to meet target CYP activity levels for inhibition and metabolism studies.

Researchers use microsomes to mimic the activity of the endoplasmic reticulum in a test tube and conduct experiments that require protein synthesis on a membrane; they provide a way for scientists to figure out how proteins are being made on the ER in a cell by reconstituting the process in a test tube.

See also

- Cytochrome P450
- List of biological development disorders
- S9 fraction

References

1. Voet D, Voet JG (2004). *Biochemistry* (https://archive.org/details/biochemistry00voet_1) (3rd ed.). Wiley. p. 1309 (https://archive.org/details/biochemistry00voet_1/page/1309). ISBN 0-471-19350-X.
2. Pan Y, Abd-Rashid BA, Ismail Z, Ismail R, Mak JW, Ong CE (2011). "Heterologous expression of human cytochromes P450 2D6 and CYP3A4 in Escherichia coli and their functional characterization". *The Protein Journal*. **30** (8): 581–91. doi:10.1007/s10930-011-9365-6 (https://doi.org/10.1007%2Fs10930-011-9365-6). PMID 22001938 (https://pubmed.ncbi.nlm.nih.gov/22001938).
3. Schwarz D, Kisselev P, Honeck H, Cascorbi I, Schunck WH, Roots I (2001). "Co-expression of human cytochrome P4501A1 (CYP1A1) variants and human NADPH-cytochrome P450 reductase in the baculovirus/insect cell system". *Xenobiotica; the Fate of Foreign Compounds*

in Biological Systems. **31** (6): 345–56. doi:10.1080/00498250110055947 (https://doi.org/10.1080%2F00498250110055947). PMID 11513247 (https://pubmed.ncbi.nlm.nih.gov/11513247).

External links

- Microsomes (https://meshb.nlm.nih.gov/record/ui?name=Microsomes) at the US National Library of Medicine Medical Subject Headings (MeSH)