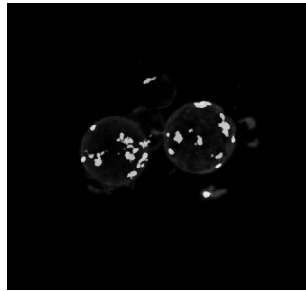
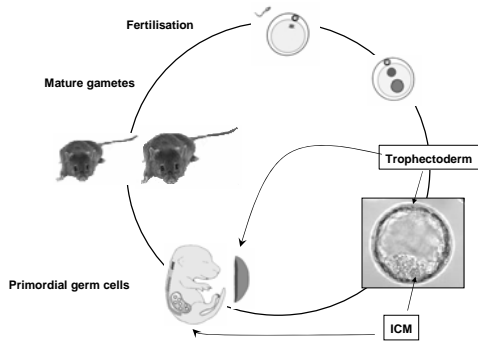
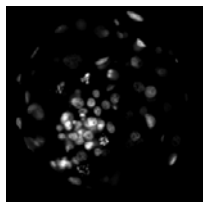


Heterochromatin organisation: the embryo rules!

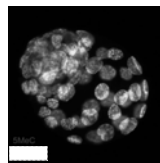


Epigenetic reprogramming cycles during development





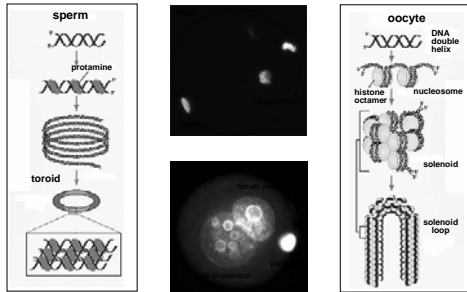
human



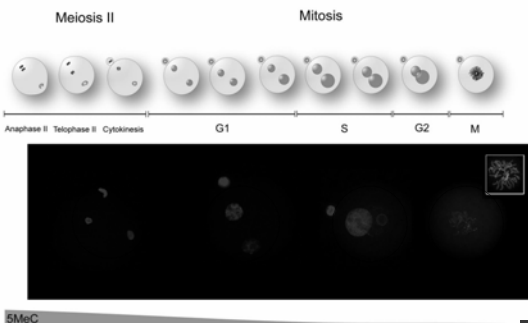
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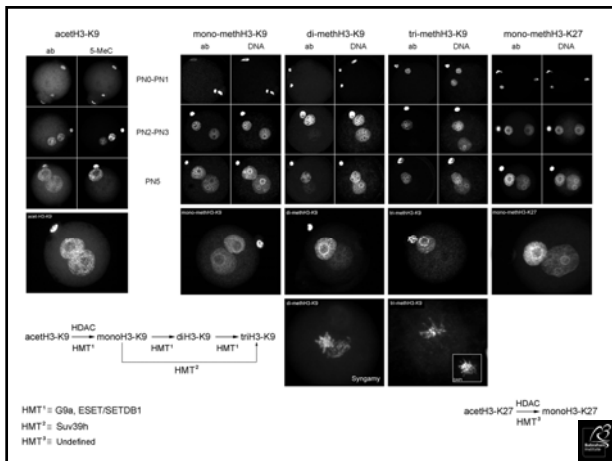
Characterisation of chromatin features in the first cell cycle

Chromatin organisation in mammalian gametes



Dynamic epigenetic changes typify the first cell cycle





Heterochromatin Protein 1 β - HP1 β :
the marker of choice for constitutive heterochromatin

Fluorescence microscopy images showing HP1 β localization in various cell lines (HeLa, Hep2, Hep3b) and tissues (HeLa cells treated with DMSO or 5-azacytidine). The images demonstrate HP1 β concentration in perinuclear rings. A graph shows the relative abundance of HP1 β in different cell lines, and a fluorescence image shows HP1 β signal in a spermatocyte.

Heterochromatin Protein 1 β - HP1 β
present in both maternal and paternal chromatin
concentrates in the perinuclear rings.

Fluorescence microscopy images showing HP1 β localization in zygotes. The images demonstrate HP1 β concentration in perinuclear rings. The bottom row shows HP1 β / H3K9me1, HP1 β / H3K9me2, and HP1 β / H3K9me3 co-localization.

Heterochromatin epigenetics in the zygote

DNA methylation

- actively removed from the male pronucleus- residual methylation is retained in perinuclear rings.
- female pronucleus remains highly methylated throughout the first cell-cycle.

Chromatin

Histone H3 methylation

mono-methH3-K9 (H3K9me1)

- present in both maternal and paternal chromatin.
- concentrates in the perinuclear rings in the male pronucleus.

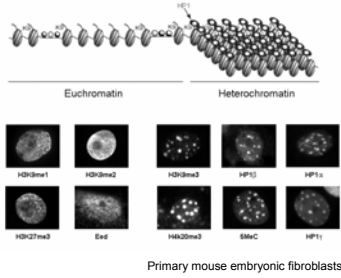
di-methH3-K9 (H3K9me2)

- absent from the male chromatin until post-replication.
- always present in the female pronucleus and concentrating in the perinuclear rings.

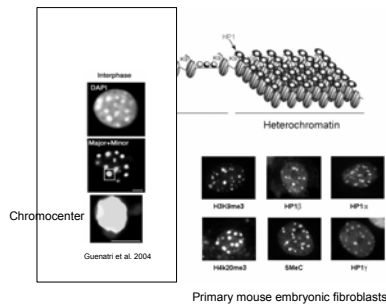
tri-methH3-K9 (H3K9me3)

- always absent from the male chromatin.
- always present in the female pronucleus in the perinuclear rings.

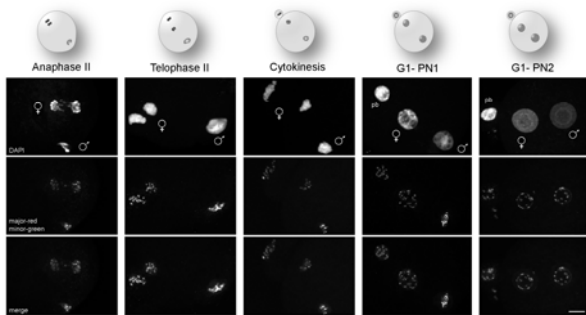
Chromatin organisation in somatic interphase nuclei




Chromatin organisation in somatic interphase nuclei



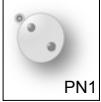
Pre-replication



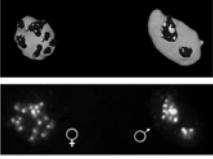
Decondensation

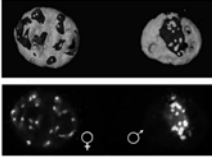


PN0



PN1






organisation resembles the chromocenters found in somatic cells (arrow)


major satellites coalesce in the center (red), minor (green) cluster to ~10 dots around the major satellites

major satellites organised around NPBs (nucleolar precursor bodies, arrow), a few chromocenter-like structures persist.

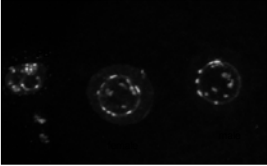
chromatin decondensing starting from the periphery while major satellites still coalescent and organised together with the surrounding minor satellites

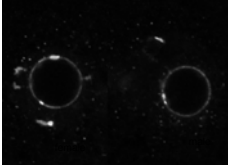


PN2




PN3






minor satellites (green) organisation looks remarkably similar between female and male pronuclei

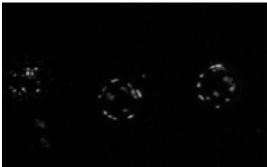
major satellites organisation (red) in the male pronucleus has changed considerably but still looks different from the female

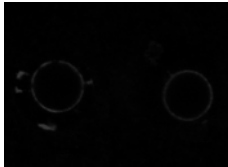


PN2



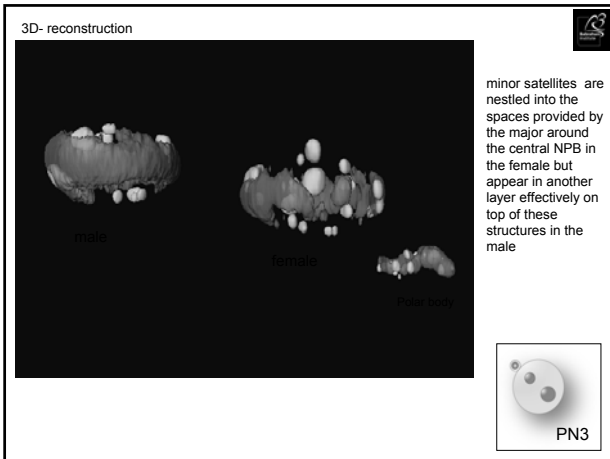
PN3

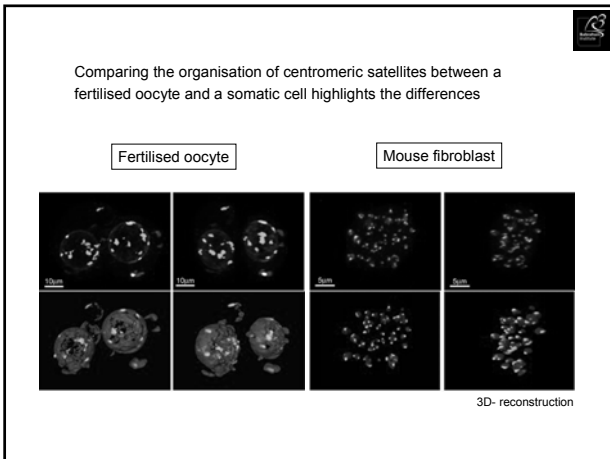


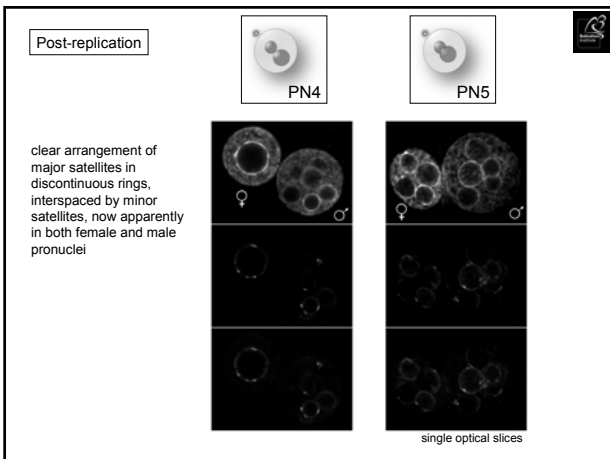


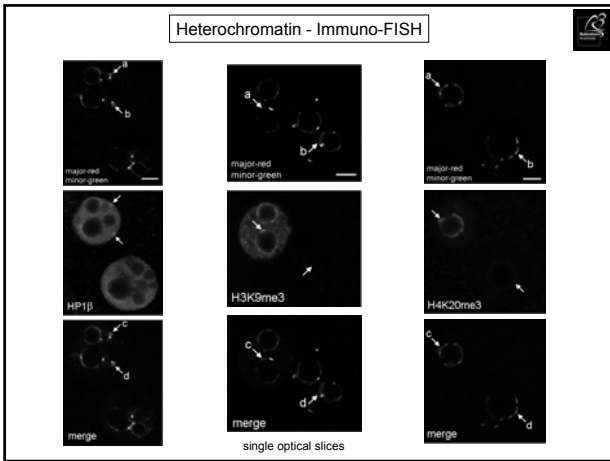
minor satellites (green) organisation looks remarkably similar between female and male pronuclei

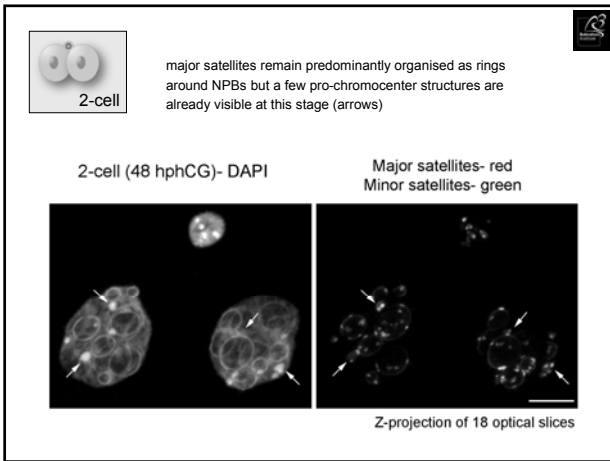
major satellites organisation (red) in the male pronucleus has changed considerably but still looks different from the female

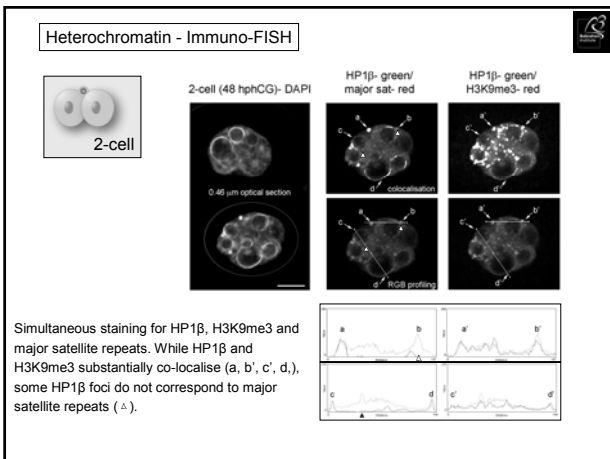




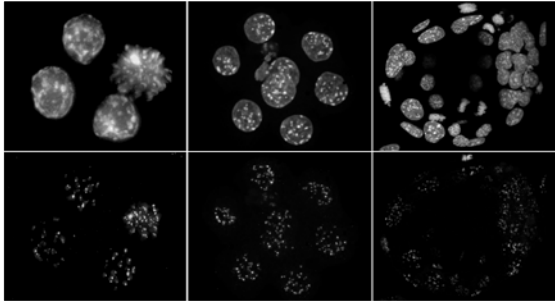








by the end of the third cell cycle all satellites are organised in pro-chromocenters (with no visible rings around nucleoli)

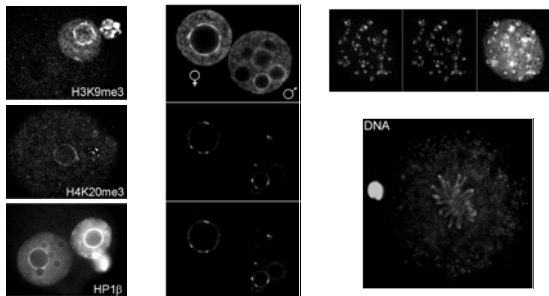


4-cell

8-cell

blastocyst

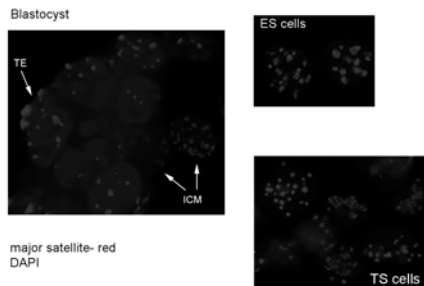
What's special about a one-cell embryo?



the embryo rules...are not yet in place?



What about cell lineages?



Acknowledgements



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BBSRC - MRC
