Follicle dynamics and global organization in the intact mouse ovary.

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Public Summary:
Quantitative analysis of tissues and organs can reveal large-scale patterning as well as the impact of perturbations and aging on biological architecture. Here we develop tools for imaging of single cells in intact organs and computational approaches to assess spatial relationships in 3D. In the mouse ovary, we use nuclear volume of the oocyte to read out quiescence or growth of oocyte-somatic cell units known as follicles. This in-ovary quantification of non-growing follicle dynamics from neonate to adult fits a mathematical function, which corroborates the model of fixed oocyte reserve. Mapping approaches show that radial organization of folliculogenesis established in the newborn ovary is preserved through adulthood. By contrast, inter-follicle clustering increases during aging with different dynamics depending on size. These broadly applicable tools can reveal high dimensional phenotypes and age-related architectural changes in other organs. In the adult mouse pancreas, we find stochastic radial organization of the islets of Langerhans but evidence for localized interactions among the smallest islets.

Scientific Abstract:
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