Being the major heterochromatin constituents, satellite DNAs serve important roles in heterochromatin establishment and regulation. Their transcripts act as epigenetic signals required for organization of pericentromeric heterochromatin during embryogenesis and are necessary for developmental progression. In addition, satellite DNAs and their transcripts potentially play an active role in modulating gene expression and epigenetic states of a genome. Due to the presence of promoter elements and transcription factor binding sites within a sequence, satellite DNAs can interfere with the expression of nearby genes. Gene activity can be directly controlled by the number of repeats in a section of satellite DNA. In the case of stress, transcriptional activation of pericentromeric satellite DNAs seems to be part of a general stress response program activated by environmental stimuli. Such diverse forms of genome regulation modulated by satellite DNAs may be controlled by selective pressures and could influence the adaptability of the organism.