Mitotic occupancy and lineage-specific transcriptional control of rRNA genes by Runx2

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Regulation of ribosomal RNA genes is a fundamental process that supports the growth of cells and is tightly coupled with cell differentiation. Although rRNA transcriptional control by RNA polymerase I (Pol I) and associated factors is well studied, the lineage-specific mechanisms governing rRNA expression remain elusive. Runt-related transcription factors Runx1, Runx2 and Runx3 establish and maintain cell identity, and convey phenotypic information through successive cell divisions for regulatory events that determine cell cycle progression or exit in progeny cells. Here we establish that mammalian Runx2 not only controls lineage commitment and cell proliferation by regulating genes transcribed by RNA Pol II, but also acts as a repressor of RNA Pol I mediated rRNA

synthesis. Within the condensed mitotic chromosomes we find that Runx2 is retained in large discrete foci at nucleolar organizing regions where rRNA genes reside. These Runx2 chromosomal foci are associated with open chromati