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Influence of mass chromosome distribution in equatorial plane on oscillatory energy of mitotic spindle trough biomechanical oscillatory model of mitotic spindle

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Abstract: Distribution of chromosomes in equatorial plane of mitotic spindle, chromosome territories (CT) and dynamics of chromosome movements towards centrosomes could carry additional epigenetic information. CT within cell nucleus manifest spacious, temporal and cell specificity. The aim of this work was to study haw different mass distribution of chromosomes in equatorial plane influence distribution of potential and kinetic energy in the system of mitotic spindle. For this purposes an oscillatory model of mitotic spindle is developed. Mitotic spindle was considered as a system of coupled oscillators where one oscillatory pair consists of centrosome, microtubule and related chromosome that are interconnected with its homologue pair. In biomechanical oscillatory model of mitotic spindle centrosomes are presented as mass particles that represent two rheonomic centers of oscillations. Microtubules are presented with standard light visco-elastic element. Homologue chromosomes are represented as mass particles that are interconnected with standard light massless elastic spring. Analytical expression for potential and kinetic energy as well as for total mechanical energy of oscillating pair of homologues chromosomes is given. Influence of mass chromosome distribution in equatorial plane on oscillatory energy of mitotic spindle is discussed. Different distribution of energy in the system of mitotic spindle could represent additional level of codding information that is transferred into the next cell generation and could be of interests in process of cell differentiation.

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