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Supporting Information

Supp 1. Ontology terms over-represented for probes up-regulated following delivery of VLPs via both intradermal injection (A) and microneedle coating (B).

A) Ontological terms returned in ID VLP treated samples.

P value	ExpCount	Count	Size	Term
1.05551816299702e-31	1.36089348224704	28	52	"response to type I interferon"
3.17225946942622e-31	0.89518555667001	24	35	"type I interferon-mediated signaling pathway"
2.11886225968669e-19	1.93665610935156	23	74	"response to interferon-gamma"
1.63075225420868e-18	5.13221601489758	33	212	"response to biotic stimulus"
2.33989970240346e-18	36.5226164452665	86	1448	"response to stress"
2.44583730246191e-18	11.7142142142142	48	453	"cellular response to organic substance"
2.08651130395234e-17	2.06673407482305	22	84	"response to virus"
1.14423653792327e-16	1.51791965327555	19	58	"interferon-gamma-mediated signaling pathway"
2.86207292046326e-12	6.43603730424072	29	288	"multi-organism process"
7.14414814458927e-11	31.2309791879904	66	1237	"response to chemical stimulus"
6.32860634990614e-09	35.2078711985689	66	1491	"signal transduction"
1.27833847271265e-08	7.38023003833972	26	282	"interspecies interaction between organisms"
3.66824741733634e-07	0.732788798133022	8	28	"negative regulation of reproductive process"
7.35104440864723e-07	1.7011168528088	11	65	"defense response to virus"
9.50880942109342e-07	4.26587764627438	17	163	"response to bacterium"
7.43048272154196e-06	2.5573653123322	12	152	"immune response"
7.86657484376521e-06	0.314052342057009	5	12	"cellular extravasation"
1.11577961155477e-05	2.22453742290382	11	85	"positive regulation of I-kappaB kinase/NF-kappaB cascade"
2.05160379141694e-05	2.36804278789905	11	92	"regulation of immune effector process"
2.17146387662664e-05	2.38086303939962	11	99	"regulation of defense response"
6.39538183327817e-05	18.7122853808968	36	715	"regulation of cell death"
6.75173324421921e-05	3.16669444907485	12	121	"cellular response to external stimulus"
6.90159067432299e-05	0.104684114019003	3	4	"positive regulation of defense response to virus by host"
6.90159067432299e-05	0.104684114019003	3	4	"negative regulation of transposition"
6.90159067432299e-05	0.104684114019003	3	4	"base conversion or substitution editing"
6.90159067432299e-05	0.104684114019003	3	4	"antigen processing and presentation of endogenous peptide antigen via MHC class I"
6.90159067432299e-05	0.104684114019003	3	4	"ISG15-protein conjugation"
6.90159067432299e-05	0.104684114019003	3	4	"cellular response to interferon-alpha"
7.93934366868755e-05	2.2736683920521	10	89	"antigen processing and presentation"
8.52054118027929e-05	18.2150358393066	35	696	"regulation of apoptosis"
0.000129921886483149	0.523420570095016	5	20	"negative regulation of type I interferon production"
0.000131238625329093	1.96282713785631	9	75	"cellular response to nutrient levels"

0.000144633047753912	1.17769628271379	7	45	"cellular response to lipopolysaccharide"
0.000144785420274864	1.55624568668047	8	82	"innate immune response"
0.000166890061478867	1.20386731121854	7	46	"regulation of response to biotic stimulus"
0.000223458050318803	3.58543090515086	12	137	"positive regulation of cell activation"
0.000250782781920773	1.28238039673279	7	49	"regulation of response to cytokine stimulus"
0.000268481348667109	0.34022337056176	4	13	"negative regulation of viral reproduction"
0.000275892651783996	3.1405234205701	11	120	"positive regulation of lymphocyte activation"
0.00028528553416248	1.30855142523754	7	50	"positive regulation of NF-kappaB transcription factor activity"
0.000323504612282877	1.33472245374229	7	51	"activation of caspase activity"
0.000331936211691021	0.157026171028505	3	6	"antigen processing and presentation of endogenous antigen"
0.000331936211691021	0.157026171028505	3	6	"negative regulation of innate immune response"
0.000365727226652022	1.36089348224704	7	52	"cellular response to biotic stimulus"
0.000402918782793961	0.99449908318053	6	38	"positive regulation of leukocyte migration"
0.000483259037405943	1.85814302383731	8	71	"adaptive immune response based on somatic recombination of immune receptors built from immunoglobulin superfamily domains"
0.00057199742616673	24.0773462243707	40	920	"death"
0.000615109054882042	1.07301216869478	6	41	"positive regulation of inflammatory response"
0.0006281094980655	3.4545757626271	11	132	"regulation of endopeptidase activity"
0.00064269797821129	0.418736456076013	4	16	"positive regulation of cell-cell adhesion"
0.000680673632334299	0.0523420570095016	2	2	"virus-infected cell apoptosis"
0.000680673632334299	0.0523420570095016	2	2	"regulation of lung blood pressure"
0.000680673632334299	0.0523420570095016	2	2	"negative regulation of retroviral genome replication"
0.000680673632334299	0.0523420570095016	2	2	"cytosol to ER transport"
0.000729092469077753	26.4212493326215	40	1394	"regulation of biological process"
0.000731679882988034	1.1068026073876	6	43	"regulation of multi-organism process"
0.000823447124057217	0.444907484580763	4	17	"negative regulation of DNA binding"
0.000823447124057217	0.444907484580763	4	17	"regulation of type I interferon-mediated signaling pathway"
0.000846752265617433	0.205504587155963	3	8	"regulation of defense response to virus by host"
0.000885957123043252	5.36506084347391	14	205	"response to extracellular stimulus"
0.00089410534344727	0.209368228038006	3	8	"T cell migration"
0.000951834356107446	14.4202367061177	27	551	"positive regulation of molecular function"
0.000966571020504442	0.785130855142524	5	30	"regulation of JAK-STAT cascade"
0.000966571020504442	0.785130855142524	5	30	"positive regulation of smooth muscle cell proliferation"
0.000966571020504442	0.785130855142524	5	30	"cellular response to tumor necrosis factor"
0.000979509450658865	1.5964327387898	7	61	"muscle cell proliferation"
0.0010366858054492	4.8407183618664	13	191	"inflammatory response"
0.00104236284758973	6.08611157647847	15	239	"regulation of intracellular protein kinase cascade"
0.00104915597835731	1.60851926977688	7	78	"cytokine-mediated signaling pathway"
0.00118045773544368	8.1391898649775	18	311	"positive regulation of signal transduction"
0.00118911101576695	1.6487747957993	7	63	"positive regulation of peptidase activity"
0.00130631563473751	1.67494582430405	7	64	"lymphocyte mediated immunity"
0.00135087920422971	8.92432072012002	19	341	"negative regulation of molecular function"
0.00136002192437279	7.56342723787298	17	289	"negative regulation of cell proliferation"
0.0014611066389927	2.70918367346939	9	135	"response to cytokine stimulus"
0.00148470583248085	4.42290381730288	12	169	"regulation of response to external stimulus"
0.00153816946126614	1.72110091743119	7	67	"antigen processing and presentation of peptide antigen via MHC class I"
0.00164238643903355	4.47524587431239	12	171	"regulation of leukocyte activation"
0.00173085434285566	2.25070845140857	8	86	"signal transduction by p53 class mediator"
0.00180086837130864	1.30830779707184	6	53	"regulation of cytokine production"
0.00181307472921148	3.3498916486081	10	128	"regulation of cell adhesion"
0.00190847806553109	0.549591598599767	4	21	"cellular response to interleukin-1"
0.00199724719531623	2.30108423686405	8	89	"positive regulation of cytokine production"
0.00200683516646702	0.0785130855142524	2	3	"cytidine deamination"
0.00200683516646702	0.0785130855142524	2	3	"mRNA modification"
0.00200683516646702	0.0785130855142524	2	3	"positive regulation of interferon-alpha production"
0.00200683516646702	0.0785130855142524	2	3	"cytidine metabolic process"
0.00200683516646702	0.0785130855142524	2	3	"pyrimidine ribonucleoside catabolic process"
0.00200683516646702	0.0785130855142524	2	3	"response to high density lipoprotein particle stimulus"
0.00201182170617183	2.8363453815261	9	113	"regulation of innate immune response"
0.00228558023846022	0.575762627104517	4	22	"regulation of viral genome replication"
0.00244872992065252	9.39539923320553	19	359	"positive regulation of programmed cell death"
0.00248614085511463	0.287881313552259	3	11	"negative regulation of leukocyte apoptosis"

0.0026398083786197	1.40704127644814	6	61	"regulation of immune response"
0.00266063350154356	2.40773462243707	8	92	"regulation of cysteine-type endopeptidase activity involved in apoptotic process"
0.00267143297703471	1.41323553925654	6	54	"cytokine metabolic process"
0.00286917231339331	42.8681446907818	59	1638	"positive regulation of biological process"
0.00287709876567464	0.99449908318053	5	38	"regulation of leukocyte chemotaxis"
0.00287709876567464	0.99449908318053	5	38	"response to heat"
0.0030021898635439	4.18736456076013	11	160	"regulation of sequence-specific DNA binding transcription factor activity"
0.00318780807600143	0.628104684114019	4	24	"acute-phase response"
0.00318780807600143	0.628104684114019	4	24	"response to dsRNA"
0.00321742934537244	1.46557759626604	6	56	"DNA damage response, signal transduction by p53 class mediator resulting in cell cycle arrest"
0.00321742934537244	1.46557759626604	6	56	"signal transduction involved in G1/S transition checkpoint"
0.00321742934537244	1.46557759626604	6	56	"signal transduction involved in DNA damage checkpoint"
0.00321742934537244	1.46557759626604	6	56	"signal transduction involved in mitotic cell cycle G1/S checkpoint"
0.00325161375595645	0.314052342057009	3	12	"interleukin-1 beta secretion"
0.00350805833555336	3.66394399066511	10	140	"immune response-regulating signaling pathway"
0.00351973507789521	1.4917486247708	6	57	"response to ionizing radiation"
0.00370867966625331	2.00507614213198	7	79	"activation of immune response"
0.00381693460893048	33.6739606126915	48	1399	"negative regulation of biological process"
0.00384268769787308	1.51791965327555	6	58	"mitotic cell cycle G1/S transition DNA damage checkpoint"
0.00384999524562686	0.103402268178786	2	4	"pyrimidine nucleoside catabolic process"
0.00394465442619082	0.104684114019003	2	4	"folic acid-containing compound biosynthetic process"
0.00394465442619082	0.104684114019003	2	4	"intracellular transport of viral proteins in host cell"
0.00394465442619082	0.104684114019003	2	4	"positive regulation of interleukin-17 production"
0.00394465442619082	0.104684114019003	2	4	"positive regulation of natural killer cell differentiation"
0.00394465442619082	0.104684114019003	2	4	"negative regulation of vasoconstriction"
0.00394465442619082	0.104684114019003	2	4	"tetrahydrofolate metabolic process"
0.00394465442619082	0.104684114019003	2	4	"intracellular protein transport in other organism involved in symbiotic interaction"
0.00414655347814325	0.34022337056176	3	13	"regulation of lymphocyte apoptosis"
0.00430658804009709	0.680446741123521	4	26	"activation of pro-apoptotic gene products"
0.00436174065923562	6.35955992665444	14	243	"hemopoietic or lymphoid organ development"
0.00505085636012617	2.11985330888481	7	81	"immune response-activating cell surface receptor signaling pathway"
0.00535776624943953	1.62260376729455	6	62	"regulation of peptidyl-tyrosine phosphorylation"
0.00540375424748574	2.14602433738956	7	82	"cell chemotaxis"
0.00566390211979229	0.732788798133022	4	28	"positive regulation of endothelial cell migration"
0.00582084284925105	5.88848141356893	13	225	"proteolysis involved in cellular protein catabolic process"
0.00583142024061152	3.32372062010335	9	127	"positive regulation of cell motility"
0.00586187461683331	7.98216369394899	16	305	"positive regulation of protein metabolic process"
0.0059304544909302	4.57992998833139	11	175	"T cell activation"
0.00616474053577163	2.19836639439907	7	84	"positive regulation of protein ubiquitination"
0.00616474053577163	2.19836639439907	7	84	"DNA integrity checkpoint"
0.006348253097834	0.392565427571262	3	15	"regulation of tyrosine phosphorylation of Stat3 protein"
0.00646161066234027	0.130855142523754	2	5	"membrane to membrane docking"
0.00646161066234027	0.130855142523754	2	5	"negative regulation of tyrosine phosphorylation of STAT protein"
0.00646161066234027	0.130855142523754	2	5	"regulation of monocyte differentiation"
0.00646161066234027	0.130855142523754	2	5	"positive regulation of nitric-oxide synthase biosynthetic process"
0.00646161066234027	0.130855142523754	2	5	"positive regulation of T cell apoptosis"
0.00646161066234027	0.130855142523754	2	5	"cellular response to alkaloid"
0.00675213610730604	1.7011168528088	6	65	"cellular response to abiotic stimulus"
0.00696004486950356	15.7811301883647	26	603	"regulation of cell communication"
0.00727057512618364	1.72728788131355	6	66	"M/G1 transition of mitotic cell cycle"
0.00727057512618364	1.72728788131355	6	66	"T cell receptor signaling pathway"
0.00728263869341243	1.23003833972329	5	47	"gastrulation"
0.00728263869341243	1.23003833972329	5	47	"positive regulation of chemotaxis"
0.00766491966390078	0.418736456076013	3	16	"regulation of leukocyte mediated cytotoxicity"

0.00766491966390078	0.418736456076013	3	16	"response to cold"
0.00766491966390078	0.418736456076013	3	16	"negative regulation of homeostatic process"
0.00766491966390078	0.418736456076013	3	16	"negative regulation of multi-organism process"
0.00781723288888329	1.7534589098183	6	67	"regulation of lymphocyte proliferation"
0.00793726271519519	8.97666277712952	17	343	"anatomical structure formation involved in morphogenesis"
0.00796156722127896	1.25620936822804	5	48	"regulation of cytokine biosynthetic process"
0.00831829915194578	2.90498416402734	8	111	"protein polyubiquitination"
0.00841568305275788	2.32922153692282	7	89	"activation of innate immune response"
0.00868329891491603	1.28238039673279	5	49	"regulation of cellular amino acid metabolic process"
0.00868329891491603	1.28238039673279	5	49	"positive regulation of mononuclear cell proliferation"
0.00891159075502386	4.18736456076013	10	160	"negative regulation of cellular protein metabolic process"
0.00893016506194354	2.35539256542757	7	90	"peptidyl-tyrosine modification"
0.00899851461162767	1.8058009668278	6	69	"regulation of G1/S transition of mitotic cell cycle"
0.00908432782230865	0.833819241982507	4	34	"positive regulation of immune response"
0.00913094949386726	0.444907484580763	3	17	"leukocyte cell-cell adhesion"
0.00913094949386726	0.444907484580763	3	17	"positive regulation of tyrosine phosphorylation of STAT protein"
0.00917491381196384	0.837472912152025	4	32	"positive regulation of T cell proliferation"
0.00917491381196384	0.837472912152025	4	32	"cellular response to vitamin"
0.00921053598888425	1.81390661740007	6	72	"response to lipopolysaccharide"
0.0092806462698543	5.54735422986181	12	218	"response to abiotic stimulus"
0.00944910813107167	1.30855142523754	5	50	"humoral immune response"
0.00945198994561211	3.58543090515086	9	137	"response to nutrient"
0.00952644788766488	0.157026171028505	2	6	"positive regulation of T cell mediated cytotoxicity"
0.00952644788766488	0.157026171028505	2	6	"positive regulation of antigen processing and presentation"
0.00952644788766488	0.157026171028505	2	6	"positive regulation of macrophage chemotaxis"
0.00952644788766488	0.157026171028505	2	6	"interleukin-6 biosynthetic process"
0.00952644788766488	0.157026171028505	2	6	"activation of JAK2 kinase activity"
0.00952644788766488	0.157026171028505	2	6	"type I interferon biosynthetic process"
0.00952644788766488	0.157026171028505	2	6	"positive regulation of myeloid leukocyte cytokine production involved in immune response"
0.00963477641974489	1.83197199533256	6	70	"negative regulation of protein ubiquitination"
0.00970982078305703	2.98349724954159	8	114	"cellular aromatic compound metabolic process"
0.00970982078305703	2.98349724954159	8	114	"myeloid cell differentiation"
0.00996224848072007	0.45813797722706	3	18	"JAK-STAT cascade"

B) Ontological terms returned in MN VLP treated samples.

P value	ExpCount	Count	Size	Term
8.17285899990729e-29	0.841467519353753	23	50	"response to type I interferon"
8.17285899990729e-29	0.841467519353753	23	50	"type I interferon-mediated signaling pathway"
5.25592362853017e-16	24.9242679232582	63	1481	"response to stress"
5.85061257183293e-16	7.33462445267767	35	449	"cellular response to organic substance"
1.73909746070792e-15	1.24115646258503	17	82	"response to virus"
1.39254066429347e-11	1.26220127903063	14	75	"response to interferon-gamma"
4.54704283796624e-11	22.9384045775833	53	1363	"response to chemical stimulus"
1.53585655963251e-10	0.992931672837428	12	59	"interferon-gamma-mediated signaling pathway"
4.38496452037803e-09	1.04341972399865	11	62	"defense response to virus"
8.2279500624069e-08	31.3699091215079	57	1864	"signal transduction"
9.59566220095974e-08	2.1065881092662	13	207	"immune response"
7.04364314901488e-07	4.71221810838102	18	280	"interspecies interaction between organisms"
8.63134328674985e-07	2.89464826657691	14	172	"regulation of cytokine production"
2.54787568937141e-06	0.639515314708852	7	38	"positive regulation of leukocyte migration"
2.54787568937141e-06	0.639515314708852	7	38	"regulation of leukocyte chemotaxis"
2.55739510364676e-06	0.901253918495298	8	75	"innate immune response"
9.679107085709e-06	0.774150117805453	7	46	"positive regulation of chemotaxis"
1.82805752844762e-05	0.0673174015483002	3	4	"positive regulation of defense response to virus by host"
1.82805752844762e-05	0.0673174015483002	3	4	"ISG15-protein conjugation"
1.82805752844762e-05	0.0673174015483002	3	4	"cellular response to interferon-alpha"
1.82805752844762e-05	0.0673174015483002	3	4	"cellular response to ethanol"

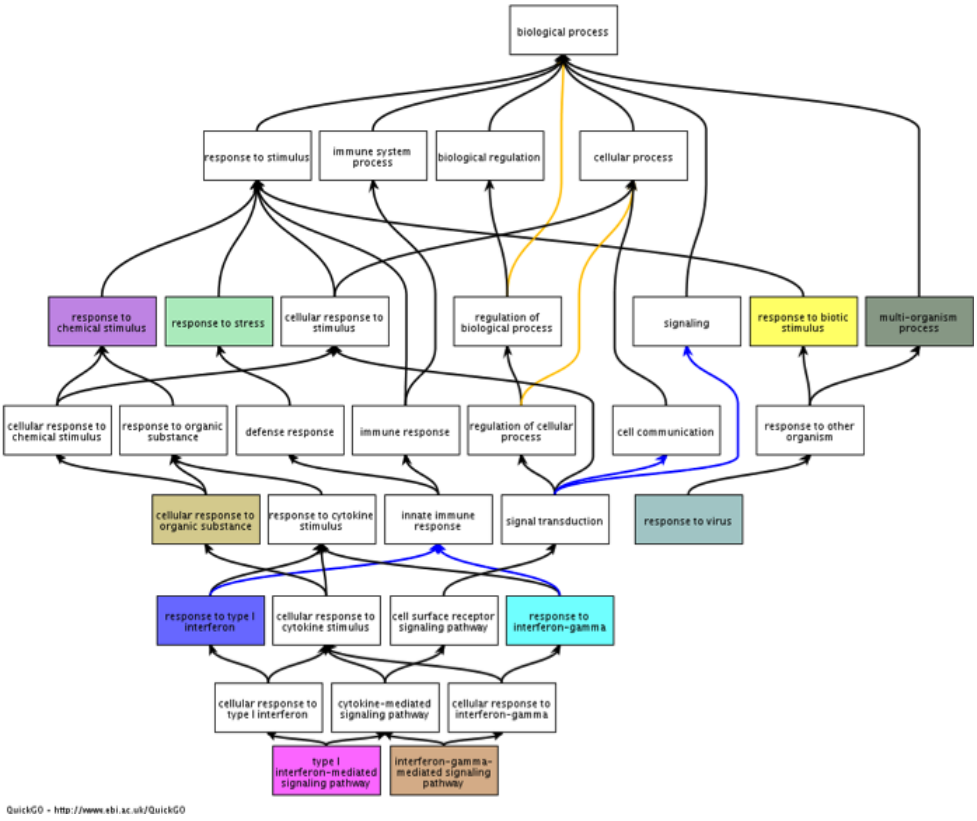
3.37118290501228e-05	0.201952204644901	4	12	"cellular extravasation"
3.37118290501228e-05	0.201952204644901	4	12	"regulation of T-helper cell differentiation"
3.92885674802161e-05	3.00948670167711	12	187	"inflammatory response"
4.03482120058871e-05	63.5812857623696	82	3778	"biological regulation"
5.67299802764391e-05	1.36317738135308	8	81	"cell chemotaxis"
7.19784306325954e-05	0.723662066644227	6	43	"humoral immune response"
7.64187485596404e-05	0.727272727272727	6	59	"cytokine-mediated signaling pathway"
7.91974084114462e-05	1.06024907438573	7	63	"regulation of behavior"
8.22187515080183e-05	0.740491417031303	6	44	"regulation of response to biotic stimulus"
8.91796066754184e-05	0.10097610232245	3	6	"positive regulation of T cell mediated cytotoxicity"
8.94154103343077e-05	0.252440255806126	4	15	"alpha-beta T cell activation involved in immune response"
8.94154103343077e-05	0.252440255806126	4	15	"T cell differentiation involved in immune response"
8.94154103343077e-05	0.252440255806126	4	15	"CD4-positive, alpha-beta T cell differentiation involved in immune response"
0.000104092468802558	1.10575951498821	7	67	"antigen processing and presentation of peptide antigen via MHC class I"
0.000114709476143651	1.50464716006885	8	94	"regulation of defense response"
0.00011513503586975	2.37293840457758	10	141	"negative regulation of multicellular organismal process"
0.000117685638750279	0.269269606193201	4	16	"regulation of CD4-positive, alpha-beta T cell activation"
0.000135372612234818	0.807808818579603	6	48	"positive regulation of mononuclear cell proliferation"
0.000142223737582394	1.16122517670818	7	69	"regulation of leukocyte proliferation"
0.00017060285282038	0.841467519353753	6	50	"positive regulation of immune effector process"
0.000190743979550798	0.858296869740828	6	51	"cellular response to biotic stimulus"
0.000280441960666627	0.0336587007741501	2	2	"positive regulation of activation of JAK2 kinase activity"
0.000280441960666627	0.0336587007741501	2	2	"cytosol to ER transport"
0.00029082518841582	0.925614271289128	6	55	"regulation of multi-organism process"
0.000297481322858606	0.336587007741501	4	20	"negative regulation of type I interferon production"
0.000362756075742985	0.353416358128576	4	21	"positive regulation of adaptive immune response"
0.00043729347551827	2.79367216425446	10	166	"regulation of response to external stimulus"
0.000446512575031918	0.656344665095927	5	39	"positive regulation of inflammatory response"
0.000523017002581916	0.387075058902726	4	23	"regulation of alpha-beta T cell differentiation"
0.000541817405270639	1.43897505057316	7	88	"antigen processing and presentation"
0.000542425836258668	1.88302713635597	8	114	"response to molecule of bacterial origin"
0.000565190617242454	5.78929653315382	15	344	"taxis"
0.000591786328006129	2.38976775496466	9	142	"leukocyte differentiation"
0.000638605960059213	4.03904409289801	12	240	"hemopoietic or lymphoid organ development"
0.000677122127963248	0.412735849056604	4	25	"positive regulation of T cell proliferation"
0.000691910291634518	0.185122854257826	3	11	"positive regulation of neutrophil chemotaxis"
0.000723665987649947	1.09390777515988	6	65	"regulation of lymphocyte proliferation"
0.000832072241546909	0.0504880511612252	2	3	"regulation of activation of Janus kinase activity"
0.000832072241546909	0.0504880511612252	2	3	"mRNA modification"
0.000911309779162648	0.201952204644901	3	12	"negative regulation of viral genome replication"
0.000920806463289846	1.1443958263211	6	68	"negative regulation of protein ubiquitination"
0.000928420732840305	0.766434516731782	5	48	"regulation of immune effector process"
0.000968609022246067	0.774150117805453	5	46	"regulation of lymphocyte differentiation"
0.00104780377821144	11.7637159205655	23	699	"regulation of cell death"
0.00112972804276114	2.10366879838438	8	125	"positive regulation of cell motility"
0.00113380137509964	0.471221810838102	4	28	"positive regulation of smooth muscle cell proliferation"
0.00117028257054577	0.218781555031976	3	13	"monocyte chemotaxis"
0.00117028257054577	0.218781555031976	3	13	"positive regulation of CD4-positive, alpha-beta T cell differentiation"
0.00142574923758399	8.38101649276338	18	498	"positive regulation of response to stimulus"
0.00147895537783291	0.504880511612252	4	30	"positive regulation of T cell differentiation"
0.00157134845612376	1.72611245256985	7	139	"response to other organism"
0.00164586390780934	0.0673174015483002	2	4	"positive regulation of T-helper 1 type immune response"
0.00164586390780934	0.0673174015483002	2	4	"base conversion or substitution editing"
0.00164586390780934	0.0673174015483002	2	4	"intracellular transport of viral proteins in host cell"
0.00164586390780934	0.0673174015483002	2	4	"antigen processing and presentation of endogenous peptide antigen via MHC class I"
0.00164586390780934	0.0673174015483002	2	4	"negative regulation of interleukin-2 production"
0.00164586390780934	0.0673174015483002	2	4	"regulation of tyrosine phosphorylation of Stat1 protein"
0.00164586390780934	0.0673174015483002	2	4	"regulation of retroviral genome replication"
0.00164586390780934	0.0673174015483002	2	4	"positive regulation of T-helper 1 cell differentiation"

0.00164586390780934	0.0673174015483002	2	4	"intracellular protein transport in other organism involved in symbiotic interaction"
0.00165074978993574	1.2790306294177	6	76	"regulation of angiogenesis"
0.00171961845547895	11.443958263211	22	680	"regulation of apoptosis"
0.00181681380024626	0.252440255806126	3	15	"positive regulation of cell killing"
0.00181681380024626	0.252440255806126	3	15	"positive regulation of transmission of nerve impulse"
0.00185358482777821	2.27196230225513	8	135	"positive regulation of cell activation"
0.00187346571390416	2.81050151464153	9	167	"regulation of leukocyte activation"
0.00203576902056065	0.261720067453626	3	16	"viral genome replication"
0.00220892029905302	0.269269606193201	3	16	"regulation of leukocyte mediated cytotoxicity"
0.00220892029905302	0.269269606193201	3	16	"regulation of T cell mediated immunity"
0.00220892029905302	0.269269606193201	3	16	"negative regulation of homeostatic process"
0.00220892029905302	0.269269606193201	3	16	"positive regulation of tyrosine phosphorylation of STAT protein"
0.00220892029905302	0.269269606193201	3	16	"sequestering of metal ion"
0.00236405814877226	0.942443621676203	5	56	"DNA damage response, signal transduction by p53 class mediator resulting in cell cycle arrest"
0.00236405814877226	0.942443621676203	5	56	"signal transduction involved in G1/S transition checkpoint"
0.00236405814877226	0.942443621676203	5	56	"signal transduction involved in DNA damage checkpoint"
0.00236405814877226	0.942443621676203	5	56	"signal transduction involved in mitotic cell cycle G1/S checkpoint"
0.00251942505552734	1.86805789296533	7	111	"I-kappaB kinase/NF-kappaB cascade"
0.00255730337929849	0.959272972063278	5	57	"muscle cell proliferation"
0.0026497069113754	0.286098956580276	3	17	"positive regulation of tumor necrosis factor production"
0.00279732893977452	1.90932420872541	7	155	"response to cytokine stimulus"
0.00292770877914254	3.58465163244699	10	213	"blood vessel morphogenesis"
0.00294290632124485	0.605856613934702	4	36	"positive regulation of ERK1 and ERK2 cascade"
0.00297785344527944	0.992931672837428	5	59	"mitotic cell cycle G1/S transition DNA damage checkpoint"
0.00314108665148738	0.302928306967351	3	18	"lipopolysaccharide-mediated signaling pathway"
0.00314108665148738	0.302928306967351	3	18	"positive regulation of nitric oxide biosynthetic process"
0.0032242849614977	0.305053236437384	3	19	"JAK-STAT cascade"
0.00325754142820094	0.622685964321777	4	37	"lymphocyte activation involved in immune response"
0.00328738033279385	1.46415348367553	6	87	"regulation of cysteine-type endopeptidase activity involved in apoptotic process"
0.00328738033279385	1.46415348367553	6	87	"signal transduction by p53 class mediator"
0.00332606079123905	4.89734096263884	12	291	"cellular homeostasis"
0.00340602458854629	0.311002362470469	3	19	"regulation of adaptive immune response based on somatic recombination of immune receptors built from immunoglobulin superfamily domains"
0.00359437196784028	0.639515314708852	4	38	"tumor necrosis factor superfamily cytokine production"
0.00368243562747705	1.49781218444968	6	89	"peptidyl-tyrosine modification"
0.00369939319301247	1.04341972399865	5	62	"cell activation involved in immune response"
0.00402492796170153	0.10097610232245	2	6	"positive regulation of antigen processing and presentation"
0.00402492796170153	0.10097610232245	2	6	"positive regulation of macrophage chemotaxis"
0.00402492796170153	0.10097610232245	2	6	"antigen processing and presentation of endogenous antigen"
0.00402492796170153	0.10097610232245	2	6	"positive regulation of alpha-beta T cell proliferation"
0.00427669020646368	2.05318074722316	7	122	"regulation of T cell activation"
0.00493591423529721	0.353416358128576	3	21	"positive regulation of lymphocyte mediated immunity"
0.00509588542588398	2.67586671154493	8	159	"negative regulation of cellular protein metabolic process"
0.00516854169314023	1.12756647593403	5	67	"M/G1 transition of mitotic cell cycle"
0.00545195694864675	1.6230303030303	6	103	"leukocyte activation"
0.00557323651268821	0.117805452709525	2	7	"positive regulation of fever generation"
0.00557323651268821	0.117805452709525	2	7	"regulation of heat generation"
0.00557323651268821	0.117805452709525	2	7	"positive regulation of natural killer cell activation"
0.00557323651268821	0.117805452709525	2	7	"pyrimidine nucleoside catabolic process"
0.00557323651268821	0.117805452709525	2	7	"negative regulation of cytokine secretion"
0.00557323651268821	0.117805452709525	2	7	"granulocyte chemotaxis"
0.00557323651268821	0.117805452709525	2	7	"mononuclear cell migration"
0.00563652054091354	0.723662066644227	4	43	"defense response to bacterium"
0.00585806246941256	1.16122517670818	5	69	"regulation of G1/S transition of mitotic cell cycle"
0.00598662050360493	3.35428671206565	9	226	"regulation of immune system process"

0.0061213668552419	0.740491417031303	4	44	"regulation of cytokine-mediated signaling pathway"
0.00641463432290489	0.387075058902726	3	23	"response to dsRNA"
0.00656671196961834	2.22147425109391	7	132	"regulation of innate immune response"
0.00661012031918812	1.19488387748233	5	71	"regulation of viral reproduction"
0.00665022112142657	3.39952877818916	9	202	"positive regulation of multicellular organismal process"
0.00674990333354118	5.35173342308987	12	318	"chemical homeostasis"
0.00692798346199969	15.2305621003029	25	905	"death"
0.00693631367167306	0.130683731896261	2	8	"regulation of defense response to virus by host"
0.00724250090362364	0.403904409289801	3	24	"regulation of acute inflammatory response"
0.00724250090362364	0.403904409289801	3	24	"positive chemotaxis"
0.00734976948333593	0.1346348030966	2	8	"positive regulation of interleukin-12 production"
0.00734976948333593	0.1346348030966	2	8	"T cell migration"
0.00761531579374539	4.10636149444631	10	244	"cellular ion homeostasis"
0.00813082522075117	0.420733759676876	3	25	"acute-phase response"
0.00842125849712891	0.425725860904794	3	26	"cellular response to lipopolysaccharide"
0.00860289031618349	1.78391114102996	6	106	"S phase of mitotic cell cycle"
0.00885810007123387	0.147316908538643	2	9	"tyrosine phosphorylation of STAT protein"
0.00896296526319692	0.824638168966678	4	49	"regulation of cellular amino acid metabolic process"
0.00896296526319692	0.824638168966678	4	49	"regulation of ion homeostasis"
0.00908056611575564	0.437563110063952	3	26	"virus-host interaction"
0.00934656209091455	0.151464153483676	2	9	"response to manganese ion"
0.00934656209091455	0.151464153483676	2	9	"response to peptidoglycan"
0.00934656209091455	0.151464153483676	2	9	"positive regulation of osteoclast differentiation"
0.00939507442337872	5.58734432850892	12	332	"regulation of hydrolase activity"
0.00976879036306726	1.83285593934288	6	111	"positive regulation of lymphocyte activation"
0.00987557097906672	14.0188488724335	23	833	"programmed cell death"

Supp 2. Similarity and inter-relationship between predominant ontological terms. Hierarchal relationship of the top 10 ontology terms up-regulated following ID (A) and microneedle (B) H1N1 VLP delivery. Term comparison charts generated using QuickGO (http://www.ebi.ac.uk/QuickGO/). In four independent experiments a single skin donor received four replicate control and four replicate treatment injections.

A



B