

Supplementary Material

1 Supplementary Tables

Cell Line	Diagnosis	Sex	ASD Status
38*	N/A	F	Unknown
182*	N/A	F	Normal
189*	N/A	F	Unknown
238*	N/A	M	Normal
195	N/A	M	Normal
312	N/A	M	Normal
152*	PW deletion	M	Normal
192*	PW deletion	F	Normal
225*	PW deletion	M	Normal
258*	PW deletion	F	Normal
148	PW deletion	M	Normal
307	PW deletion	F	Normal
156*	PW UPD	F	Normal
162*	PW UPD	F	Normal
171*	PW UPD	F	Normal
249*	PW UPD	F	Normal
270	PW UPD	F	Normal

191	PW UPD	M	Normal
235	PW UPD	M	Normal
197	PW UPD	M	Normal
94*	PW UPD	F	Possible ASD
228*	PW UPD	M	Possible ASD
250*	PW UPD	M	Possible ASD
268*	PW UPD	F	Possible ASD
277	PW UPD	F	Possible ASD
181	PW UPD	M	Possible ASD

Supplementary Table 1. Cell lines used for RNAseq and immunocytochemistry analysis. Asterisk (*) denotes subjects used in RNAseq experiment.

Gene	Function	Link to PWS
<i>PEX10</i>	Peroxisomes breakdown toxins and synthesize lipids	Mutations lead to Zellweger syndrome. Primary phenotypes of Zellweger syndrome are hypotonia and neurodevelopmental delay [80]
<i>SNTB2</i>	Plays a role in regulation of secretory granules and localization of membrane proteins	Dystrophins are associated with muscular dystrophy [81]
<i>CTDP1</i>	Dephosphorylates a subunit of RNApol making it available for transcription	Mutations are associated with neuropathy, facial dysmorphism, and cataracts [82]
<i>AKT1S1</i>	Subunit of mTORC, which regulates cell growth in response to nutrients and hormonal signaling	Altered mTORC signaling has been linked to a variety of neurological disorders including autism, epilepsy, and neurodegenerative disorders [83]

<i>ATP7A</i>	Supplies copper to copper requiring proteins in the secretory pathway	Associated with Menkes disease [84]. Primary phenotypes are hypotonia, hypothermia, failure to thrive, and seizures.
<i>MYL5</i>	Component of ATPase cellular motor protein myosin	Myosin has many neuronal functions, particularly at the synapse [85]
<i>MIPOL1</i>	Function is not well characterized	Link to hand and feet abnormalities
<i>TMEM92</i>	Transmembrane protein with unknown function	Unknown
<i>DHRS1</i>	Functions as an oxidoreductase	Associated with speech/ language impairment

Supplementary Table 2. Core PWS transcripts outside of the 15q11.2-13.1 region that were significantly different versus control in all PWS subgroup.

Gene	Full Name	Function
<i>ACOT9</i>	Acyl-CoA Thioesterase 9	Mitochondrial acyl-CoA thioesterase
<i>AGPAT5</i>	1-Acylglycerol-3-Phosphate O-Acyltransferase 5	Expressed in mitochondria
<i>AIFM1</i>	Apoptosis Inducing Factor Mitochondria Associated 1	NADH oxidoreductase found in the mitochondrial intermembrane space
<i>BNIP1</i>	BCL2 Interacting Protein 1	Involved in mitophagy
<i>CLTC</i>	Clathrin Heavy Chain	Expressed in mitochondria
<i>CMC4</i>	C-X9-C Motif Containing 4	Expressed in mitochondria
<i>COX5B</i>	Cytochrome C Oxidase Subunit 5B	Component of the electron transport chain
<i>COX7B</i>	Cytochrome C Oxidase Subunit 7B	Component of the electron transport chain
<i>COX7C</i>	Cytochrome C Oxidase Subunit 7C	Component of the electron transport chain
<i>CS</i>	Citrate Synthase	TCA cycle enzyme
<i>CYB5A</i>	Cytochrome B5 Type A	Electron carrier expressed in mitochondria

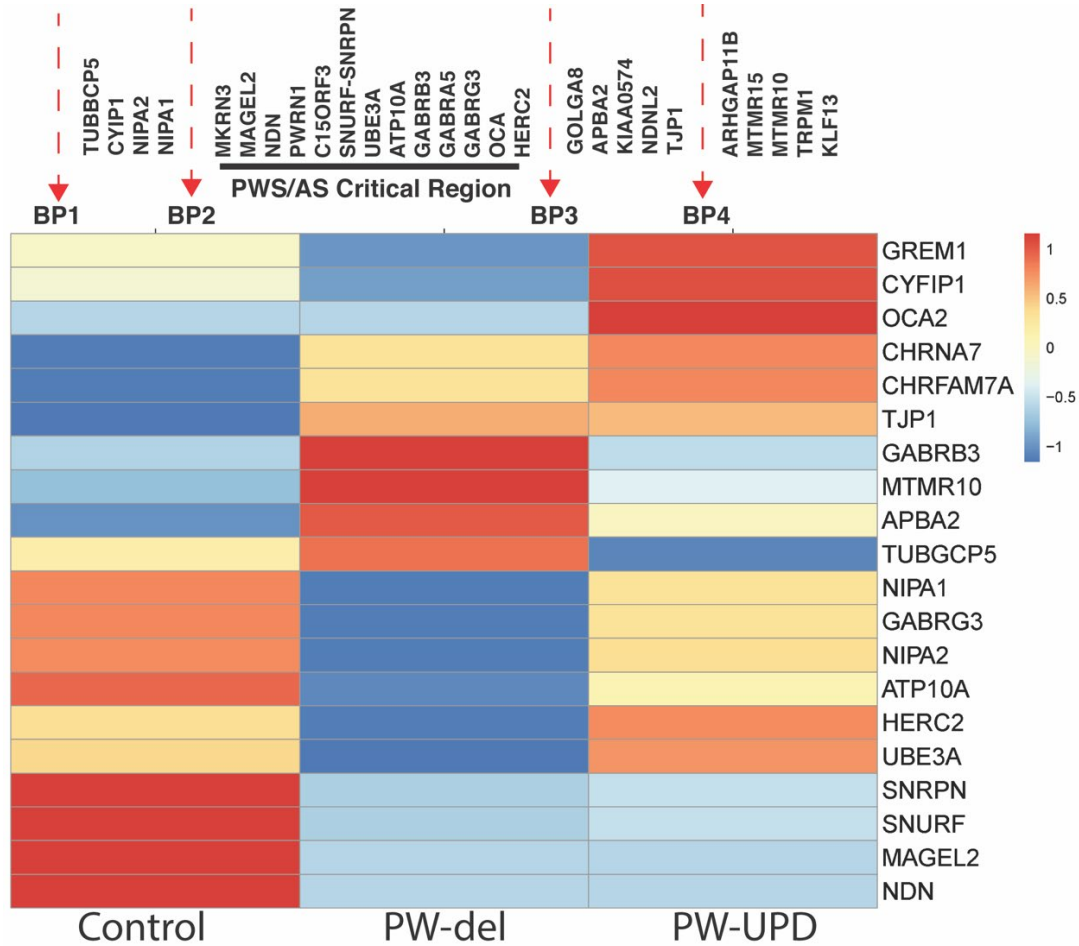
<i>EHHADH</i>	Enoyl-CoA Hydratase And 3-Hydroxyacyl CoA Dehydrogenase	Involved in mitochondrial fatty acid oxidation
<i>FDXR</i>	Ferredoxin Reductase	Mitochondrial flavoprotein involved in the electron transport chain
<i>GFM1</i>	G Elongation Factor Mitochondrial 1	Mitochondrial translation elongation factor
<i>GHR</i>	Growth Hormone Receptor	Expressed in mitochondria
<i>GLUD1</i>	Glutamate Dehydrogenase 1	Mitochondrial matrix enzyme
<i>GPX1</i>	Glutathione Peroxidase 1	Protects cells from oxidative stress
<i>GSTP1</i>	Glutathione S-Transferase Pi 1	Protects cells from oxidative stress
<i>HAP1</i>	Huntingtin Associated Protein 1	Expressed in mitochondria
<i>MFN2</i>	Mitofusin 2	Involved in mitochondrial fusion and maintenance of the mitochondrial matrix
<i>MINOS1</i>	Mitochondrial Contact Site And Cristae Organizing System Subunit 10	Involved in the maintenance of mitochondrial architecture
<i>MRPL4</i>	Mitochondrial Ribosomal Protein L4	Component of the mitochondrial ribosomal 39S subunit
<i>MRPL41</i>	Mitochondrial Ribosomal Protein L41	Component of the mitochondrial ribosomal 39S subunit
<i>MRPL47</i>	Mitochondrial Ribosomal Protein L47	Component of the mitochondrial ribosomal 39S subunit
<i>MRPS33</i>	Mitochondrial Ribosomal Protein S33	Component of the mitochondrial ribosomal 28S subunit
<i>MRPS5</i>	Mitochondrial Ribosomal Protein S5	Component of the mitochondrial ribosomal 28S subunit
<i>MTIF2</i>	Mitochondrial Translational Initiation Factor 2	Mitochondrial translation intitation factor
<i>NAXE</i>	NAD(P)HX Epimerase	Involved in mitochondrial metabolic processes

<i>NDUFA1</i>	NADH:Ubiquinone Oxidoreductase Subunit A1	Component of the electron transport chain
<i>NDUFV2</i>	NADH:Ubiquinone Oxidoreductase Core Subunit V2	Component of the electron transport chain
<i>NFS1</i>	Cysteine Desulfurase, Mitochondrial	Expressed in mitochondria
<i>NT5M</i>	5',3'-Nucleotidase, Mitochondrial	5' nucleotidase localized to the mitochondrial matrix
<i>OAT</i>	Ornithine Aminotransferase	Mitochondrial enzyme ornithine aminotransferase
<i>OXML1</i>	Oxidoreductase Like Domain Containing 1	Expressed in mitochondria
<i>PERP</i>	P53 Apoptosis Effector Related To PMP22	Expressed in mitochondria
<i>POR</i>	Cytochrome P450 Oxidoreductase	Enzyme involved in electron transport
<i>PRKAR2B</i>	Protein Kinase CAMP-Dependent Type II Regulatory Subunit Beta	Plays a role in regulating energy balance
<i>RMND1</i>	Required For Meiotic Nuclear Division 1 Homolog	Involved in mitochondrial translation
<i>SDHC</i>	Succinate Dehydrogenase Complex Subunit C	Component of the electron transport chain
<i>SDHD</i>	Succinate Dehydrogenase Complex Subunit D	Component of the electron transport chain
<i>SLC25A36</i>	Solute Carrier Family 25 Member 36	Mitochondrial transport protein
<i>SLC25A39</i>	Solute Carrier Family 25 Member 39	Mitochondrial transport protein
<i>SLC25A5</i>	Solute Carrier Family 25 Member 5	Mitochondrial transport protein
<i>SLC35F6</i>	Solute Carrier Family 35 Member F6	Involved in the maintenance of mitochondrial membrane potential
<i>SUCLG2</i>	Succinate-CoA Ligase GDP-Forming Subunit Beta	TCA cycle enzyme

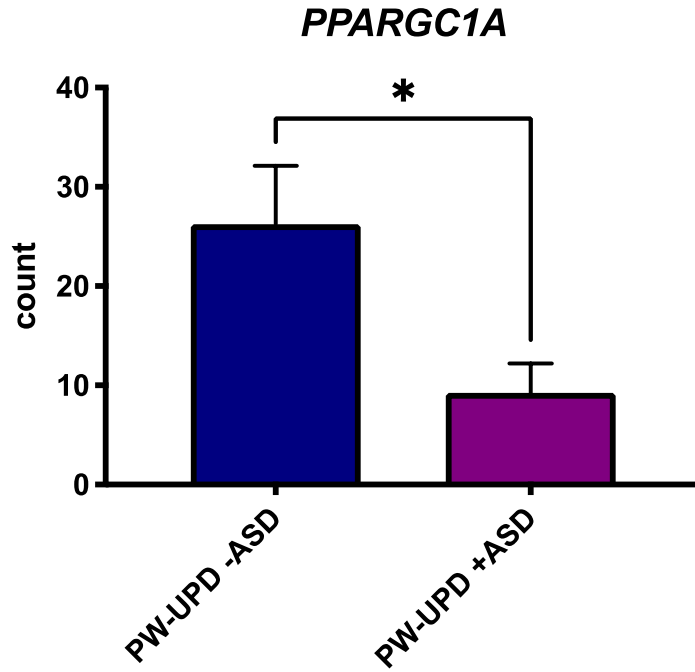
<i>SYNE2</i>	Spectrin Repeat Containing Nuclear Envelope Protein 2	Expressed in mitochondria
<i>TIMM17A</i>	Translocase Of Inner Mitochondrial Membrane 17A	Mitochondrial transport protein
<i>TMEM160</i>	Transmembrane Protein 160	Expressed in mitochondria
<i>TMTC1</i>	Transmembrane O-Mannosyltransferase Targeting Cadherins 1	Expressed in mitochondria
<i>TP63</i>	Tumor Protein P63	Expressed in mitochondria
<i>TUFM</i>	Tu Translation Elongation Factor, Mitochondrial	Mitochondrial translation elongation factor
<i>TXN</i>	Thioredoxin	Involved in redox reactions
<i>UQCR10</i>	Ubiquinol-Cytochrome C Reductase, Complex III Subunit X	Component of the electron transport chain
<i>UQCR11</i>	Ubiquinol-Cytochrome C Reductase, Complex III Subunit XI	Component of the electron transport chain
<i>UQCRC2</i>	Ubiquinol-Cytochrome C Reductase Core Protein 2	Component of the electron transport chain
<i>UQCRFS1</i>	Ubiquinol-Cytochrome C Reductase, Rieske Iron-Sulfur Polypeptide 1	Component of the electron transport chain
<i>UQCRH</i>	Ubiquinol-Cytochrome C Reductase Hinge Protein	Component of the electron transport chain
<i>USP30</i>	Ubiquitin Specific Peptidase 30	Involved in mitophagy

Supplementary Table 3. List of genes identified in DAVID mitochondrial enrichment categories.

1.1 Supplementary Figures



Supplementary Figure 1. Genes in the 15q11.2-q13 critical region shows expected PWS imprinted expression. Across the PWS/AS critical region, maternally imprinted genes such as *MAGEL2*, *SNRPN*, and *SNURF* showed decreased expression in both PW-del and PW-UPD neurons.



Supplementary Figure 2. Expression of mitochondrial biogenesis factor, *PPARGC1A*, is significantly decreased in PW-UPD +ASD neurons. Mean RNAseq count for each group is shown in the graph. Significance was determined by an unpaired *t*-test ($p \leq 0.05$).