Shared genes, shared drugs: the genetics of autoimmune disease

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citizens of science

Background

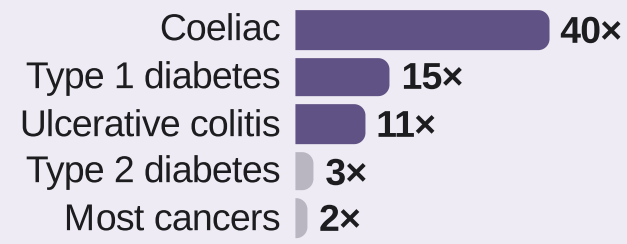
The body attacks itself

In autoimmune disease, the immune system attacks the body's own organs. About **1 in 10** people have one. We studied three:

- **Ulcerative colitis** — gut
- **Psoriasis** — skin
- **Psoriatic arthritis** — joints

They run in families

Extra risk if a sibling has it:



Genes play a big part. Grey = not autoimmune.

Finding risk in our DNA

Our DNA is 99.9% identical. Most differences are one-letter changes (**SNPs**):

…GCA**C**CGTT… …GCA**T**CGTT…

A **GWAS** compares people with and without a disease to find **risk regions**.

3× Drugs aimed at these genes are ~3× more likely to be approved.

Aim & Hypothesis

Aim: Find the DNA risk regions shared by **ulcerative colitis**, **psoriasis** and **psoriatic arthritis**, and see which ones drugs already target.

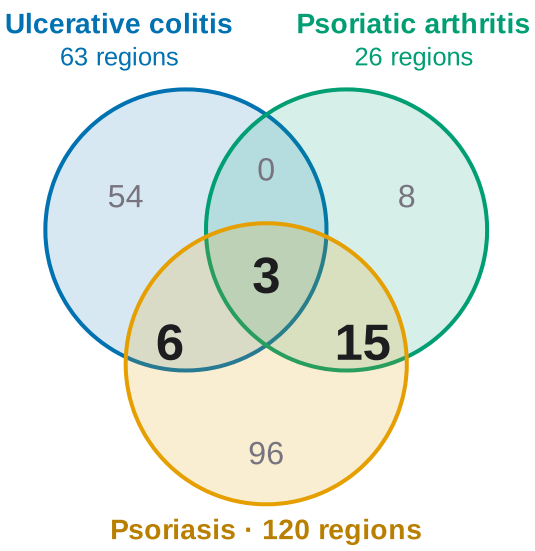
Hypothesis: The three diseases share risk regions, which explains why one drug can treat several of them.

Methods

1. **Collect** free, public GWAS results for the three diseases.
2. **Compare** with HyPrColoc: is it the *same* risk signal in each disease?
3. **Look up** approved drugs for shared genes on Open Targets.

Results

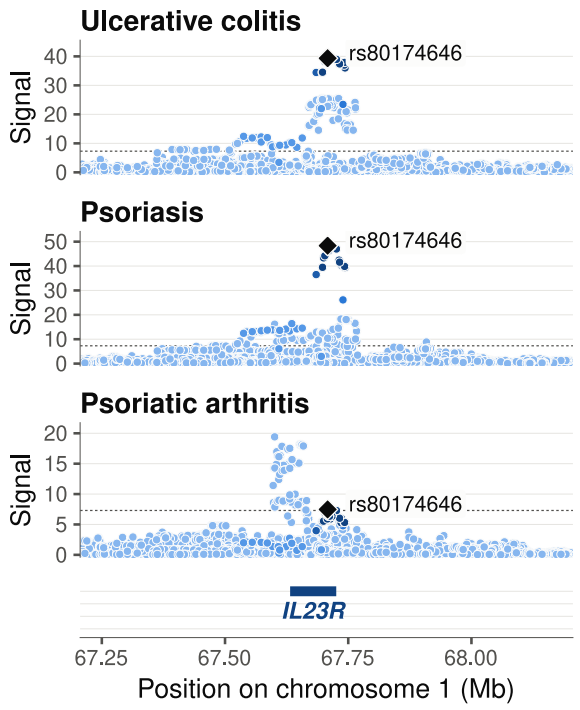
24 risk regions are shared by 2+ diseases



15/24 approved advanced drugs for these diseases treat **more than one**.

20/24 shared regions have **no drug** aimed at them yet: future targets?

All 3 diseases share one signal at IL23R



Each dot is a SNP; higher = stronger link to the disease. **IL23R** builds an "antenna" on immune cells. Drugs blocking this signal (ustekinumab, guselkumab, risankizumab) are approved for **all three**.

Key Takeaways

Genes matter. Autoimmune diseases run in families, and much of the risk is shared between diseases.

Shared genes, shared drugs. Genes like IL23R are why one medicine can treat gut, skin and joints.

Science is open! Anyone can explore GWAS Catalog and Open Targets. Next: pin down the exact gene in each region.

GWAS data: de Lange et al. 2017 (UC); Dand et al. 2025 (psoriasis); Soomro et al. 2022 (PsA). Drugs: Open Targets Platform. Approval odds: Tsepilov et al. 2026 (bioRxiv). WEHI · Bahlo Lab.