**Only corresponding reference papers**

Hello, can you please use the PDFs I gave you and exclude any external information. I want to write a sub-section in a paper titled 'The spectrum of sex differences in cancer'. Can you write a summary about the topic 'Sex chromosome loss in cancer' under tentative section 'Tumor suppressor effects of the X chromosome' for such a paper. Please use the PDFs that I have provided and write paragraphs on . This summary should focus on the effect of loss of X chromosome and Y chromosome in cancer"

In the context of "Sex chromosome loss in cancer," several studies have revealed significant associations between the loss of sex chromosomes and various types of cancers. Loss of the Y chromosome has been reported in different renal cell tumors such as chromophobe carcinomas (60%), oncocytomas (51%), and clear cell carcinomas (39%)【23†source】. Moreover, the loss of chromosome Y was linked with favorable disease outcomes in certain cancer types, reflecting that its presence or absence may influence tumor biology; however, this could vary across different cancers. For instance, in chronic myelomonocytic leukemia, Y loss was associated with better prognosis, while it signified worse outcomes in head and neck cancer and multiple myeloma. Similarly, the loss of the X chromosome (monosomy X) has been observed in myeloid-derived cells of patients with myelodysplastic syndromes (MDS) that evolved into acute myeloid leukemia (AML). It is suggested that the loss of the X chromosome might be involved in the expansion of a dysplastic clone, contributing to the illness's progression and potentially indicating the loss of a tumor suppressor gene. Although there currently is no identified tumor suppressor gene on the X chromosome, monosomy X could be associated with MDS and the neoplastic transformation of cells, particularly when it arises as the sole non-constitutional cytogenetic abnormality in bone marrow【29†source】. Taken together, these studies highlight the tumor suppressor effects of the X chromosome and suggest that the loss of sex chromosomes, whether X or Y, may have distinct impacts on the pathogenesis and prognosis of various cancers. This underscores the potential significance of sex chromosome composition in tumor biology and the disease course, implicating the need for further research to understand its role in cancer.

**All reference papers**

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In considering the tumor suppressor effects of the X chromosome within the context of 'Sex Chromosome Loss in Cancer,' we observe a notable sex disparity in cancer incidence, with an unexplained male predominance in many cancer types【39†source】. The phenomenon of sex chromosome loss, particularly concerning the loss of the Y chromosome, is a common event in aneuploid tumors and may take place at any point in tumorigenesis【32†source】【33†source】. Earlier research revealed variable results regarding the frequency of Y-loss across different cancer types due to disparate analysis methods. The loss of the Y chromosome has been reported with significant variability, with the highest occurrences in squamous cell carcinomas, gastric cancers, pancreatic neoplasms, and bladder cancers, with much lower frequencies in prostate cancers and hematologic diseases【33†source】. Investigating the link between chromosomal loss and oncogenesis, we find a subset of the X chromosome's genes can escape X-inactivation, a protective mechanism for females that averts the complete functional loss from a single mutation, which could otherwise lead to cancer. This has contributed to the identification of putative 'escape from X-inactivation tumor-suppressor' (EXITS) genes, which show loss-of-function mutations more frequently in males. Notable among these EXITS genes are ATRX, CNKSR2, DDX3X, KDM5C, KDM6A, and MAGEC3. Specifically, it's suggested that the biallelic expression of these genes in females offers an explanation for a portion of the reduced cancer incidence in females as compared to males across various tumor types【39†source】. The significance of this chromosomal interplay in cancer is emphasized by the realization that both the loss of the Y chromosome and the mutations in EXITS genes contribute to sex biases in cancer incidence. However, the full implications and mechanisms of how loss of sex chromosomes impacts cancer progression and patient outcomes remain areas of ongoing research and discussion.