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Adrenal gland Cancer: RNA-seq analysis

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Current Topics in Bioinformatics

Abstract: *Benign adrenal gland tumors are rare, non-cancerous masses. As part of the endocrine system, the adrenal glands (small, triangular in shape, located up from the kidneys) produce hormones that give instructions to almost every organ and tissue in your body. This type of cancer can manifest at any age. However, it is more likely to affect children under 5 years of age, and adults between 40 and 50 years of age. When adrenal gland cancer is found early, there is scope for care. But if the cancer has spread beyond the adrenal glands, the chances of care decrease. The main objective of this review is the study of adrenal gland cancer by means of RNA-seq analysis. This analysis has been carried out using Rstudio and the packages: ggplot2, ggrepel, BiocManager. The results show that twice as many genes are under expressed as over-expressed in adrenal gland cancer. Those genes of the adrenal gland that respond to stimuli and chemical substances are those that are deferentially expressed in relation to the rest of the categories. Genes for metabolic processes of different chemicals are significant as well.*

Keywords: **Adrenal gland, RNA-Seq Analysis, Adrenal cancer**

1 Introduction

The adrenal glands are two small triangle-shaped glands, each of them are located on top of each kidney. Each adrenal gland is about the size of the top part of the thumb. The outer part of the gland is called the cortex. It produces steroid hormones such as cortisol, aldosterone, and hormones that can be changed into testosterone. The inner part of the gland is called the medulla. It produces epinephrine and norepinephrine. [**?**]

When the glands produce more or less hormones than normal, you can become sick. This might happen at birth or later in life. The adrenal glands can be affected by many diseases, such as autoimmune disorders, infections, tumors, and bleeding. Some are permanent and some go away over time. Medicines can also affect the adrenal glands.

The pituitary, a small gland at the bottom of the brain, releases a hormone called ACTH that is important in stimulating the adrenal cortex. Pituitary diseases can lead to problems with adrenal function.

Adrenal gland cancer are divide into two types adrenal cortex tumors and adrenal medulla. Most tumors of the adrenal cortex are benign tumors known as adenomas. These tumors are usually less than 5 centimeters across. [**?**] They usually occur in only one adrenal gland, but sometimes both. This type of cancer can manifest at any age. However, it is more likely to affect children under 5 years of age, and adults between 40 and 50 years of age.When adrenal gland cancer is found early, there is scope for care. But if the cancer has spread beyond the adrenal glands, the chances of care decrease.[**?**]

We use RNA-seq because is a recent approach to carry out expression profiling using high-throughput sequencing (HTS) technologies. In past decade, microarrays were pre-

dominantly used, but because the sequencing costs have decreased, RNA-seq became the preferred option to simultaneously measure the expression of tens of thousands of genes for multiple samples.

In this review we walk through a gene-level RNA-seq differential expression analysis using Bioconductor packages to find genes over- or under-expressed in adrenal gland cancer patients.

1.1 Experimental Data

Experimental data was extracted from The Cancer Genome Atlas (TCGA). TCGA is a collaboration between the National Cancer Institute (NCI) and the National Human Genome Research Institute (NHGRI)has generated comprehensive, multi-dimensional maps of the key genomic changes in 33 types of cancer. The TCGA dataset, comprising more than two petabytes of genomic data, has been made publicly available, and this genomic information helps the cancer research community to improve the prevention, diagnosis, and treatment of cancer.

Recount is an online resource consisting of RNA-seq gene and exon counts for different studies, including TCGA data. The RNA-seq data of Adrenal gland cancer was extracted from there. The data set is available at this link `http://duffel.rail.bio/recount/v2/TCGA/rse_gene_adrenal_gland.Rdata` and can be downloaded.

2 Methods

2.1 Packages and tools used

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2.2 Data description

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2.3 Statistical tests

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3 Results with figures

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4 Discussion

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5 Conclusion

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6 Appendix with supplementary figures and the code (commented and with proper objects names)

FIGURAS