Y and mitochondrial chromosomes in the heterogeneous stock rat population

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Genome-wide association studies typically evaluate the autosomes and sometimes the X Chromosome, but seldom consider the Y or mitochondrial Chromosomes. We genotyped the Y and mitochondrial Chromosomes in heterogeneous stock rats (*Rattus norvegicus*), an outbred population created from eight inbred strains. We identified 8 distinct Y and 4 distinct mitochondrial Chromosomes among the 8 founders. However, only two types of each nonrecombinant chromosome were observed in our modern heterogeneous stock rat population (generations 81-97).

Despite the relatively large sample size, there were virtually no significant associations for behavioral, physiological, metabolome, or microbiome traits after correcting for multiple comparisons. However, both Y and mitochondrial Chromosomes were strongly associated with expression of a few genes located on those chromosomes, which provided a positive control. Our results suggest that within modern heterogeneous stock rats there are no Y and mitochondrial Chromosomes differences that strongly influence behavioral or physiological traits. These results do not address other ancestral Y and mitochondrial Chromosomes that do not appear in modern heterogeneous stock rats, nor do they address effects that may exist in other rat populations, or in other species.