

Inactivation or non-reactivation: What accounts better for the silence of sex chromosomes during mammalian male meiosis?

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During the first meiotic prophase in male mammals, sex chromosomes undergo a program of transcriptional silencing called meiotic sex chromosome inactivation (MSCI). MSCI is triggered by accumulation of proteins like BRCA1, ATR, and γ H2AX on unsynapsed chromosomes, followed by local changes on the sex chromatin, including histone modifications, incorporation of specific histone variants, non-histone proteins, and RNAs. It is generally thought that MSCI represents the transition of unsynapsed chromatin from a transcriptionally active state to a repressed state. However, transcription is generally low in the whole nucleus during the early stages of the first meiotic prophase, when markers of MSCI first appear, and is then reactivated globally during pachytene. Thus, an alternative possibility is that MSCI represents the targeted maintenance and/or reinforcement of a prior repressed state, i.e., a failure to reactivate. Here, we present an analysis of the temporal and spatial appearance of