Mechanistic insights into the impact of Cold Atmospheric Pressure Plasma on human epithelial cell lines

Marlène Dezest [a], Laurent Chavatte [a], Marion Bourdens[b], Damien Quinton[c], Mylène Camus[d], Luc Garrigues[d], Pascal Descargues [e], Stéphane Arbault[c], Odile Burlet-Schiltz[d], Louis Casteilla [b] Franck Clément[a], Valérie Planat[b&] and Anne-Laure Bulteau [a&*]

Supplementary Methods

Determination of cytosolic glutathione levels (GSH)

Glutathione levels were determined using Thiol tracker violet detection reagent ((Thermofischer, Saint Aubin, France) and analyzed using a microplate fluorimetric reader (BMG-FLUOstar Galaxy, Stuttgart, Germany), excitation/emission wavelengths were 405/526 nm.

Assay for aconitase activity

Mitochondria were isolated as previously described [25]. Mitochondria were suspended in 25 mM phosphate buffer pH 7.25 supplemented with 0.05% Triton X-100 and aconitase activity was assayed spectrophotometrically at 340 nm, as previously described [26].

Assay for KGDH

Mitochondria were diluted in 25 mM MOPS, 0.05% Triton X-100, pH 7.4, and KGDH activity was assayed spectrophotometrically as the rate of NAD^+ reduction to NADH as previously described [27].

Supplementary Figure Legends

Fig. S1. Antioxidant response following plasma treatment.

A. Measurement of reduced glutathione levels. HaCaT, SK-MEL-28 and HCT-116 cells were exposed to plasma treatment (He, He-O_2 and He-N_2) for 5 min with 1 hr post-treatment

storage. 24 hr after plasma treatment they were incubated with ThiolTrackerTM Violet dye for 30 min and GSH level was assayed using a microplate fluorimetric reader. GSH level is presented as a percent of non-treated cells. Data, mean ± SEM from three independent cultures,* $P < 0.05$; B. NRF2 induction following plasma treatment. HaCaT and HCT-116 cells were exposed to plasma treatment (He, He-O_2 and He-N_2) for 5 min with 1 hr post-treatment storage. 24 hr after plasma treatment, NRF2 expression was detected by immunoblotting against NRF2 protein using whole-cell lysates ($n = 3$). C. Actin was used as loading control for quantification. D. Removal of extracellular H_2O_2 by cells is a first-order process. HaCaT cells were grown in normal or medium supplemented in Selenium (Se), a condition which is known to increase glutathione peroxidase activity, and exposed to plasma treatment (He, He-O_2 and He-N_2) for 5 min and then assayed for the remaining extracellular H_2O_2 by cyclic voltammetry or Amplex red assays. The observed first-order rate constant for the loss of extracellular H_2O_2 in this experiment was determined to be kobs= 0.31 min^{-1} for He-plasma, kobs= 0,28 min^{-1} for He-N_2 plasma, kobs= 1,04 min^{-1} He-O_2 plasma and kobs= 0,72 min^{-1} for HaCaT cell supplemented with selenium and treated with He-plasma. HCT-116 and SK-MEL-28 cells were grown in normal medium and exposed to He plasma treatment and then assayed for the remaining extracellular H_2O_2 by Amplex red assays. The observed first-order rate constant for the loss of extracellular H_2O_2 in this experiment was determined to be kobs= 0.78 min^{-1} for HCT-116 cells and kobs= 1,08 min^{-1} for SK-MEL-28 cells.

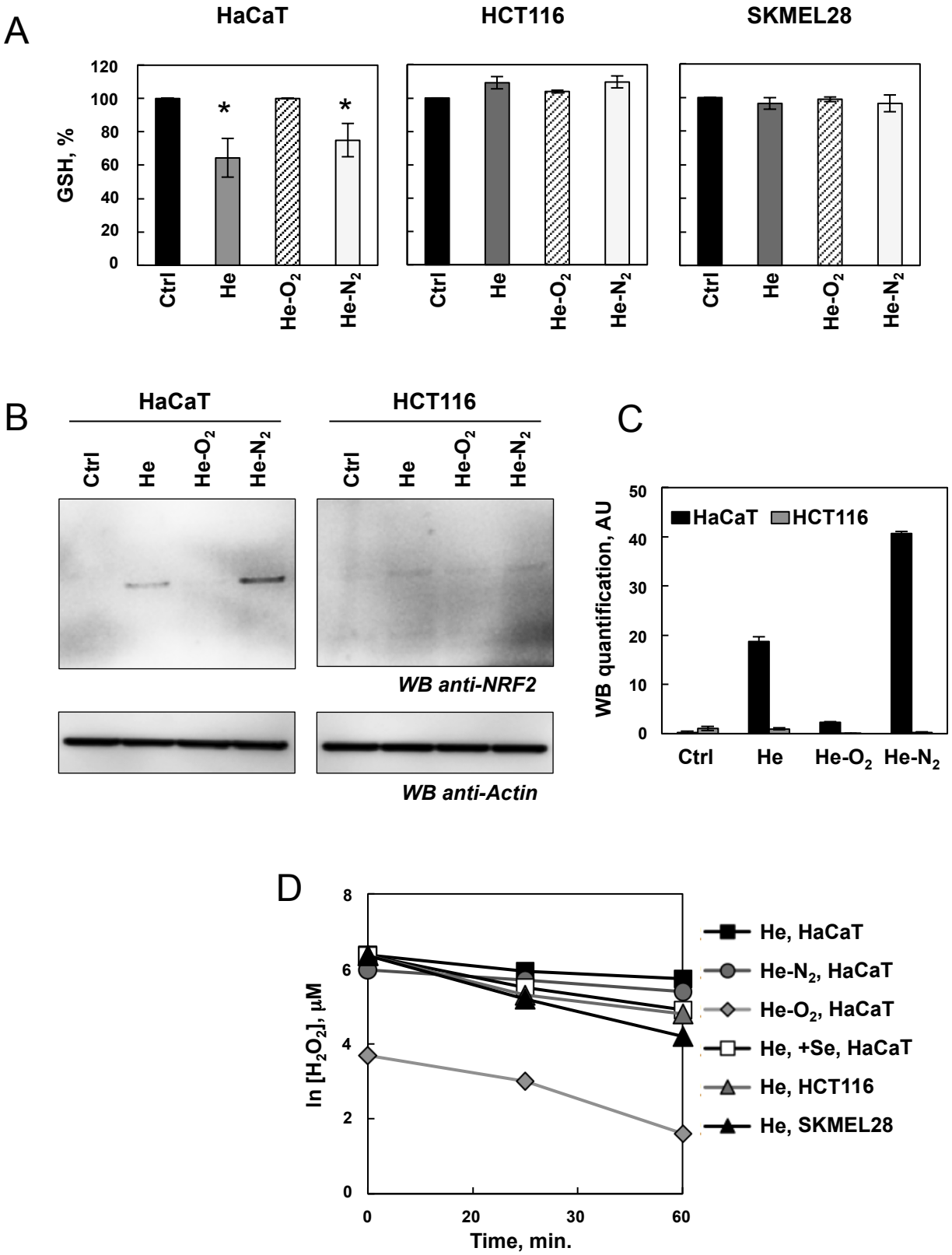
Fig. S2. Effect of plasma treatment on activity of key metabolic enzymes in HaCaT cells. A. HaCaT cells were exposed to PAL for 1 hr (PBS treated for 5 min by He, He-O_2 and He-N_2 plasmas). Mitochondria were prepared 24hr after plasma treatment and aconitase activity was assayed. B. For the same CAPP treatment, mitochondria were prepared 24 hr plasma

treatment and α ketoglutarate activity was assayed. Data, mean ± SEM from three independent cultures,* $P < 0.05$; ** $P < 0.01$.

Table S1. List of proteins of varying abundances after the different plasma treatments (helium, He; helium/nitrogen, N; helium/oxygen, O) in comparison with control HaCaT cells (C)

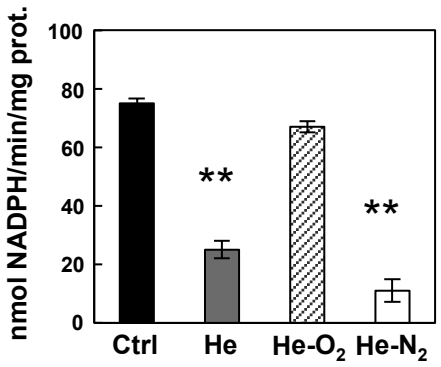
Table S2. List of proteins affected by the plasma activated treatments in HaCaT cells comparison with control cells.

Supplementary Figure 1



Supplementary Figure 2

A



B

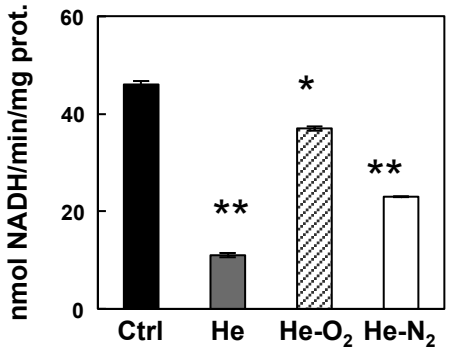


Table S1. List of proteins altered by the different plasma treatments (helium, He; helium/nitrogen, N; helium/oxygen, O) in comparison to control HaCaT cells (C)

Gene names	Acc n°	Name	Ratio N/C	*p* value	Ratio He/C	*p* value	Ratio O2/C	*p* value
Up and down-regulated in three plasma treatments								
AARS2	Q5JTZ9	Alanine--tRNA ligase, mitochondrial	1334,94	0,0000	1299,55	0,0000	885,55	0,0001
SUPT6H	Q7KZ85	Transcription elongation factor SPT6	14,67	0,0000	17,70	0,0002	14,90	0,0002
KRT1	P04264	Keratin, type II cytoskeletal 1	11,23	0,0050	4,26	0,0008	3,00	0,0023
PLAUR	Q03405	Urokinase plasminogen activator surface receptor	9,75	0,0000	12,19	0,0004	5,34	0,0011
DDX54	Q8TDD1	ATP-dependent RNA helicase DDX54	3,45	0,0039	4,39	0,0017	0,20	0,0013
ASPH	Q12797	Aspartyl/asparaginyl beta-hydroxylase	2,21	0,0016	2,54	0,0065	2,12	0,0062
OAS2	P29728	2-5-oligoadenylate synthase 2	0,28	0,0006	0,37	0,0041	0,47	0,0094
Up and down-regulated in two plasma treatments								
CHD4	Q14839	Chromodomain-helicase-DNA-binding protein 4	111,08	0,0001	118,18	0,0001		
POMP	Q9Y244	Proteasome maturation protein	29,85	0,0002	29,78	0,0002		
TP53BP1	Q12888	Tumor suppressor p53-binding protein 1	27,27	0,0000	23,30	0,0000		
MKI67	P46013	Antigen KI-67	21,77	0,0007	22,59	0,0009		
FLNB	O75369	Filamin-B	19,15	0,0000	19,61	0,0000		
TPR	P12270	Nucleoprotein TPR	15,95	0,0001	18,24	0,0001		
FLNA	P21333	Filamin-A	14,60	0,0001	15,73	0,0001		
DYNC1H1	Q14204	Cytoplasmic dynein 1 heavy chain 1	14,16	0,0003	14,98	0,0003		
F10	P00742	Coagulation factor X	12,73	0,0001	21,30	0,0000		
PRKDC	P78527	DNA-dependent protein kinase catalytic subunit	12,72	0,0002	12,22	0,0003		
C6	P13671	Complement component C6	12,21	0,0002	19,78	0,0001		
HLA-C	P04222	HLA class I histocompatibility antigen, Cw-3 alpha chain	11,27	0,0000			12,08	0,0000
DIDO1	Q9BTC0	Death-inducer obliterator 1	9,50	0,0000	9,04	0,0001		
PRRC2C	Q9Y520	Protein PRRC2C	9,29	0,0002	11,06	0,0008		
RANBP2	P49792	E3 SUMO-protein ligase RanBP2	9,03	0,0004	10,75	0,0005		
LGMN	Q99538	Legumain	8,41	0,0043	9,19	0,0047		
MDC1	Q14676	Mediator of DNA damage checkpoint protein 1	7,57	0,0025	9,12	0,0028		
WDR46	O15213	WD repeat-containing protein 46	7,56	0,0009	5,81	0,0005		
PLEC	Q15149	Plectin	7,42	0,0001	8,07	0,0001		
SPTAN1	Q13813	Spectrin alpha chain, non-erythrocytic 1	6,24	0,0033	5,87	0,0040		
SDC4	P31431	Syndecan-4	6,18	0,0013	7,11	0,0015		
AHCTF1	Q8WYP5	Protein ELYS	6,09	0,0001	5,14	0,0004		
EPPK1	P58107	Epiplakin	5,81	0,0012	8,15	0,0008		
UBE2O	Q9C0C9	Ubiquitin-conjugating enzyme E2 O	5,14	0,0054	4,10	0,0084		
SEC16A	O15027	Protein transport protein Sec16A	5,09	0,0020	4,21	0,0078		
TNKS1BP1	Q9C0C2	182 kDa tankyrase-1-binding protein	4,70	0,0005	4,39	0,0007		
SRRM2	Q9UQ35	Serine/arginine repetitive matrix protein 2	4,60	0,0000	8,27	0,0002		
TNC	P24821	Tenascin	4,20	0,0020	8,35	0,0086		
FAM175B	Q15018	BRISC complex subunit Abro1	4,05	0,0058	3,06	0,0001		
MBD2	Q9UBB5	Methyl-CpG-binding domain protein 2	3,98	0,0030	4,36	0,0020		
HBA1	P69905	Hemoglobin subunit alpha	3,95	0,0021	12,17	0,0000		
CLDN4/9/6/3	O14493	Claudin-4/9/6/3	3,72	0,0003			2,92	0,0007
GOLM1	Q8NBJ4	Golgi membrane protein 1	3,65	0,0001	4,75	0,0015		
ECT2	Q9H8V3	Protein ECT2	3,60	0,0033			2,93	0,0074
CEP170B	Q9Y4F5	Centrosomal protein of 170 kDa protein B	3,46	0,0097	7,16	0,0067		
AHNAK	Q09666	Neuroblast differentiation-associated protein AHNAK	3,43	0,0002	4,25	0,0001		
SLC30A1	Q9Y6M5	Zinc transporter 1	3,21	0,0001	5,30	0,0001		
CHD8/6/9/7	Q9HCK8	Chromodomain-helicase-DNA-binding protein 8/6/9/7	3,03	0,0002	2,65	0,0009		
TCOF1	Q13428	Treacle protein	3,02	0,0051	3,32	0,0021		
MARCKSL1	P49006	MARCKS-related protein	2,77	0,0024	2,72	0,0019		
UBR4	Q5T4S7	E3 ubiquitin-protein ligase UBR4	2,52	0,0004	2,97	0,0029		
HABP2	Q14520	Hyaluronan-binding protein 2	2,51	0,0002	3,84	0,0003		
RAP2B/A	P61225	Ras-related protein Rap-2b/a	2,46	0,0051			2,05	0,0095
ACIN1	Q9UKV3	Apoptotic chromatin condensation inducer in the nucleus	2,44	0,0054	2,40	0,0076		
WDR43	Q15061	WD repeat-containing protein 43	2,29	0,0010	2,10	0,0018		
LAMB3	Q13751	Laminin subunit beta-3	2,18	0,0002	3,59	0,0001		
ATAD1	Q8NBU5	ATPase family AAA domain-containing protein 1	2,07	0,0031	3,31	0,0081		
FTH1	P02794	Ferritin heavy chain	2,04	0,0038			2,28	0,0028
IVL	P07476	Involucrin	0,50	0,0029	0,48	0,0088		
CD109	Q6YHK3	CD109 antigen	0,47	0,0013	0,43	0,0081		
ZZEF1	O43149	Zinc finger ZZ-type and EF-hand domain-containing protein 1	0,44	0,0005	0,42	0,0053		
PKP1	Q13835	Plakophilin-1	0,38	0,0004	0,37	0,0005		
ISYNA1	Q9NPH2	Inositol-3-phosphate synthase 1	0,26	0,0035	0,19	0,0069		
PTK7	Q13308	Inactive tyrosine-protein kinase 7	0,25	0,0029	0,20	0,0084		
ABHD14B	Q96IU4	Alpha/beta hydrolase domain-containing protein 14B	0,24	0,0061	0,24	0,0056		
REPS1	Q96D71	RalBP1-associated Eps domain-containing protein 1	0,24	0,0000	0,23	0,0000		
ENDOG	Q14249	Endonuclease G, mitochondrial	0,10	0,0000	0,08	0,0037		
CASP1	P29466	Caspase-1;Caspase-1 subunit p20;Caspase-1 subunit p10	0,09	0,0000	0,14	0,0045		
KRT2	P35908	Keratin, type II cytoskeletal 2 epidermal			3,79	0,0002	2,71	0,0046
Up and down-regulated in only one plasma treatment								
HDAC7	Q8WUI4	Histone deacetylase 7	61,34	0,0084				
NUP214	P35658	Nuclear pore complex protein Nup214	7,26	0,0041				
DNTTIP2	Q5QJE6	Deoxynucleotidyltransferase terminal-interacting protein 2	5,05	0,0062				
INCENP	Q9NQS7	Inner centromere protein	4,91	0,0074				
HECTD1	Q9ULT8	E3 ubiquitin-protein ligase HECTD1	4,84	0,0053				
PLEK	P08567	Pleckstrin	4,70	0,0061				
RIF1	Q5UIP0	Telomere-associated protein RIF1	4,69	0,0018				
SCAF11	Q99590	Protein SCAF11	4,68	0,0065				
LYN	P07948	Tyrosine-protein kinase Lyn	4,57	0,0006				
PRPF4B	Q13523	Serine/threonine-protein kinase PRP4 homolog	3,14	0,0002				
PPM1A	P35813	Protein phosphatase 1A	3,13	0,0060				
CDK7	P50613	Cyclin-dependent kinase 7	3,06	0,0001				
DLGAP4	Q9Y2H0	Disks large-associated protein 4	2,85	0,0002				
TMEM109	Q9BVC6	Transmembrane protein 109	2,71	0,0013				
APOBEC3B	Q9UH17	DNA dC->dU-editing enzyme APOBEC-3B	2,69	0,0005				
STX3	Q13277	Syntaxin-3	2,58	0,0004				
POLR1A	O95602	DNA-directed RNA polymerase I subunit RPA1	2,43	0,0054				
APLP2	Q06481	Amyloid-like protein 2	2,15	0,0057				

TNPO2	O14787	Transportin-2	2,08	0,0038					
GDAP1	Q8TB36	Ganglioside-induced differentiation-associated protein 1	2,01	0,0058					
RRP1	P56182	Ribosomal RNA processing protein 1 homolog A	2,00	0,0081					
IFIT1	P09914	Interferon-induced protein with tetratricopeptide repeats 1	0,48	0,0007					
EFNB1	P98172	Ephrin-B1	0,37	0,0001					
MX1	P20591	Interferon-induced GTP-binding protein Mx1	0,36	0,0002					
IDH2	P48735	Isocitrate dehydrogenase [NADP], mitochondrial	0,35	0,0093					
ID1	P41134	DNA-binding protein inhibitor ID-1	0,34	0,0098					
ARFIP1	P53367	Arfaptin-1	0,28	0,0022					
TRIM21	P19474	E3 ubiquitin-protein ligase TRIM21	0,27	0,0086					
DHRS1	Q96LJ7	Dehydrogenase/reductase SDR family member 1	0,12	0,0009					
C8B	P07358	Complement component C8 beta chain			12,47	0,0003			
IGF2R	P11717	Cation-independent mannose-6-phosphate receptor			9,25	0,0003			
QIL1	Q5XKP0	Protein QIL1			6,49	0,0030			
LHFPL2	Q6ZUX7	Lipoma HMGIC fusion partner-like 2 protein			5,06	0,0010			
DCTD	P32321	Deoxycytidylate deaminase			4,92	0,0003			
VTN	P04004	Vitronectin			4,78	0,0003			
PRPF8	Q6P2Q9	Pre-mRNA-processing-splicing factor 8			4,44	0,0097			
APOM	O95445	Apolipoprotein M			3,70	0,0001			
EHD3	Q9NZN3	EH domain-containing protein 3			3,65	0,0049			
POLR1B	Q9H9Y6	DNA-directed RNA polymerase I subunit RPA2			3,61	0,0092			
CEP164	Q9UPV0	Centrosomal protein of 164 kDa			3,60	0,0000			
ZC3H4	Q9UPT8	Zinc finger CCCH domain-containing protein 4			3,47	0,0025			
RRAGA/B	Q7L523	Ras-related GTP-binding protein A/B			3,20	0,0056			
RNF19B/A	Q6ZMZ0	E3 ubiquitin-protein ligase RNF19B/A			3,13	0,0018			
APOB	P04114	Apolipoprotein B-100;Apolipoprotein B-48			2,78	0,0065			
SYNE2	Q8WXH0	Nesprin-2			2,67	0,0022			
APP	P05067	Amyloid beta A4 protein			2,67	0,0092			
LAMA3	Q16787	Laminin subunit alpha-3			2,66	0,0000			
LAMC2	Q13753	Laminin subunit gamma-2			2,65	0,0007			
FTSJ3	Q8IY81	pre-rRNA processing protein FTSJ3			2,47	0,0011			
THBS1	P07996	Thrombospondin-1			2,30	0,0008			
QRICH1	Q2TAL8	Glutamine-rich protein 1			2,26	0,0058			
CD44	P16070	CD44 antigen			2,26	0,0081			
TIMM21	Q9BVV7	Mitochondrial import inner membrane translocase subunit Tim21			2,21	0,0059			
MTHFD2	P13995	Bifunctional methylenetetrahydrofolate dehydrogenase/cyclohydrolase			2,09	0,0073			
ZFP36L1	Q07352	Zinc finger protein 36			2,08	0,0055			
SRP72	O76094	Signal recognition particle subunit SRP72			0,50	0,0008			
PBXIP1	Q96AQ6	Pre-B-cell leukemia transcription factor-interacting protein 1			0,49	0,0013			
HMGN1	P05114	Non-histone chromosomal protein HMG-14			0,49	0,0002			
OAS3	Q9Y6K5	2-5-oligoadenylate synthase 3			0,48	0,0052			
SERPINB13	Q9UIV8	Serpin B13			0,48	0,0006			
STK39	Q9UEW8	STE20/SPS1-related proline-alanine-rich protein kinase			0,47	0,0021			
FBP1	P09467	Fructose-1,6-bisphosphatase 1			0,47	0,0006			
DHX36	Q9H2U1	Probable ATP-dependent RNA helicase DHX36			0,47	0,0029			
LYPLA2	O95372	Acyl-protein thioesterase 2			0,46	0,0047			
PYCARD	Q9ULZ3	Apoptosis-associated speck-like protein containing a CARD			0,46	0,0004			
LCLAT1	Q6UWP7	Lysocardiolipin acyltransferase 1			0,45	0,0004			
RABL6	Q3YEC7	Rab-like protein 6			0,45	0,0036			
ETHE1	O95571	Persulfide dioxygenase ETHE1, mitochondrial			0,44	0,0029			
NAPRT1	Q6XQN6	Nicotinate phosphoribosyltransferase			0,44	0,0083			
ASS1	P00966	Argininosuccinate synthase			0,43	0,0003			
AP2A2	O94973	AP-2 complex subunit alpha-2			0,41	0,0022			
SRP19	P09132	Signal recognition particle 19 kDa protein			0,41	0,0021			
NT5DC1	Q5TFE4	5-nucleotidase domain-containing protein 1			0,41	0,0052			
HLA-DRA	P01903	HLA class II histocompatibility antigen, DR alpha chain			0,40	0,0051			
NT5C2	P49902	Cytosolic purine 5-nucleotidase			0,40	0,0001			
LRRC1	Q9BTT6	Leucine-rich repeat-containing protein 1			0,40	0,0049			
LRSAM1	Q6UWE0	E3 ubiquitin-protein ligase LRSAM1			0,38	0,0058			
ASUN	Q9NVM9	Protein asunder homolog			0,31	0,0023			
SERPINB3	P29508	Serpin B3			0,29	0,0000			
POLR2G	P62487	DNA-directed RNA polymerase II subunit RPB7			0,29	0,0051			
HERC4	Q5GLZ8	Probable E3 ubiquitin-protein ligase HERC4			0,27	0,0049			
MAP2K4	P45985	Dual specificity mitogen-activated protein kinase kinase 4			0,26	0,0032			
FANCD2	Q9BXW9	Fanconi anemia group D2 protein			0,26	0,0066			
CCNB2	O95067	G2/mitotic-specific cyclin-B2			0,25	0,0100			
DDX58	O95786	Probable ATP-dependent RNA helicase DDX58			0,21	0,0067			
UFC1	Q9Y3C8	Ubiquitin-fold modifier-conjugating enzyme 1			0,21	0,0007			
PDCD4	Q53EL6	Programmed cell death protein 4			0,19	0,0054			
ABCB6	Q9NP58	ATP-binding cassette sub-family B member 6, mitochondrial			0,19	0,0004			
AAR2	Q9Y312	Protein AAR2 homolog			0,10	0,0062			
NUCKS1	Q9H1E3	Nuclear ubiquitous casein and cyclin-dependent kinase substrate 1			0,07	0,0000			
GAK	O14976	Cyclin-G-associated kinase					9,54	0,0004	
RANBP3	Q9H6Z4	Ran-binding protein 3					6,18	0,0086	
ZRANB2	O95218	Zinc finger Ran-binding domain-containing protein 2					4,23	0,0039	
DPF2	Q92785	Zinc finger protein ubi-d4					3,72	0,0007	
BRD4	O60885	Bromodomain-containing protein 4					3,16	0,0018	
THADA	Q6YHU6	Thyroid adenoma-associated protein					2,47	0,0094	
HTRA2	O43464	Serine protease HTRA2, mitochondrial					2,36	0,0018	
DCTN4	Q9UJW0	Dynactin subunit 4					2,31	0,0013	
ATP2B1/3	P20020	Plasma membrane calcium-transporting ATPase 1/3					2,17	0,0037	
CDYL	Q9Y232	Chromodomain Y-like protein					2,08	0,0008	
MYBBP1A	Q9BQG0	Myb-binding protein 1A					0,46	0,0040	
ODR4	Q5SWX8	Protein odr-4 homolog					0,34	0,0098	
MPHOSPH8	Q99549	M-phase phosphoprotein 8					0,32	0,0026	
C1orf174	Q8IYL3	UPF0688 protein C1orf174					0,29	0,0006	
PPIC	P45877	Peptidyl-prolyl cis-trans isomerase C					0,20	0,0000	
HLA-C	Q07000	HLA class I histocompatibility antigen, Cw-15 alpha chain					0,16	0,0000	

Table S2. List of proteins affected by the plasma activated treatments in HaCaT cells comparison to control cells

Gene names	Protein names	Acc n°	Ratio He/C	t-test
Up-regulated proteins				
Q16763	Ubiquitin-conjugating enzyme E2 S	Q5JTZ9	34,37	0,0000
Q4G0Z9	MCM domain-containing protein 2	Q14839	23,31	0,0007
P42357	Histidine ammonia-lyase	Q9Y244	20,19	0,0000
Q96CM8	Acyl-CoA synthetase family member 2, mitochondrial	Q12888	9,88	0,0000
Q8IZP0	Abl interactor 1	P46013	8,46	0,0045
Q96EM0	Trans-L-3-hydroxyproline dehydratase	P00742	7,24	0,0056
O14656	Torsin-1A	P13671	2,56	0,0025
Q16787	Laminin subunit alpha-3	O75369	2,17	0,0089
Q96JB1	Dynein heavy chain 8, axonemal	P12270	2,16	0,0053
P30307	M-phase inducer phosphatase 3	Q7KZ85	2,16	0,0083
Down-regulated proteins				
P52292	Importin subunit alpha-1	KPNA2	0,48	0,0016
P20340	Ras-related protein Rab-6A	RAB6A	0,47	0,0000
Q5K651	Sterile alpha motif domain-containing protein 9	SAMD9	0,43	0,0029
O75449	Katanin p60 ATPase-containing subunit A1	KATNA1	0,43	0,0014
P50281	Matrix metalloproteinase-14	MMP14	0,43	0,0044
P49768	Presenilin-1	PSEN1	0,41	0,0062
Q9BPZ7	Target of rapamycin complex 2 subunit MAPKAP1	MAPKAP1	0,37	0,0020
Q9NQW6	Actin-binding protein anillin	ANLN	0,37	0,0053
Q7Z412	Peroxisome assembly protein 26	PEX26	0,34	0,0095
Q6UXN9	WD repeat-containing protein 82	WDR82	0,33	0,0020
Q13835	Plakophilin-1	PKP1	0,32	0,0057
Q9NUQ3	Gamma-taxilin	TXLNG	0,31	0,0010
P43003	Excitatory amino acid transporter 1	SLC1A3	0,25	0,0067
O95155	Ubiquitin conjugation factor E4 B	UBE4B	0,23	0,0000
Q9H4H8	Protein FAM83D	FAM83D	0,22	0,0072
Q53EL6	Programmed cell death protein 4	PDCD4	0,21	0,0010
Q6NXE6	Armadillo repeat-containing protein 6	ARMC6	0,20	0,0036
Q96TA2	ATP-dependent zinc metalloprotease YME1L1	YME1L1	0,18	0,0075
Q4J6C6	Prolyl endopeptidase-like	PREPL	0,14	0,0019
P40937	Replication factor C subunit 5	RFC5	0,13	0,0007
Q07000	HLA class I histocompatibility antigen	HLA-C	0,11	0,0033
I1YAP6	Tripartite motif-containing protein 77	TRIM77	0,11	0,0004
Q96KB5	Lymphokine-activated killer T-cell-originated protein kinase	PBK	0,09	0,0000
P42695	Condensin-2 complex subunit D3	NCAPD3	0,02	0,0036
Q9BUP3	Oxidoreductase HTATIP2	HTATIP2	0,01	0,0002