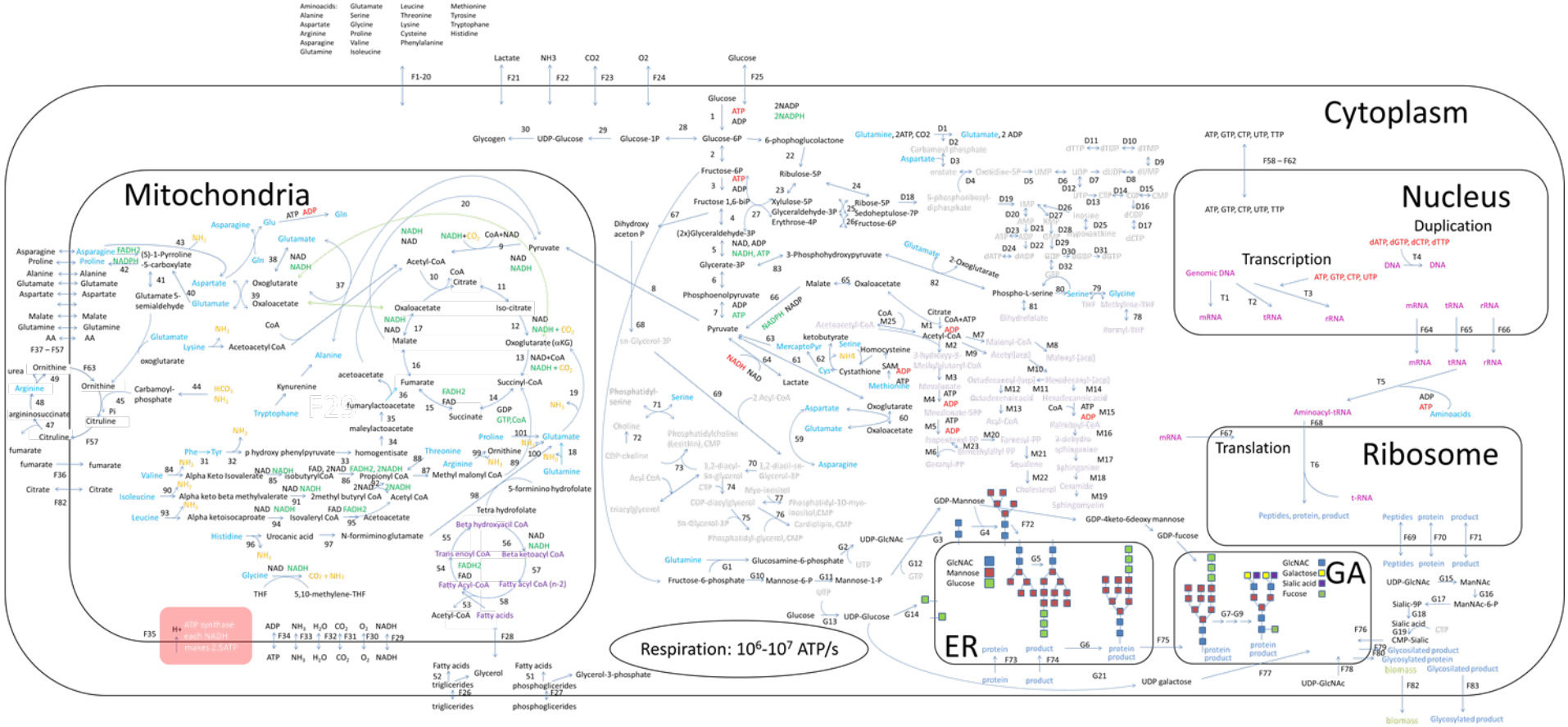

Supplementary figure 1: Complex scheme of CHO cell metabolism. In the scheme intermediates of glycolysis, pentose phosphate pathway, glutaminolysis, nucleotide synthesis pathway, lipid synthesis, beta oxidation, transcription, translation and glycosylation are shown. Each equilibrium reaction is numbered. Metabolic pathways included in the models are marked in supplemental table. For more information check Table 1.

Supplementary figure 1: Empirically determined metabolic flux values used in published models

			Hagrot 2015	Nyberg 1998	Altamirano 2001		Sengupta 2010	Altamirano 2006	Xing 2011	Provost 2004	Goudar 2009	Jiang 2016
Index	Pathway	Reaction	flux (pmol/cellday)	mmol/gdry cell	nmol/10^6cellsh	nmol/10^6cellsh	mmol x 10^{-5}/10^{+5} cells/day	nmol10^{-6}cells/h	nmol10^{-6}cells/h	mM/d/10^{+5}cells	pmol/celld	nmol/ug protein/h
1	Glycolisys	Glucose+ATP => Glucose6P+ADP		4,96	59,89	25,04	19,2	129		5	1,499	
2		Glucose-6P = > Fructose6P					12,1					
4		ATP + Fructose6P => Fructose1,6BP + ADP	3,13 (from glucose)	4,52			2x16,83 (from f6p in dhap)		83,9 (from glucose)	3,76	1,417 (from G6P)	
5		Fructose-1,6BP + ADP + NADP => 2Glyceraldehyde-3P +ATP + NADPH					36,03					
6		3PG => PhosphoenolPyruvate			56,94 (from G6P)	21,11						
7		Phosphoenolpyruvate + ADP => Pyruvate + ATP	3,13 (from glycine)	7,98	113,89	42,21	36.04	125,19 (from glucose)	165,1 (from g3p)	7,53		1,2369(from glucose)
8		Pyruvate cyto => Pyruvate mito	1,15 (from pyruvate)		44,51	1,54	34,1				2,852 (from GAP)	0,5952
9		Pyruvate => acetyl-CoA	2,49	9,53	44,51	23,1	34,1	14,19	105,9	0,35	1,809	0,5167
10	TCA cycle	oxaloacetate + Acetyl-CoA => Citrate + CoA	2,49		44,51	33,34	34,1	14,19		0,3472		0,5594
12		isocitrate + NAD => Oxoglutarate + NADH		6,03 (from oaa)	35,73 (from citrate)	33,34	34,16 (from citrate)	14,19 (from citrate)	110,1 (from acCoa)	0,3472(from citrate)	1,322 (from oxaloacete)	0,1376 (from citrate)
13		oxoglutarate + NAD + CoA => succinyl-CoA + NADH	3,33	10,02	49,9	36,06	33,56		113,7		1,726	
14		succinyl-CoA + GDP => Succinate + GTP	3,33		50,08	36,46	33,63					0,2578(from oxoglutarate)
15		succinate + FAD => Fumarate + FADH2		10.05 (from succCoA)							1,879 (from succoa)	0,2578
16		fumarate => Malate	3,33 (from succinate)		50,48(from succinate)	36,86	33,71 (from succinate)	31,54 (from oxoglutarate)		1,1051(from oxoglutarate)		0,2578
17		malate + NAD => Oxalacetate + NADH	2,54	10.05 (from fumarate)	44,18	32,94	34,05	14,25	114,6(from succoa)	0,6327	1,911(from fumarate)	0,4809
18	Glutaminolysis	glutamine => Glutamate	0,58	4,67	3,54(?)	4,74				0,7579	0,225	0,2362
19		glutamate + NAD => Oxoglutarate + NADH	-4,89	2,31				6,05		0,2038	0,254	0,2153
20		malate => Pyruvate	0,79		15,4	16,2		19,2		0,4724	1,809 (from oaa)	
23	Pentose phosphate pathway	ribulose-5P => xylulose-5P			1,15	1,54	7,1	2,59		0,28		
24		ribulose-5P => ribose-5P					7,1(iz g6p)					
25		Ribose-5P + xylulose-5P => glyceraldehyde-3P + sedohuptolose-7P					2,369					
26		glyceraldehyde-3P + sedohuptolose-7P => Erythrose-4P + Fructose-6P					2,369					
27		fructose-6P + xylulose-5P => Erythrose-4P + glyceraldehyde-3P					2,369					
31	Amino acid metabolism	Phe => Tyr			0.0001							
37		oxoglutarate + alanine => pyruvate + glutamate	-0,56	0,95 (opposite)						0,27		
39		aspartate + oxoglutarate => oxaloacetate + glutamate	-0,06		0,01	-0,02		0,06		0,2854		
42		s-1-pyroline-5-carboxylate => proline			0,02							
43		asparagine => Aspartate + NH2	0,66		3,58							
60		oxaloglutarate + aspartate => Glutamate + oxaloacetate										0,0786
63		cys => Pyruvate	0,05(from cys)		0,54 (From pyruvate)							
64		pyruvate + NADH => Lactate + NAD	6,27	1,89	80,6		0.65	245	52,7	7,39	1,719	2,0938
65		oxaloacetate => malate										0,4383
66		malate + NADP => Pyruvate + NADPH										0,2152
79		glycine + Methylene-THF => serine + THF	2,24		3,05	3,74			6,2			
80		Phospho-L-serine => serine	7,32 (to pyruvate)		1,26 (to pyruvate)	0,32						
82		2-Oxoglutarate + Phospho-L-serine => 3-Phosphohydroxypyruvate + glutamate	5,12 (kontra)									
M1		citrate + CoA + ATP => Acetyl-CoA + ADP + oxaloacetate										0,5169
M10		Acetyl[acp] => Hexadecanyl-[acp]										0,0646 (from AcCoA)
D1		glutamine + ATP => glutamate + ADP							12,4			
D5		Orotidine-5P => UMP								0,1427 (nucleotide syn)		
T1		genomicDNA => mRNA			0,85							
T4		DNA => DNA			0.3							
F1	Transport	AlanineMedium => Alaninecyto						2,1				
F3		ArgininеMedium => Argininecyto	0,11									
F4		AspartateMedium => AspartateCyto						-0,4				
F6		GlycineMedium => GlycineCyto	-0,12					2,9				
F7		GlutamineMedium => GlutamineCyto	1,12					-36,1				0,2362 (intra)
F8		GlutamateMedium => GlutamateCyto						5,2				0,0730 (secretion)
F10		IsoleucineMedium => IsoleucineCyto						-6,4				
F11		LeucineMedium => LeucineCyto						-6,9				
F13		MethionineMedium => MethionineCyto						-1,7				
F14		PhenylalanineMedium => PhenylalanineCyto						-2,9				
F15		ProlineMedium => ProlineCyto						-0,3				
F16		SerineMedium => SerineCyto	-0,04					-7,5				
F17		ThreonineMedium => ThreonineCyto						-4,3				
F19		TyrosineMedium => TyrosineCyto						-2,2				
F20		ValineMedium => ValineCyto						-5,3				
F21		lactateMedium => lactateCyto						299,5				2,0938
F22		NH3Medium => NH3Cyto						27				
F25		GlucoseCyto => GlucoseMedium						-201,1				1,2369
F44		GlutamateCyto => GlutamateMito			7,64							0,073