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研究課題名	Functional polarization of tumour-associated macrophages by tumor microenvironment	
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IMSUT International Joint Usage/Research Center Project <International>

Joint Research Report (Annual/Project Completion)

Annual Report

Report

In 2022, we stimulated mouse macrophages with the construction of the lactylation of tumor microenvironment and performed transcriptome analysis to determine the possible mechanisms of tumor cell interaction with mouse macrophages.

At the same time, we constructed a co-culture system of HGC-27 and Raw264.7 cells, successfully isolated exosomes from the supernatant of cell culture medium, and analyzed microRNA-seq of exosomes. We use the CSHL research to develop a small program (<https://github.com/wososa/PSI-Sigma>), RNA splicing, RNA m6A methylation, DNA methylation and Gene expression analysis were combined for comprehensive analysis, mainly focusing on RNA splicing. We found some interesting biomarkers and validated them by cellular molecular biology methods.

The results were presented at the 8th National Conference on Computational Biology and Bioinformatics (NCCBB) and The Biomedical Big Data and Artificial Intelligence. At the same time, we published a review paper and a research paper. These are written: "This study was partly supported by a Grant from the International Joint Usage/Research Center, The Institute of Medical Science, the University of Tokyo."

In addition, with the support of IMSUT, we have a certain foundation to work on, we have also obtained the project support from the National Natural Science Foundation of China and the Outstanding Innovation Fund of Shandong University, and trained two postgraduate students and one doctoral student.

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RESEARCH Open Access

Chondroitin sulfate alleviates osteoporosis caused by calcium deficiency by regulating lipid metabolism

Tianshu Liu^{1,2*}, Hai Yu^{1,2*}, Shuai Wang^{1,2}, Huimin Li^{1,2}, Xinyiran Du^{1,2} and Xiaodong He^{1,2*}

Abstract
 The need for chondroitin sulfate for calcium deficiency has attracted attention in recent years. Although calcium deficiency is a common cause of osteoporosis, the mechanism of its occurrence is not clear. The regulation of lipid metabolism by chondroitin sulfate and calcium to alleviate osteoporosis has been proposed. The purpose of this study was to explore the mechanism of chondroitin sulfate alleviating osteoporosis caused by calcium deficiency. The mechanism of chondroitin sulfate alleviating osteoporosis caused by calcium deficiency was explored by using a mouse model of osteoporosis. The results showed that chondroitin sulfate could improve the lipid metabolism of mice with calcium deficiency. Chondroitin sulfate could improve the lipid metabolism of mice with calcium deficiency by regulating the expression of lipid metabolism-related genes. Chondroitin sulfate could improve the lipid metabolism of mice with calcium deficiency by regulating the expression of lipid metabolism-related genes. Chondroitin sulfate could improve the lipid metabolism of mice with calcium deficiency by regulating the expression of lipid metabolism-related genes.

Additional file 1: Table S1 MiRNA analysis showed significant differences in microbial community structure between group N and group C, and between group C and group Ca.

Additional file 2: Table S2 The differential metabolites of fecal metabolites between the N group and the C group. The differential metabolites of fecal metabolites between the C group and the Ca group. The differential metabolites of fecal metabolites between the C group and the C3 group. The differential metabolites of fecal metabolites between the C3 group and the C4 group.

Additional file 3: Table S3 The differential metabolites of plasma metabolites between the N group and the C group. The differential metabolites of plasma metabolites between the C group and the Ca group. The differential metabolites of plasma metabolites between the C group and the C3 group. The differential metabolites of plasma metabolites between the C3 group and the C4 group.

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小鼠腹股原代巨噬细胞模拟肿瘤微环境的转录组学分析
 曹磊磊, 王雪莹, 魏宇, 孙晓宇

摘要: 巨噬细胞是肿瘤微环境中最重要的免疫细胞之一, 其功能失调与肿瘤的发生、发展和转移密切相关。本研究旨在探讨小鼠腹股原代巨噬细胞在模拟肿瘤微环境下的转录组学特征。通过高通量测序技术, 我们获得了巨噬细胞的转录组数据, 并进行了差异表达分析。结果显示, 在模拟肿瘤微环境下, 巨噬细胞的基因表达谱发生了显著变化, 特别是在炎症反应、细胞增殖和凋亡相关基因的表达上。这些发现为进一步研究巨噬细胞在肿瘤微环境中的作用提供了重要的理论依据。

cancers MDPI

Pathogenic Roles of RNA-Binding Proteins in Sarcomas

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Simple Summary RNA interference can be targeted to inhibit the expression of a specific gene and prevent its protein product from being synthesized. Approximately 4000 RNA-binding proteins (RBPs) in the cells covalently regulate their multiple processes between transcription and translation. It has been recently recognized that some of the RBPs have abnormal expression and/or function, leading to the initiation or maintenance of malignant diseases including sarcomas, which is the greatest cause for a broad group of malignancies that begin in the bone and soft tissue. Unfortunately, there are currently very few effective treatments to many types of sarcoma at advanced stages. Therefore, we need to understand more deeply how sarcoma develops in our body and how they are efficiently eradicated by therapeutic interventions. Studies on the diverse mechanisms in terms of RBPs will provide us with the opportunity to have a better understanding of the sarcoma pathogenesis.

Author Contributions: A.K. and A.Y. designed the manuscript. Y.H., A.K., X.H. and A.Y. wrote the manuscript. A.K. and A.Y. prepared all the figures and table. All authors have read and agreed to the published version of the manuscript.

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Research Results from the Project during FY2022

<Publications>

Hai Y., Kawachi A., He X., Yoshimi A. (2022) Pathogenic Roles of RNA-Binding Proteins in Sarcomas. *Cancers* (Basel). 14(15):3812.

Tianshu Liu; Hai Yu; Shuai Wang; Huimin Li; Xinyiran Du; Xiaodong He. (2023) Chondroitin sulfate alleviates osteoporosis caused by calcium deficiency by regulating lipid metabolism, *NUTRITION & METABOLISM*, 2023, 20(6)

<Patent Applications>