Analysis

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1 题目

待定（根据实际分析）

2 摘要（拟设计）

2.1 要求

- 方向：皮肤科，特应性皮炎（Atopic Dermatitis，AD）[1,2]
- 分值：5 分 +

2.2 AD 研究现状概述

AD 涉及的因素较多（epidermal barrier dysfunction, host genetics, environmental factors, and immune perturbations[2]）。AD 中调节皮肤屏障功能和免疫反应的潜在机制和关键分子已被揭示[3]。JAK-STAT 通路在 AD 机制中起到关键作用[4]。AD 的 Biomarkers 已被综述[5]。

AD 被认为不仅是一种皮肤病（Is Atopic Dermatitis Only a Skin Disease?[6]），而是与其它疾病在一定环境因素下互关联（cardiovascular, autoimmune, neurological, psychiatric, and metabolic disorders）；这些被怀疑通过更复杂的遗传和免疫学机制与 AD 的发病机制相关，但其相关性仍知之甚少（2023 年文献）[6]。

关联的疾病[6]：

- Cardiovascular Diseases
  - coronary artery disease
  - angina pectoris
  - myocardial infarction
  - stroke
  - peripheral vascular disease
- Neurologic and Psychiatric Diseases
  - Epilepsy
  - Autism
  - Depression
  - ...
- Autoimmune Diseases
  - Alopecia Areata
  - Vitiligo
  - Rheumatoid Diseases
  - Type I Diabetes
- Obesity

2.3 拟解决的问题

AD 和其他疾病（Cardiovascular Diseases, Neurologic and Psychiatric Diseases, Autoimmune Diseases, Obesity）的关联机制探究。从基因表达数据入手，研究 AD 和多种疾病的互关联基因和机制。

Figure 1为图 Comorbidities frequently associated with AD 概览。

(对应文件为 `~/Pictures/Screenshots/Screenshot from 2023-10-09 10-20-39.png`)

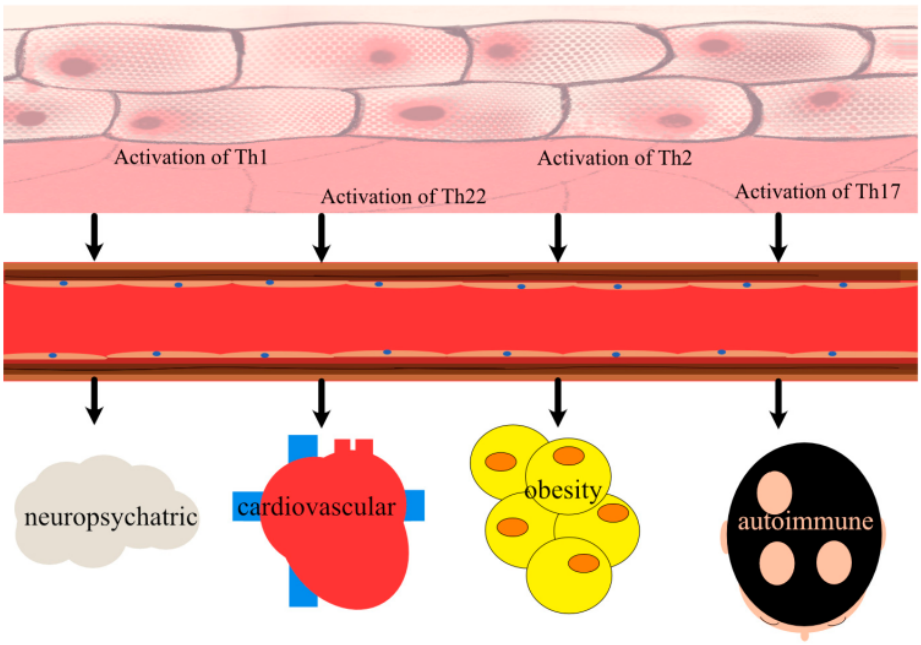

Figure 1. Comorbidities frequently associated with atopic dermatitis (AD). Even though AD is a skin disease, more is known about the co-occurrence of AD-related comorbidities that do not necessarily affect only the skin. The relationship between AD and comorbidities is likely to be bidirectional and complex. This list, however, is not exhaustive, and increasingly more diseases with a higher incidence among AD patients are being identified.

Figure 1: Comorbidities frequently associated with AD

2.4 预期路线

AD 可能会存在不同类型，可能需要根据 Fig. 1 将不同病例（RNA-seq 数据）聚类，各自和各种疾病关联分析，寻找相关基因。各类型的并发症（并发症 a、b、c）可能和 AD 之间有互关联基因，假设这些为集合 A，集合 B，集合 C。那么，集合 A、B、C 等之间，可能还存在某种关联性（该关联性需要采取适当的方法探讨，联系实际解决问题）。预期的关联性较强，有突出结果，则根据这个思路深入分析；若关联性弱，则调整方向，可能调整研究的并发症（缩减范围），寻找有关联的点深入突破。后期可再以 RNA-seq 或 scRNA-seq 进一步验证。

2.5 可用的数据集

AD 的数据集：

- GSE224783, RNA-seq
- GSE237920, RNA-seq
- GSE184509, RNA-seq
- GSE213849, scRNA-seq
- GSE197023, ST, scRNA-seq
- GSE222840, scRNA-seq
- ...

除上述 AD 数据集外，还需要其它关联疾病的（GEO）数据集。这些数据将根据实际情况选用。

2.6 数据分析拟采用的方法：

- RNA-seq 数据分析
  - 差异分析
  - 富集分析[7]
  - 免疫浸润预测[8]
  - 基因共表达（WGCNA）[9]
  - ...
- scRNA-seq 数据分析（或验证）
  - 细胞鉴定[10]（The pathology of AD is accompanied by an imbalance in immunity involving Th1, Th2, and Treg cells, culminating in alterations in Th1- and Th2-mediated immune responses and IgE-mediated hypersensitivity[3]）
  - 拟时分析[11]
  - 细胞通讯[12]
  - ...
- 关联因素探讨
  - 共表达分析
  - 蛋白互作
  - 文献调研
  - ...

2.7 工作量

预期工作量较大，需要 1-2 周时间。

3 前言

4 研究设计流程图

5 材料和方法

6 分析结果

7 结论

Reference

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