Chromosomes make a rapid retreat from nuclear territories

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Chromosomes move faster than we first thought. Research published in BioMed Central's open access journal, *Genome Biology*, details new findings about the way chromosomes move around the nucleus when leaving the proliferative stage of the cell cycle and entering quiescence - and the unexpected speed at which they move.

Researchers from Brunel University's Institute for Cancer Genetics and Pharmacogenomics have been trying to understand how human chromosomes occupy different territories at different stages of the cell cycle. It was already known that some chromosomes move from a characteristic non-random distribution during quiescence to an alternative distribution during the proliferative stage of cell growth, and that this migration can take up to 36 hours. The movements are thought to be necessary in order to place chromosomes with more active genes in an optimal position for transcription. However, this new research shows that in the other direction, from proliferation to quiescence, chromosomal territory reorganisation is surprisingly speedy.

Research leader, Joanna Bridger said, "Excitingly, we found that chromosome repositioning was very rapid and complete within 15 minutes". Primary human fibroblast quiescence was induced by starving the cells of serum. Then, by using 2D-FISH imaging analysis to map the chromosome territory locations of all 22 autosomes plus the two sex chromosomes, a possible mechanism for this rapid movement was unearthed. Knowing that actin and myosin motors are involved in chromosome migration during mitosis, Bridger and her team inhibited

the polymerisation of these two proteins and sure enough found that the chromosomes stayed put.

Bridger continues, "These data imply that rapid chromosome movement as they respond to a removal of growth factors is due to an energy-driven process involving a nuclear actin: myosin motor function". Further work involving cells transfected with siRNA to block the transcription of nuclear myosin 1ß reveals that this isoform of the protein is the most likely candidate for significant involvement in chromosomal territory reorganisation.

More information: Rapid chromosome territory relocation by nuclear motor activity in response to serum removal in primary human fibroblasts, Ishita S Mehta, Manelle Amira, Amanda J Harvey and Joanna M Bridger, Genome Biology (in press), genomebiology.com/

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