In Vivo Visualization of Chromosome Dynamics

Background

- The lacI protein binds the lacO DNA sequences with high affinity
- The lacI gene and lacO DNA sequences have been engineered to be present in cultured mammalian cells but so far this system has not been adapted to any in vivo mammalian model.

LacO and lacR Transgenic Mice

Problem

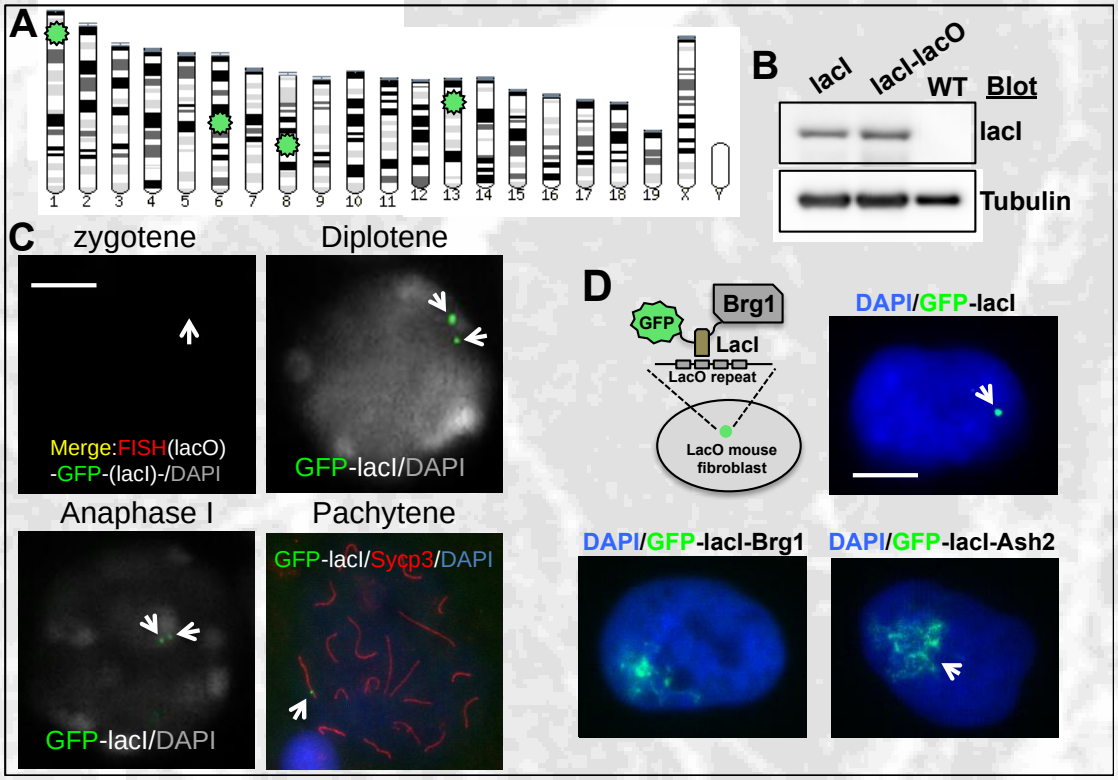
There is no *in vivo* system in mammals to directly visualize events occurring at the chromosomal (or loci) level.

OMRF's Solutions

Create a chromosome-based visualization system using the lacI-lacO technology for localizing fluorophores to precise genomic locations *in vivo*.

Create a chromosome-based system in which literally any lacI-fusion proteins can be directed to lacO sequences at precise genomic locations *in vivo*.

Data



A) Chromosome localization of lacO insertions in different transgenic mice lines. B) Western blot showing GFP-lacI in lacI and lacI-lacO transgenic mice. C) GFP-lacI in meiocytes is located at the expected lacO repeat sequences. D) Schematic of GFP-lacI-Brg1 and GFP-lacI-Ash2 fusion protein tethered to LacO repeats. Cultured mouse fibroblast showing GFP-fusion proteins binding to lacO are shown.

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Summary

Dr. Pezza has created a chromosome-based visualization system using a lac operator-lac repressor technology for localizing fluorophores to precise genomic locations.

This technology can visualize dynamic events in meiosis and somatic tissues, such as rapid chromosome movements, disjunction of meiotic chromosomes, presynaptic homolog association, germ cell lineage, and cell differentiation.

This system can also be used to direct proteins or fusion-proteins to specific genomic locations. This opens the opportunity to directly study the epigenetic regulation of fundamental cellular processes such as DNA repair and transcription.

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