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Protein aggregation and aging in fission yeast

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Although replicative aging has been clearly demonstrated in asymmetrically dividing unicellular organisms, it has been controversial if symmetrically dividing microbes age or not. Based on large-scale single-cell lineage data obtained by time-lapse microscopy with a microfluidic device, we have extensively demonstrated the absence of replicative aging in the old-pole cell lineages of fission yeast Schizosaccharomyces pombe in favorable conditions. Here, we observed how Hsp104-associated protein aggregates, one of the potential aging factors, formed and accumulated in those aging-free lineages, and examined its relation to cellular growth and death. Cells cultured in rich medium contained zero or one major Hsp104-GFP focus. Once formed, the protein aggregates tended to remain at the old-poles for several generations, but eventually cleared upon cell division. The distribution of the clearance time was roughly approximated by an exponential distribution, suggesting randomness of the clearance events. Neither the aggregation level nor aggregation age did not correlate with generation time, indicating that the presence of protein aggregates per se does not affect cellular growth. Although protein aggregates quickly accumulated just before death, the aggregation level failed to predict the onset of the dying process. These results suggest that Hsp104-associated protein aggregates are not “aging factor” in fission yeast.