

ДОПОЛНИТЕЛЬНЫЕ МАТЕРИАЛЫ

Бунеева О.А., Катица И.Г., Згода В.Г., Медведев А.Е. (2023) Нейропротекторные эффекты изатина и афобазола сопровождаются увеличением уровня растворимого в Тритоне X-100 альфа-синуклеина в мозге крыс с экспериментальным ротеноновым паркинсонизмом.

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Таблица S1. Белки мозга крыс, относительное содержание которых меняется при воздействии нейротоксина ротенона и нейропротекторов изатина и афобазола (по сравнению с контролем). Жирным шрифтом номера по базе Uniprot выделены у митохондриальных белков.

№	№ по базе Uniprot	Ген по Uniprot	Название белка по Uniprot	Функции	Ротенон		Ротенон+изатин		Изатин		Ротенон+афобазол		Афобазол	
					- Log (P-значен ие)	Отлич ие от кон тро ля*	- Log (P-значен ие)	Отлич ие от кон тро ля*	- Log (P-значен ие)	Отлич ие от кон тро ля*	- Log (P-значен ие)	Отлич ие от кон тро ля*	- Log (P-значен ие)	Отлич ие от кон тро ля*
1	D3ZQG6	<i>Trim2</i>	Tripartite motif-containing protein 2	6	2.7	0.9	2.7	0.6	2.4	0.5	2.9	0.7	2.6	0.7
2	O08839	<i>Bin1</i>	Myс box-dependent-interacting protein 1	2	3.5	0.6	3.4	0.8	5.1	1.3	3.1	1.0	3.8	1.2
3	O88767	<i>Park7</i>	Parkinson disease protein 7 homolog	4	2.6	1.5	2.2	1.6	2.4	1.8	2.3	1.7	2.4	1.8
4	S5RZM8	<i>COX2</i>	Cytochrome c oxidase subunit 2	1	1.8	1.3	1.8	1.6	2.0	2.0	1.7	1.7	1.5	1.6
5	P04797	<i>Gapdh</i>	Glyceraldehyde-3-phosphate dehydrogenase	1	2.4	0.7	3.8	2.0	3.6	1.9	3.8	2.0	3.7	2.1
6	P07895	<i>Sod2</i>	Superoxide dismutase [Mn], mitochondrial	4	3.6	-1.6	2.5	-1.2	2.0	-0.8	2.9	-1.5	2.9	-1.4
7	P07943	<i>Akr1b1</i>	Aldo-keto reductase family 1 member B1	7	3.4	1.0	3.6	1.0	3.5	1.0	2.9	0.7	3.4	0.9

8	P10888	<i>Cox4i1</i>	Cytochrome c oxidase subunit 4 isoform 1, mitochondrial	1	3.1	1.1	2.9	1.4	3.0	1.4	2.9	1.3	2.9	1.3
9	P11951	<i>Cox6c2</i>	Cytochrome c oxidase subunit 6C-2	1	2.0	0.9	2.8	1.4	2.6	1.3	3.1	1.7	2.7	1.4
10	P12075	<i>Cox5b</i>	Cytochrome c oxidase subunit 5B, mitochondrial	1	2.6	1.9	2.2	2.0	2.1	1.9	2.4	2.5	2.5	2.5
11	P13668	<i>Stmn1</i>	Stathmin	2	2.7	0.7	2.8	1.3	4.0	2.2	3.3	1.4	3.6	1.8
12	P19527	<i>Nefl</i>	Neurofilament light polypeptide	2	3.1	-0.8	3.7	-1.9	4.0	-1.9	4.4	-2.4	4.1	-1.9
13	P20788	<i>Uqcrl1</i>	Cytochrome b-c1 complex subunit Rieske, mitochondrial	1	2.1	1.8	2.2	2.3	2.6	2.9	2.7	3.1	2.6	2.9
14	A0A8I6AAG6	<i>Slc1a3</i>	Amino acid transporter	2	3.6	3.2	3.4	3.7	3.4	3.5	3.8	4.5	3.5	3.9
15	Q2I6B2	<i>Atp6v0a1</i>	V-type proton ATPase subunit a	2	4.5	4.5	3.4	4.3	3.2	3.8	3.5	4.5	3.3	4.1
16	A0A0A0MY31	<i>Itp1l</i>	Inositol 1,4,5-trisphosphate receptor	3	2.5	-0.6	3.1	-1.0	3.1	-0.9	3.1	-0.6	3.6	-1.1
17	A0A8L2R8Y3	<i>Mif</i>	Macrophage migration inhibitory factor	3	2.4	1.1	2.0	1.1	3.0	1.8	2.8	1.6	2.3	1.3
18	A0A8I5ZMM3	<i>Dlg4</i>	Discs large MAGUK scaffold protein 4	3	2.6	-0.5	4.7	-1.3	5.4	-1.6	3.7	-1.6	4.0	-1.6
19	P31596	<i>Gene</i>	Excitatory amino acid transporter 2	2	2.7	0.8	2.9	1.0	3.2	0.9	3.4	1.0	2.9	0.9

20	F1M2I5	<i>Opcm1</i>	Opioid binding protein/cell adhesion molecule-like	3	6.2	2.4	3.6	1.6	2.8	0.9	2.6	1.1	3.0	0.9
21	P37377	<i>Snca</i>	Alpha-synuclein	4	1.6	2.5	2.3	6.0	2.4	6.5	2.3	5.6	2.4	6.3
22	A0A8I6A6P9	<i>Arl3</i>	ADP ribosylation factor like GTPase 3	3	2.7	0.9	2.8	0.9	2.2	0.8	2.3	0.8	1.8	0.9
23	P38983	<i>Rpsa</i>	40S ribosomal protein SA	5	4.0	1.5	3.3	1.5	3.0	1.4	3.4	1.7	3.4	1.6
24	P55051	<i>Fabp7</i>	Fatty acid-binding protein, brain	7	2.8	1.5	2.6	1.7	2.9	2.1	1.9	1.3	2.7	1.9
25	P62329	<i>Tmsb4x</i>	Thymosin beta-4 Gene Tmsb4x	2	2.4	1.6	2.0	0.7	3.7	1.4	3.3	2.6	2.7	1.7
26	P62744	<i>Ap2s1</i>	AP-2 complex subunit sigma	2	3.4	1.3	3.1	1.6	2.6	1.3	3.1	1.9	3.2	1.6
27	P62815	<i>Atp6v1b2</i>	V-type proton ATPase subunit B, brain isoform	2	4.4	0.8	3.7	0.9	3.3	0.6	2.5	0.5	3.4	0.6
28	P69682	<i>Ncap1</i>	Adaptin ear-binding coat-associated protein 1	2	2.4	0.6	3.1	1.2	3.7	1.7	3.5	1.4	3.6	1.7
29	P81155	<i>Vdac2</i>	Voltage-dependent anion-selective channel protein 2	2	5.9	2.4	3.9	1.7	4.2	1.6	2.9	1.0	4.1	1.4
30	P84076	<i>Hpcal3</i>	N3euron-specific calcium-binding protein hippocampi	3	4.2	1.4	2.7	0.9	2.3	0.7	3.2	1.3	2.9	1.3

			n											
31	P97697	<i>Impa1</i>	Inositol monophosphatase 1	3	3.5	1.6	2.0	1.1	2.2	1.2	2.2	1.2	2.2	1.1
32	P97846	<i>Cntnapi1</i>	Contactin-associated protein 1	3	4.9	1.6	5.1	1.3	3.7	1.0	3.6	1.2	4.5	1.0
33	F8WFS9	<i>Add2</i>	Adducin 2	2	2.7	-1.3	5.3	-1.2	5.8	-1.6	4.4	-1.7	5.6	-1.8
34	Q4FZT2	<i>Ppme1</i>	Protein phosphatase methylesterase 1	3	4.2	-0.8	2.6	-0.7	3.3	-0.9	3.1	-0.9	2.4	-0.7
35	Q5BK63	<i>Ndufa9</i>	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial	1	3.8	0.8	3.3	0.9	3.4	0.9	3.8	1.2	3.0	1.0
36	Q5U2N3	<i>Pitpnm1</i>	Membrane-associated phosphatidylinositol transfer protein 1	2	2.3	-0.7	2.3	-0.7	3.6	-1.1	3.4	-0.7	3.3	-0.8
37	Q5U318	<i>Peal5</i>	Astrocytic phosphoprotein PEA-15	3	2.8	1.5	3.2	1.7	3.4	1.8	2.4	1.4	3.1	1.7
38	Q5XI22	<i>Acat2</i>	Acetyl-CoA acetyltransferase, cytosolic	7	1.9	1.3	2.1	1.2	2.7	2.0	2.1	1.3	2.4	1.6
39	Q5XIH7	<i>Phb2</i>	Prohibitin-2	3	2.8	1.2	2.9	1.4	2.9	1.3	2.9	1.4	2.6	1.2
40	Q5XIN6	<i>Letm1</i>	Mitochondrial proton/calcium exchanger protein	2	2.1	1.1	2.4	1.8	2.7	2.1	2.8	2.4	2.6	2.1
41	Q62813	<i>Lsamip</i>	Limbic system-associated membrane protein	3	2.7	3.9	1.7	2.9	1.5	2.5	1.7	3.0	1.7	3.0

42	Q63198	<i>Cntn1</i>	Contactin-1	3	3.0	1.9	2.2	1.7	1.8	1.2	2.2	1.6	2.1	1.5
43	Q63560	<i>Map6</i>	Microtubule-associated protein 6	1	2.0	1.1	4.6	2.5	4.8	2.9	5.3	3.0	5.7	3.3
44	A0A8L2Q7K1	<i>Ndufs1</i>	NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial	1	3.8	0.5	3.3	0.4	4.1	0.6	3.7	0.5	3.8	0.7
45	A0A8L2QK81	<i>Snd1</i>	Staphylococcal nuclease domain-containing protein	5	2.4	-0.8	2.5	-1.0	3.4	-1.5	2.9	-1.1	3.3	-1.5
46	Q6P0K8	<i>Jup</i>	Junction plakoglobin	2	3.0	3.4	2.1	2.9	2.4	3.5	2.8	4.5	3.1	5.4
47	A0A8I6A243	<i>Gpi</i>	Glucose-6-phosphate isomerase	1	2.9	0.8	3.8	1.3	3.8	1.3	3.3	1.1	3.4	1.1
48	Q812E9	<i>Gpm6a</i>	Neuronal membrane glycoprotein M6-a	5	2.8	1.2	3.7	1.4	4.1	1.2	4.8	2.1	3.5	1.6
49	A0A8I6AGZ2	<i>Pex5l</i>	Peroxin 2, isoform CRA_c	4	2.5	-0.9	2.5	-0.6	3.0	-0.7	3.1	-1.5	3.6	-1.0
50	A0A140TAA4	<i>Pdcd6ip</i>	Programmed cell death 6-interacting protein	4	2.3	-0.6	2.9	-0.7	3.3	-0.9	3.2	-0.9	3.3	-0.9
51	Q9Z2L0	<i>Vdac1</i>	Voltage-dependent anion-selective channel protein 1	2	4.3	1.6	3.8	1.5	3.8	1.5	3.5	1.3	3.6	1.5
52	A0A096MJT3	<i>Septin4</i>	Septin 4	1	3.2	-1.3	2.4	-0.7	2.7	-1.0	3.4	-1.5	3.6	-1.3
53	A0A0G2JSR0	<i>Vdac3</i>	Voltage-dependent anion channel 3	2	4.1	3.6	3.1	3.2	3.0	3.2	3.0	3.3	3.1	3.3

54	A0A0G2JVL6	<i>Ndufa8</i>	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8	1	1.9	1.2	1.7	1.5	2.1	2.0	2.0	1.9	2.1	1.9
55	Q6S3A1	<i>StatusUniProtKB unreviewed (TrEMBL)</i>	Plectin 4	2	2.4	-0.6	3.5	-1.8	4.5	-3.2	4.4	-3.4	4.5	-2.7
56	G3V9N8	<i>Aplb1</i>	AP complex subunit beta	2	3.2	1.2	3.4	1.6	3.1	1.4	3.2	1.4	2.9	1.4
57	A0A0G2K7Y2	<i>Oxr1</i>	Oxidation resistance 1	3	2.7	1.4	1.9	1.2	2.2	1.5	2.1	1.4	2.2	1.4
58	A0A8I5Y7K3	<i>Trappc3</i>	Trafficking protein particle complex subunit	2	2.9	-0.6	2.7	-0.9	3.8	-1.3	2.7	-1.0	3.6	-1.3
59	F1LPG5	<i>Ndufb4</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4	1	2.1	1.0	3.6	1.2	4.2	1.5	3.9	1.4	3.4	1.0
60	A0A8I6A0P2	<i>Nomo1</i>	Nodal modulator 1	3	2.9	-1.9	2.5	-1.5	2.1	-1.2	2.3	-1.5	2.0	-1.3
61	A0A8I6A1Y1	<i>Ogdh</i>	Oxoglutarate dehydrogenase (succinyl-transferring)	1	3.4	-0.5	3.1	-0.5	2.9	-0.4	3.0	-0.6	3.2	-0.6
62	A0A8I6A304	<i>Baspl1</i>	Brain abundant, membrane attached signal protein 1	3	5.1	4.2	3.6	4.1	4.6	3.5	3.8	4.8	3.6	4.3
63	A0A8I6A522	<i>Rab2a</i>	RAB2A, member RAS oncogene family	3	3.4	0.7	2.7	0.6	2.9	0.5	3.4	0.7	2.8	0.5

64	A0A8I6A7U6	<i>Sfpq</i>	Splicing factor proline and glutamine rich Gene Sfpq	5	4.9	-1.5	3.9	-1.7	2.1	-2.8	3.5	-2.8	3.6	-2.6
65	A0A8I6ADT5	<i>Ndufs3</i>	NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial	1	2.4	0.7	2.3	0.7	3.2	0.7	3.2	0.7	2.9	0.7
66	A0A8I6GEH9	<i>Ntm</i>	Neurotrimin	3	4.8	2.7	3.6	2.5	3.2	1.9	3.1	2.0	3.0	1.8
67	A0A8I6APA7	<i>Nefh</i>	Neurofilament heavy	2	3.6	-2.1	2.5	-2.8	3.4	-2.8	3.3	-4.1	2.9	-2.9
68	Q5BJZ3	<i>Nnt</i>	Proton-translocating NAD(P)(+) transhydrogenase	4	2.6	0.7	2.1	0.7	2.9	1.0	2.8	1.0	2.6	0.9
69	A0A8I6GH02	<i>Cntnap2</i>	Contactin associated protein 2	3	1.9	-0.9	2.2	-0.9	2.3	-1.0	2.3	-1.2	2.7	-1.3
70	A0A8I6GH75	<i>Ddbl</i>	DNA damage-binding protein 1	5	3.1	0.9	2.9	1.0	2.3	0.7	2.5	0.9	2.3	0.9
71	B2RYS8	<i>Ndufb8</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial	1	3.4	1.3	3.3	1.5	3.3	1.5	3.1	1.5	3.0	1.3
72	B2RYW3	<i>Ndufb9</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9	1	4.1	0.9	2.9	0.8	3.2	0.7	3.2	1.0	3.8	1.1
73	D3ZZK	<i>Epha</i>	Receptor	3	3.2	-0.6	2.7	-0.8	3.4	-0.9	3.4	-1.0	2.5	-0.8

	3	4	protein-tyrosine kinase											
74	D4A7L4	<i>Ndufb11</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial	1	1.8	1.3	2.4	1.3	2.0	1.2	1.8	1.1	2.5	1.3
75	D4ABT8	<i>Hnrnpul2</i>	Heterogeneous nuclear ribonucleoprotein U-like 2	5	2.8	-1.1	4.0	-1.1	2.3	-1.6	2.3	-1.8	2.8	-1.0
76	M0RAY1	<i>Pdcd5</i>	Programmed cell death 5	5	2.1	0.7	2.2	1.2	2.5	1.5	2.1	1.1	2.3	1.4
77	Q9JLT5	<i>Wfs1</i>	WFS1 (Wolfram Syndrome Protein 1)	3	2.7	3.0	2.1	2.5	2.0	2.2	2.5	3.3	2.1	2.4
78	F1LR17	<i>Aak1</i>	AP2 associated kinase 1	3	2.6	0.9	2.3	1.2	2.3	1.1	2.5	1.3	2.7	1.4
79	F1M8K0	<i>Dagl1</i>	Dystroglycan 1	3	1.7	-1.2	3.1	-1.2	1.9	-0.9	2.1	-0.9	2.5	-0.7
80	F7EPH4	<i>Ppal</i>	Inorganic diphosphatase	7	4.0	3.3	3.2	3.4	3.2	3.0	3.2	3.2	3.2	3.2
81	Q6P9V1	<i>Cd81</i>	Tetraspanin	4	3.1	1.7	2.7	1.8	2.4	1.9	3.0	2.5	2.9	2.1
82	G3V7L8	<i>Atp6v1e1</i>	ATPase H ⁺ transporting V1 subunit E1	2	3.7	0.8	3.3	1.0	5.5	1.0	5.7	0.8	2.2	0.6
83	G3V9Z3	<i>Maoa</i>	Amine oxidase	6	2.9	1.8	2.4	1.6	2.6	1.9	2.5	1.8	2.4	1.7
84	H1UBM5	<i>Cpne6</i>	Copine 6 protein	2	5.2	1.8	4.1	1.5	3.8	1.2	2.9	1.2	3.4	1.3
85	Q52KS1	<i>Pfkm</i>	ATP-dependent 6-phosphofructokinase	1	5.5	0.7	2.7	0.6	4.4	0.3	3.1	0.8	5.8	0.5
86	Q5M7T6	<i>Atp6v0d1</i>	V-type proton ATPase subunit	3	6.7	4.4	5.2	4.3	5.1	3.7	5.2	4.4	5.1	4.1

*Отличие от контроля: $\log_2 X$, где X – разница по сравнению с контролем (обозначена на диаграммах в статье).

Функции белков:

1. Белки/ферменты, участвующие в процессах генерации энергии и углеводного обмена.
2. Белки, участвующие в образовании цитоскелета и экзоцитозе.
3. Белки, участвующие в передаче сигнала и регуляции активности ферментов.
4. Антиоксидантные и защитные белки/ферменты.
5. Белки-регуляторы экспрессии генов, клеточного деления и дифференцировки.
6. Ферменты, участвующие в метаболизме белков, аминокислот и других азотистых соединений.
7. Ферменты, участвующие в метаболизме липидов.

Таблица к рисунку 2. Номера и названия белков, фигурирующих на рисунке 2, по базе Uniprot

№ по базе Uniprot	Ген по Uniprot	Название белка по Uniprot
P07895	<i>Sod2</i>	Superoxide dismutase [Mn], mitochondrial
S5RZM8	<i>COX2</i>	Cytochrome c oxidase subunit 2
P10888	<i>Cox4i1</i>	Cytochrome c oxidase subunit 4 isoform 1, mitochondrial
P11951	<i>Cox6c2</i>	Cytochrome c oxidase subunit 6C-2
P12075	<i>Cox5b</i>	Cytochrome c oxidase subunit 5B, mitochondrial
P20788	<i>Uqcrcf1</i>	Cytochrome b-c1 complex subunit Rieske, mitochondrial
Q5XIH7	<i>Phb2</i>	Prohibitin-2
Q5XIN6	<i>Letm1</i>	Mitochondrial proton/calcium exchanger protein
A0A8L2Q7K1	<i>Ndufs1</i>	NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial
A0A0G2JVL6	<i>Ndufa8</i>	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8
Q5BK63	<i>Ndufa9</i>	NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial
F1LPG5	<i>Ndufb4</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4
B2RYS8	<i>Ndufb8</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial
B2RYW3	<i>Ndufb9</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9
D4A7L4	<i>Ndufb11</i>	NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial
A0A8I6ADT5	<i>Ndufs3</i>	NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial
A0A8I6A1Y1	<i>Ogdh</i>	Oxoglutarate dehydrogenase (succinyl-transferring)
Q5BJZ3	<i>Nnt</i>	Proton-translocating NAD(P)(+) transhydrogenase
Q9Z2L0	<i>Vdac1</i>	Voltage-dependent anion-selective channel protein 1
P81155	<i>Vdac2</i>	Voltage-dependent anion-selective channel protein 2
A0A0G2JSR0	<i>Vdac3</i>	Voltage-dependent anion channel 3

Таблица к рисунку 3. Номера и названия белков, фигурирующих на рисунке 3, по базе Uniprot

№ по базе Uniprot	Ген по Uniprot	Название белка по Uniprot
P37377	<i>Snca</i>	Alpha-synuclein
O88767	<i>Park7</i>	Parkinson disease protein 7 homolog
P04797	<i>Gapdh</i>	Glyceraldehyde-3-phosphate dehydrogenase
D3ZQG6	<i>Trim2</i>	Tripartite motif-containing protein 2
Q9Z2L0	<i>Vdac1</i>	Voltage-dependent anion-selective channel protein 1
P81155	<i>Vdac2</i>	Voltage-dependent anion-selective channel protein 2
A0A0G2JSR0	<i>Vdac3</i>	Voltage-dependent anion-selective channel protein 3
Q5XIH7	<i>Phb2</i>	Prohibitin-2
Q9JLT5	<i>Wfs1</i>	WFS1 (Wolfram Syndrome Protein 1)