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This work studied the effects of a highly palatable ‘junk-food’ cafeteria diet (CAF) on the expression of key genes of the mesolimbic system, evaluating short-term, long-term and transgenerational effects in female rats. In the short term (30 days) CAF diet intake deregulated the dopamine pathway increasing the expression of dopamine transporter (DAT) in ventral tegmental area (VTA) with decreased methylation status of its promoter region and decreasing dopamine receptor (DRD) 2 expression in accumbens nucleus (NAc). These alterations reflect a reduced dopamine signalling which could promote excessive intake of palatable foods. However, in the long term (80 days CAF) the changes were reversed. These alterations were transmitted to the offspring involving epigenetic mechanisms. At PND10, maternal CAF diet decreased the transcription of tyrosine hydroxylase (TH), DRD2 and DAT in VTA with changes in the methylation status of their promoters. In NAc, maternal CAF diet reduced DRD1, DRD2 and DAT expression in the offspring at PND10, although changes in the methylation patterns were only detected in DAT promoter. The decrease in the synthesis of DA by TH and reduced actions through its receptors suggest a reduced dopamine signalling more pronounced than in the dams. These results provide novel insights into the mechanisms through which junk-food feeding can affect the reward system through life and in the early postnatal life of the offspring. Particularly important is the expression decline of DRD2 given its physiological implication in obesity and addiction.