The epigenetic reprogramming of germ cells is characterised by genome-wide erasure and subsequent re-establishment of DNA methylation. This is thought to be crucial for establishing the correct epigenetic patterning that is congruent with the totipotency state of this cell lineage. Murine studies indicate that DNA de-methylation is complete by embryonic day (E) 13.5 and that re-methylation is initiated by E-15.5 in male germ cells and continues throughout gestation. However epigenetic reprogramming has not been described for the rat, in which gestation lasts for an additional 2-4 days. Furthermore, the potential involvement of the more recently identified cytosine modifications; 5-hydroxymethylcytosine (5hmC), 5-formylcytosine (5fC) and 5-carboxylcytosine (5caC), has not been characterised during germ cell ontogeny.

Our study aims to characterise the global dynamics of 5mC, 5hmC, 5fC and 5caC during the re-establishment phase of epigenetic reprogramming in rat germ cells. Testes were collected on E-14.5-19.5 and E-21.5, and the localisation of 5mC, 5hmC, 5fC and 5caC identified by immunofluorescence. Our observations suggest that re-methylation is initiated later in rat germ cell development compared to mice and additionally that dynamic changes occur in the localisation of 5hmC, 5fC and 5caC in rat germ cells. This indicates that these modifications may have a role in DNA reprogramming events during germ cell development.