

**Supplementary table S1:** Candidate causal pathways and genes associated with pathways affecting male fertility

Index	Candidate causal pathway	Description	Nominal P Value	FDR	Gene mapped with variant	Number of Genes Involved
1	Mhc Pathway	Antigen Processing and Presentation	0.002	0.001	HLA-DRB1, HLA-DRA	2
2	TCRA Pathway	Lck and Fyn tyrosine kinases in initiation of TCR Activation	0.002	0.001	HLA-DRB1, HLA-DRA	2
3	IL5 Pathway	IL 5 Signaling Pathway	0.002	0.001	HLA-DRB1, HLA-DRA	2
4	B-cell Pathway	Antigen Dependent B Cell Activation	0.002	0.001	HLA-DRB1, HLA-DRA	2
5	Eosinophils Pathway	The Role of Eosinophils in the Chemokine Network of Allergy	0.002	0.001	HLA-DRB1, HLA-DRA	2
6	ctla4 Pathway	The Co-Stimulatory Signal During T-cell Activation	0.002	0.001	HLA-DRB1, HLA-DRA	2
7	Inflammatory Pathway	Cytokines and Inflammatory Response	0.002	0.001	HLA-DRB1, HLA-DRA	2
8	BB-cell Pathway	Bystander B Cell Activation	0.002	0.001	HLA-DRB1, HLA-DRA	2
9	B-lymphocyte Pathway	B Lymphocyte Cell Surface Molecules	0.002	0.001	HLA-DRB1, HLA-DRA	2
10	Graft-versus-host disease	Graft-versus-host disease	0.001	0.003	HLA-DRB1, HLA-DRA, HLA-DQA1	3
11	Allograft rejection	Allograft rejection	0.001	0.003	HLA-DRB1, HLA-DRA, HLA-DQA1	3
12	Autoimmune thyroid disease	Autoimmune thyroid disease	0.001	0.003	HLA-DRB1, HLA-DRA, HLA-DQA1	3
13	Type I diabetes mellitus	Type I diabetes mellitus	0.001	0.003	HLA-DRB1, HLA-DRA, HLA-DQA1	3
14	Asthma	Asthma	0.001	0.003	HLA-DRB1, HLA-DRA, HLA-DQA1	3
15	Lymphocyte Proliferation	Expansion of Lymphocyte proliferation by cell division	0.003	0.007	RIPK, PDCD1LG2	2
16	Systemic lupus erythematosus	Systemic lupus erythematosus	0.001	0.009	HLA-DRB1, HLA-DRA, HLA-DQA1, C1QA, C1QB	5

17	Th1/Th2Pathway	Th1/Th2 Differentiation	0.001	0.01	HLA-DRB1, IL18R1, HLA- DRA	3
18	Drug metabolism - cytochrome P450	Drug metabolism - cytochrome P450	0.02	0.02	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3	8
19	Metabolism of xenobiotics by cytochrome P450	Metabolism of xenobiotics by cytochrome P450	0.02	0.02	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3	8
20	Androgen and estrogen metabolism	Androgen and estrogen metabolism	0.02	0.02	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3	8
21	Pentose and glucuronate interconversions	Pentose and glucuronate interconversions	0.02	0.02	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3	8
22	Porphyrin and chlorophyll metabolism	Porphyrin and chlorophyll metabolism	0.02	0.02	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3	8
23	Retinol metabolism	Retinol metabolism	0.018	0.021	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3	8
24	Cell adhesion molecules (CAMs)	Cell adhesion molecules (CAMs)	0.001	0.021	HLA-DRB1, HLA-DQA1, HLA-DRA, PDCD1LG2	4

25	Drug metabolism - other enzymes	Drug metabolism - other enzymes	0.02	0.021	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3, CDA	9
26	CSK Pathway	Activation of Csk by cAMP-dependent Protein Kinase Inhibition	0.019	0.023	HLA-DRB1, HLA-DRA, GNB1	3
27	Antigen processing and presentation	Antigen processing and presentation	0.005	0.023	HLA-DRB1, HLA-DRA, HLA-DQA1, NFYC	4
28	UDP Glycosyl Transferase Activity	Catalysis of the transfer of a glycosyl group from a UDP-sugar to a small hydrophobic molecule	0.017	0.024	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3, EXTL1	9
29	T Cell Activation	The change in morphology and behavior of a mature or immature T cell resulting from exposure to a mitogen, cytokine, chemokine, cellular ligand, or an antigen for which it is specific.	0.015	0.024	RIPK2, PDCD1LG2, DDOST	3
30	Transferase Activity Transferring Hexosyl Groups	Catalysis of the transfer of a hexosyl group from one compound (donor) to another (acceptor)	0.015	0.024	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3, EXTL1	9
31	Starch and sucrose metabolism	Starch and sucrose metabolism	0.018	0.024	UGT1A8, UGT1A9, UGT1A10, UGT1A6, UGT1A7, UGT1A4, UGT1A5, UGT1A3, ATP13A2	9
32	Hematopoietic cell lineage	Hematopoietic cell lineage	0.023	0.025	HLA-DRB1, HLA-DRA, CSF3R	3