Sex Chromosomal Differences and Increased Leukemia Rates in Males

Gutti, Sireesha (School: Paul Laurence Dunbar High School)

Long-term trends for leukemia (blood cancer) have consistently shown that men have significantly higher incidence and mortality rates than women, but the reason why this occurs isn't clear. To understand this, it is important to begin with differences at the most fundamental level: sex chromosomes (X and Y). Women have two X chromosomes while men have a X and a Y chromosome. For this experiment, all genes expressed differentially for AML (Acute Myeloid Leukemia) were obtained using the GEPIA database. The locations of the 1,000 most overexpressed and 1,000 most underexpressed genes were determined and the statistical significance of the differences in expression between males and females for the genes on the sex chromosomes was calculated using a Student's T-test and the UALCAN database. The Y chromosome didn't have any genes expressed differentially between AML and Normal, but there was significant (p-value<0.05) differential expression of five genes (ARSD, MBNL3, TCEAL3, VCX3A, & FMR1NB) on the X chromosome between males and females. Since MBNL3 was overexpressed in both AML and males and FMR1NB was underexpressed in both AML and males, it is likely that MBNL3 is a possible tumor promoter and FMR1NB is a possible tumor suppressor. Both FMR1NB and MBNL3 may work coordinately or independently to contribute to increased male leukemia rates. Identifying these differences and genes that are differentially expressed between males and females is important for developing more targeted, sex-specific treatments or preventative measures for leukemia, which can help lower rates of leukemia in males and females and improve survival rates.

Awards Won: