

Where have all the cell organelles gone during the cell division?

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Madam, the life ensuring organelle of a cell in the form of a nucleus containing chromosomes is being covered by a porous gated nuclear membrane. It is associated with endoplasmic reticulum, ribosome, Golgi apparatus, lysosomes, mitochondria, multiple vesicles that are supposed to be arranged on the dynamic cytoskeleton. This is to ensure specific cell activity of DNA replication, repair and chromosome formation during interphase. Since the life of a cell depends on the functional interplay of the intracellular organelles, how the cytoplasmic space is created for the phases of cell division to form spindles, nuclear envelop fragmentation, appearance of centrosomes at spindle poles, appearance of equatorial chromosomes and contraction ring leading finally to appearance of two daughter cells with the resumption of transcription activity.¹ Important observations from the literature are: A. Two modes of distribution of organelles into daughter cells are proposed. One is stochastic-mode that involves the rearrangement of all organelles before cytokinesis. The other one is ordered-mode that involves after cytokinesis.² B. Since the division of cell organelles depends on their copy number, mitochondria have been shown to move towards the peripheral membrane at the

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start of mitosis.³ C. Endoplasmic reticulum-network is fragmented at the onset of mitosis and reconstructed after the division into daughter cells.⁴ D. Stochastic mode of organelles distribution in daughter cells has been shown to occur through mitotic spindles like hitchhiking with chromosomes.² The question arises: where do the organelles disappear during different phases of cell cycle leaving an open space for the drama of cell division to occur? If this is true, a cell must be able to rearrange their internal organelles to adapt to new challenges. This rearrangement of organelles could be mediated through the dynamic filaments of cytoskeleton contraction towards the periphery in close proximity of cell membrane during M-phase and relaxation would bring back post-mitotically to the normal setting of organelles in daughter cells. Of note is the fact that chromosomes and the nuclear envelop seem to follow the distribution pattern of both ordered and stochastic modes. However, the direct evidence of such a model needs to be experimentally elucidated.

References

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