

Supplementary Table 3. Go terms

GO_ID	Category	Name	Description	GO(P-val): Control vs. Case
GO:0000278	Biological_process	Mitotic cell cycle	Progression through the phases of the mitotic cell cycle, the most common eukaryotic cell cycle, which canonically comprises four successive phases called G1, S, G2, and M and includes replication of the genome and the subsequent segregation of chromosomes into daughter cells. In some variant cell cycles nuclear replication or nuclear division may not be followed by cell division, or G1 and G2 phases may be absent.	0.000936
GO:0001942	Biological_process	Hair follicle development	The process whose specific outcome is the progression of the hair follicle over time, from its formation to the mature structure. A hair follicle is a tube-like opening in the epidermis where the hair shaft develops and into which the sebaceous glands open.	0.000003
GO:0002741	Biological_process	Positive regulation of cytokine secretion involved in immune response	Any process that activates or increases the frequency, rate, or extent of cytokine secretion contributing to an immune response.	0.000934
GO:0003408	Biological_process	Optic cup formation involved in camera-type eye development	The developmental process pertaining to the initial formation of the optic cup, a two-walled vesicle formed from the optic vesicle.	0.000925
GO:0006082	Biological_process	Organic acid metabolic process	The chemical reactions and pathways involving organic acids, any acidic compound containing carbon in covalent linkage.	0.000937
GO:0006119	Biological_process	Oxidative phosphorylation	The phosphorylation of ADP to ATP that accompanies the oxidation of a metabolite through the operation of the respiratory chain. Oxidation of compounds establishes a proton gradient across the membrane, providing the energy for ATP synthesis.	0.000407
GO:0006120	Biological_process	Mitochondrial electron transport, NADH to ubiquinone	The transfer of electrons from NADH to ubiquinone that occurs during oxidative phosphorylation, mediated by the multisubunit enzyme known as complex I.	0.000293
GO:0006260	Biological_process	DNA replication	The cellular metabolic process in which a cell duplicates one or more molecules of DNA. DNA replication begins when specific sequences, known as origins of replication, are recognized and bound by initiation proteins, and ends when the original DNA molecule has been completely duplicated and the copies topologically separated. The unit of replication usually corresponds to the genome of the cell, an organelle, or a virus. The template for replication can either be an existing DNA molecule or RNA.	0.000002
GO:0006278	Biological_process	RNA-dependent DNA replication	A DNA replication process that uses RNA as a template for RNA-dependent DNA polymerases (e.g. reverse transcriptase) that synthesize the new strands.	0.000003
GO:0006582	Biological_process	Melanin metabolic process	The chemical reactions and pathways involving melanins, pigments largely of animal origin. High molecular weight polymers of indole quinone, they are irregular polymeric structures and are divided into three groups: allomelanins in the plant kingdom and eumelanins and pheomelanins in the animal kingdom.	0.000046
GO:0006629	Biological_process	Lipid metabolic process	The chemical reactions and pathways involving lipids, compounds soluble in an organic solvent but not, or sparingly, in an aqueous solvent. Includes fatty acids; neutral fats, other fatty-acid esters, and soaps; long-chain (fatty) alcohols and waxes; sphingoids and other long-chain bases; glycolipids, phospholipids and sphingolipids; and carotenes, polyprenols, sterols, terpenes and other isoprenoids.	0.000129

Supplementary Table 3. Continued

GO_ID	Category	Name	Description	GO(P-val): Control vs. Case
GO:0006631	Biological _process	Fatty acid metabolic process	The chemical reactions and pathways involving fatty acids, aliphatic monocarboxylic acids liberated from naturally occurring fats and oils by hydrolysis.	0.000625
GO:0006820	Biological _process	Anion transport	The directed movement of anions, atoms or small molecules with a net negative charge, into, out of or within a cell, or between cells, by means of some agent such as a transporter or pore.	0.000452
GO:0007067	Biological _process	Mitosis	A cell cycle process comprising the steps by which the nucleus of a eukaryotic cell divides; the process involves condensation of chromosomal DNA into a highly compacted form. Canonically, mitosis produces two daughter nuclei whose chromosome complement is identical to that of the mother cell.	0.00086
GO:0007079	Biological _process	Mitotic chromosome movement towards spindle pole	The cell cycle process in which the directed movement of chromosomes from the center of the spindle towards the spindle poles occurs. This mediates by the shortening of microtubules attached to the chromosomes, during mitosis.	0.000924
GO:0007275	biological _process	Multicellular organismal development	The biological process whose specific outcome is the progression of a multicellular organism over time from an initial condition (e.g. a zygote or a young adult) to a later condition (e.g. a multicellular animal or an aged adult).	0.000008
GO:0007405	Biological _process	Neuroblast proliferation	The expansion of a neuroblast population by cell division. A neuroblast is any cell that will divide and give rise to a neuron.	0.000664
GO:0007442	Biological _process	Hindgut morphogenesis	The process in which the anatomical structures of the hindgut are generated and organized.	0.000059
GO:0008202	Biological _process	Steroid metabolic process	The chemical reactions and pathways involving steroids, compounds with a 1,2,cyclopentanoperhydrophenanthrene nucleus.	0.000641
GO:0008544	Biological _process	Epidermis development	The process whose specific outcome is the progression of the epidermis over time, from its formation to the mature structure. The epidermis is the outer epithelial layer of a plant or animal, it may be a single layer that produces an extracellular material (e.g. the cuticle of arthropods) or a complex stratified squamous epithelium, as in the case of many vertebrate species.	0
GO:0009888	Biological _process	Tissue development	The process whose specific outcome is the progression of a tissue over time, from its formation to the mature structure.	0.000424
GO:0010976	Biological _process	Positive regulation of neuron projection development	Any process that increases the rate, frequency or extent of neuron projection development. Neuron projection development is the process whose specific outcome is the progression of a neuron projection over time, from its formation to the mature structure. A neuron projection is any process extending from a neural cell, such as axons or dendrites (collectively called neurites).	0.000573
GO:0015914	Biological _process	Phospholipid transport	The directed movement of phospholipids into, out of or within a cell, or between cells, by means of some agent such as a transporter or pore. Phospholipids are any lipids containing phosphoric acid as a mono- or diester.	0.000528
GO:0016337	biological _process	Cell-cell adhesion	The attachment of one cell to another cell via adhesion molecules.	0.000316
GO:0018958	Biological _process	Phenol-containing compound metabolic process	The chemical reactions and pathways involving a phenol, any compound containing one or more hydroxyl groups directly attached to an aromatic carbon ring.	0.00009

Supplementary Table 3. Continued

GO_ID	Category	Name	Description	GO(P-val): Control vs. Case
GO:0022900	Biological _process	Electron transport chain	A process in which a series of electron carriers operate together to transfer electrons from donors to any of several different terminal electron acceptors to generate a transmembrane electrochemical gradient.	0.000037
GO:0022904	Biological _process	Respiratory electron transport chain	A process in which a series of electron carriers operate together to transfer electrons from donors such as NADH and FADH2 to any of several different terminal electron acceptors to generate a transmembrane electrochemical gradient.	0.000024
GO:0031069	Biological _process	Hair follicle morphogenesis	The process in which the anatomical structures of the hair follicle are generated and organized.	0.000274
GO:0032502	Biological _process	Developmental process	A biological process whose specific outcome is the progression of an integrated living unit: an anatomical structure (which may be a subcellular structure, cell, tissue, or organ), or organism over time from an initial condition to a later condition.	0.000292
GO:0033153	Biological _process	T cell receptor V(D)J recombination	The process in which T cell receptor V, D, and J, or V and J gene segments, depending on the specific locus, are recombined within a single locus utilizing the conserved heptamer and nonamer recombination signal sequences (RSS).	0.000268
GO:0042438	Biological _process	Melanin biosynthetic process	The chemical reactions and pathways resulting in the formation of melanins, pigments largely of animal origin. High molecular weight polymers of indole quinone, they are irregular polymeric structures and are divided into three groups: allomelanins in the plant kingdom and eumelanins and phaeomelanins in the animal kingdom.	0.00003
GO:0042445	Biological _process	Hormone metabolic process	The chemical reactions and pathways involving any hormone, naturally occurring substances secreted by specialized cells that affects the metabolism or behavior of other cells possessing functional receptors for the hormone.	0.000221
GO:0042633	Biological _process	Hair cycle	The cyclical phases of growth (anagen), regression (catagen), quiescence (telogen), and shedding (exogen) in the life of a hair; one of the collection or mass of filaments growing from the skin of an animal, and forming a covering for a part of the head or for any part or the whole of the body.	0
GO:0042640	Biological _process	Anagen	The growth phase of the hair cycle. Lasts, for example, about 3 to 6 years for human scalp hair.	0.000268
GO:0043588	Biological _process	Skin development	The process whose specific outcome is the progression of the skin over time, from its formation to the mature structure. The skin is the external membranous integument of an animal. In vertebrates the skin generally consists of two layers, an outer nonsensitive and nonvascular epidermis (cuticle or skarfskin) composed of cells which are constantly growing and multiplying in the deeper, and being thrown off in the superficial layers, as well as an inner vascular dermis (cutis, corium or true skin) composed mostly of connective tissue.	0
GO:0044281	Biological _process	Small molecule metabolic process	The chemical reactions and pathways involving small molecules, any low molecular weight, monomeric, non-encoded molecule.	0.000152

Supplementary Table 3. Continued

GO_ID	Category	Name	Description	GO(P-val): Control vs. Case
GO:0045333	Biological _process	Cellular respiration	The enzymatic release of energy from organic compounds (especially carbohydrates and fats) which either requires oxygen (aerobic respiration) or does not (anaerobic respiration).	0.000415
GO:0048814	Biological _process	Regulation of dendrite morphogenesis	Any process that modulates the frequency, rate or extent of dendrite morphogenesis.	0.000463
GO:0048856	Biological _process	Anatomical structure development	The biological process whose specific outcome is the progression of an anatomical structure from an initial condition to its mature state. This process begins with the formation of the structure and ends with the mature structure, whatever form that may be including its natural destruction. An anatomical structure is any biological entity that occupies space and is distinguished from its surroundings. Anatomical structures can be macroscopic such as a carpel, or microscopic such as an acrosome.	0.000313
GO:0050773	Biological _process	Regulation of dendrite development	Any process that modulates the frequency, rate or extent of dendrite development.	0.00043
GO:0051301	Biological _process	Cell division	The process resulting in the physical partitioning and separation of a cell into daughter cells.	0.000651
GO:0051302	Biological _process	Regulation of cell division	Any process that modulates the frequency, rate or extent of the physical partitioning and separation of a cell into daughter cells.	0.000262
GO:0055114	Biological _process	Oxidation-reduction process	A metabolic process that results in the removal or addition of one or more electrons to or from a substance, with or without the concomitant removal or addition of a proton or protons.	0.000023
GO:0060831	Biological _process	Smoothed signaling pathway involved in dorsal/ventral neural tube patterning	The series of molecular signals generated as a consequence of activation of the transmembrane protein Smoothed contributing to the dorsal/ventral pattern of the neural tube.	0.000895
GO:0060900	Biological _process	Embryonic camera-type eye formation	The developmental process pertaining to the initial formation of a camera-type eye from unspecified neurectoderm. This process begins with the differentiation of cells that form the optic field and ends when the optic cup has attained its shape.	0.000289
GO:0005743	Cellular _component	Mitochondrial inner membrane	The inner, i.e. lumen-facing, lipid bilayer of the mitochondrial envelope. It is highly folded to form cristae.	0.000532
GO:0005746	Cellular _component	Mitochondrial respiratory chain	The protein complexes that form the mitochondrial electron transport system (the respiratory chain), associated with the inner mitochondrial membrane. The respiratory chain complexes transfer electrons from an electron donor to an electron acceptor and are associated with a proton pump to create a transmembrane electrochemical gradient.	0.000077
GO:0005747	Cellular _component	Mitochondrial respiratory chain complex I	A protein complex located in the mitochondrial inner membrane that forms part of the mitochondrial respiratory chain. It contains about 25 different polypeptide subunits, including NADH dehydrogenase (ubiquinone), flavin mononucleotide and several different iron-sulfur clusters containing non-heme iron. The iron undergoes oxidation-reduction between Fe(II) and Fe(III), and catalyzes proton translocation linked to the oxidation of NADH by ubiquinone.	0.000071

Supplementary Table 3. Continued

GO_ID	Category	Name	Description	GO(P-val): Control vs. Case
GO:0005833	Cellular _component	Hemoglobin complex	An iron-containing, oxygen carrying complex. In vertebrates it is made up of two pairs of associated globin polypeptide chains, each chain carrying a noncovalently bound heme prosthetic group.	0.00042
GO:0005856	Cellular _component	Cytoskeleton	Any of the various filamentous elements that form the internal framework of cells, and typically remain after treatment of the cells with mild detergent to remove membrane constituents and soluble components of the cytoplasm. The term embraces intermediate filaments, microfilaments, microtubules, the microtrabecular lattice, and other structures characterized by a polymeric filamentous nature and long-range order within the cell. The various elements of the cytoskeleton not only serve in the maintenance of cellular shape but also have roles in other cellular functions, including cellular movement, cell division, endocytosis, and movement of organelles.	0
GO:0005882	Cellular _component	Intermediate filament	A cytoskeletal structure that forms a distinct elongated structure, characteristically 10 nm in diameter, that occurs in the cytoplasm of eukaryotic cells. Intermediate filaments form a fibrous system, composed of chemically heterogeneous subunits and involved in mechanically integrating the various components of the cytoplasmic space. Intermediate filaments may be divided into five chemically distinct classes: Type I, acidic keratins; Type II, basic keratins; Type III, including desmin, vimentin and others; Type IV, neurofilaments and related filaments; and Type V, lamins.	0
GO:0004324	Cellular _component	Protein complex	Any macromolecular complex composed of two or more polypeptide subunits, which may or may not be identical. Protein complexes may have other associated non-protein prosthetic groups, such as nucleotides, metal ions or other small molecules.	0.000038
GO:00045095	Cellular _component	Keratin filament	A filament composed of acidic and basic keratins (types I and II), typically expressed in epithelial cells. The keratins are the most diverse classes of IF proteins, with a large number of keratin isoforms being expressed. Each type of epithelium always expresses a characteristic combination of type I and type II keratins.	0
GO:00045111	Cellular _component	Intermediate filament cytoskeleton	Cytoskeletal structure made from intermediate filaments, typically organized in the cytosol as an extended system that stretches from the nuclear envelope to the plasma membrane. Some intermediate filaments run parallel to the cell surface, while others traverse the cytosol; together they form an internal framework that helps support the shape and resilience of the cell.	0
GO:00070469	Cellular _component	Respiratory chain	The protein complexes that form the electron transport system (the respiratory chain), associated with a cell membrane, usually the plasma membrane (in prokaryotes) or the inner mitochondrial membrane (on eukaryotes). The respiratory chain complexes transfer electrons from an electron donor to an electron acceptor and are associated with a proton pump to create a transmembrane electrochemical gradient.	0.000047
GO:00097233	Cellular _component	Alveolar lamellar body membrane	The lipid bilayer surrounding an alveolar lamellar body, a specialized secretory organelle found in type II pneumocytes and involved in the synthesis, secretion, and reutilization of pulmonary surfactant.	0.000924

Supplementary Table 3. Continued

GO_ID	Category	Name	Description	GO(P-val): Control vs. Case
GO:0003777	Molecular_function	Microtubule motor activity	Catalysis of movement along a microtubule, coupled to the hydrolysis of a nucleoside triphosphate (usually ATP).	0.000495
GO:0003824	Molecular_function	Catalytic activity	Catalysis of a biochemical reaction at physiological temperatures. In biologically catalyzed reactions, the reactants are known as substrates, and the catalysts are naturally occurring macromolecular substances known as enzymes. Enzymes possess specific binding sites for substrates, and are usually composed wholly or largely of protein, but RNA that has catalytic activity (ribozyme) is often also regarded as enzymatic.	0.000038
GO:0003954	Molecular_function	NADH dehydrogenase activity	Catalysis of the reaction: NADH + H ⁺ + acceptor = NAD ⁺ + reduced acceptor.	0.000064
GO:0003964	Molecular_function	RNA-directed DNA polymerase activity	Catalysis of the reaction: deoxynucleoside triphosphate + DNA(n) = diphosphate + DNA(n+1). Catalyzes RNA-template-directed extension of the 3'- end of a DNA strand by one deoxynucleotide at a time.	0.000001
GO:0004012	Molecular_function	Phospholipid-translocating ATPase activity	Catalysis of the movement of phospholipids from one membrane bilayer leaflet to the other, driven by the hydrolysis of ATP.	0.000887
GO:0004129	Molecular_function	Cytochrome-c oxidase activity	Catalysis of the reaction: 4 ferrocytochrome c + O ₂ + 4 H ⁺ = 4 ferricytochrome c + 2 H ₂ O.	0.000089
GO:0005198	Molecular_function	Structural molecule activity	The action of a molecule that contributes to the structural integrity of a complex or assembly within or outside a cell.	0.000397
GO:0005344	Molecular_function	Oxygen transporter activity	Enables the directed movement of oxygen into, out of or within a cell, or between cells.	0.000475
GO:0005509	Molecular_function	Calcium ion binding	Interacting selectively and non-covalently with calcium ions (Ca ²⁺).	0.000399
GO:0008137	Molecular_function	NADH dehydrogenase (ubiquinone) activity	Catalysis of the reaction: NADH + H ⁺ + ubiquinone = NAD ⁺ + ubiquinol.	0.000064
GO:0015078	Molecular_function	Hydrogen ion transmembrane transporter activity	Catalysis of the transfer of hydrogen ions from one side of a membrane to the other.	0.000491
GO:0016491	Molecular_function	Oxidoreductase activity	Catalysis of an oxidation-reduction (redox) reaction, a reversible chemical reaction in which the oxidation state of an atom or atoms within a molecule is altered. One substrate acts as a hydrogen or electron donor and becomes oxidized, while the other acts as hydrogen or electron acceptor and becomes reduced.	0
GO:0016614	Molecular_function	Oxidoreductase activity, acting on CH-OH group of donors	Catalysis of an oxidation-reduction (redox) reaction in which a CH-OH group act as a hydrogen or electron donor and reduces a hydrogen or electron acceptor.	0.00061
GO:0016616	Molecular_function	Oxidoreductase activity, acting on the CH-OH group of donors, NAD or NADP as acceptor	Catalysis of an oxidation-reduction (redox) reaction in which a CH-OH group acts as a hydrogen or electron donor and reduces NAD ⁺ or NADP.	0.000783
GO:0016628	Molecular_function	Oxidoreductase activity, acting on the CH-CH group of donors, NAD or NADP as acceptor	Catalysis of an oxidation-reduction (redox) reaction in which a CH-CH group acts as a hydrogen or electron donor and reduces NAD or NADP.	0.000069
GO:0016655	Molecular_function	Oxidoreductase activity, acting on NAD(P)H, quinone or similar compound as acceptor	Catalysis of an oxidation-reduction (redox) reaction in which NADH or NADPH acts as a hydrogen or electron donor and reduces a quinone or a similar acceptor molecule.	0.000017
GO:0019825	Molecular_function	Oxygen binding	Interacting selectively and non-covalently with oxygen (O ₂).	0.00049

GO: gene ontology.