Micronutrient Deficiencies and the Human Plasma Nutriproteome

Ingo Ruczinski

Johns Hopkins Bloomberg School of Public Health

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A collaboration with: KP West, RN Cole, K Schulze, S Herbrich, P Christian, P Scholl, A Labrique, J Yager, J Groopman

Background

- Micronutrient deficiencies remain a complex and "hidden" aspect of malnutrition worldwide.
- Timely and thorough estimation of the prevalence of multiple micronutrient deficiencies is hampered by dependence on complex, time and resource-intensive laboratory indicators of nutritional status.
- We are seeking to establish the validity of a "plasma nutriproteome" that could be used as a basis for developing tests to assess multiple micronutrient deficiencies in populations on a single methodological platform.

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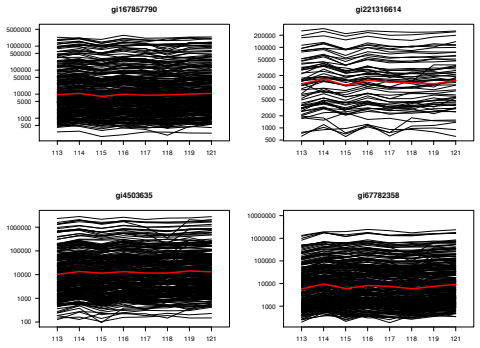
Project overview

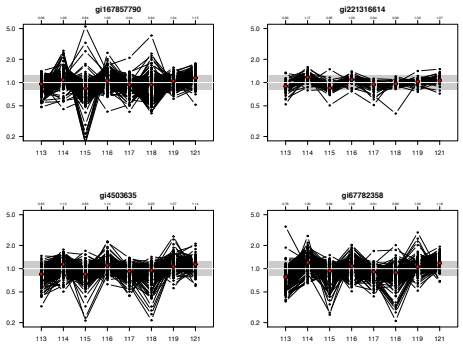
- Using 8plex iTRAQ based proteomics, we are identifying plasma proteins that covary with conventional plasma indicators of micronutrient status.
- Plasma samples collected and archived from 1000 Nepalese children, 6-9 years of age, were selected for comprehensive nutritional analyses.
- Over 2,500 unique plasma proteins have been identified (with a false discovery rate set at 95%) in pooled plasma and individual specimen (n=198 to date, n=500 anticipated by spring 2012).
- Biostatistical methods are developed to improve the quantitation of the relative protein abundances in the samples (see the following slides), and to detect a protein signature predictive of indicators of micronutrient status.

Reporter ion intensities



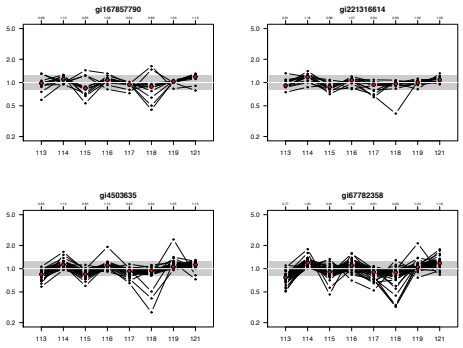
⟶ Run with 8 technical replicates of a master pool

Log reporter ion intensities (median polish)



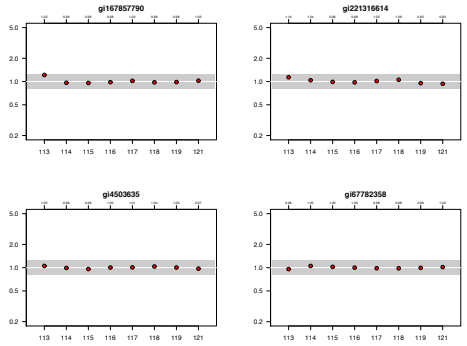
⟶ Run with 8 technical replicates of a master pool

Log reporter ion intensities (median polish, by peptide)



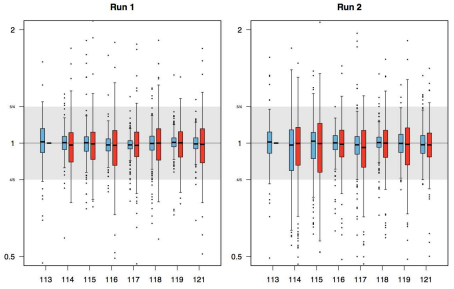
⟶ Run with 8 technical replicates of a master pool

Estimated relative protein abundances



⟶ Run with 8 technical replicates of a master pool

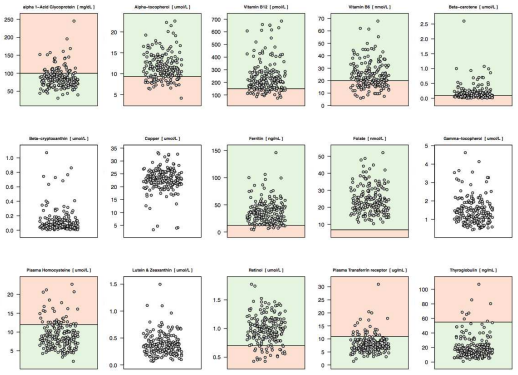
Variability



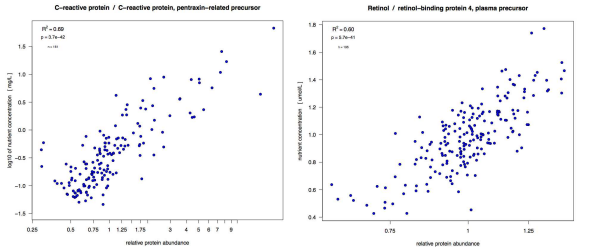
Using the new quantitation method, we obtain more precise measurements (blue boxplots) compared to Protein Discovery estimates (red boxplots).

⟶ Two runs with 8 technical replicates of a master pool

Micronutrient and marker measurements

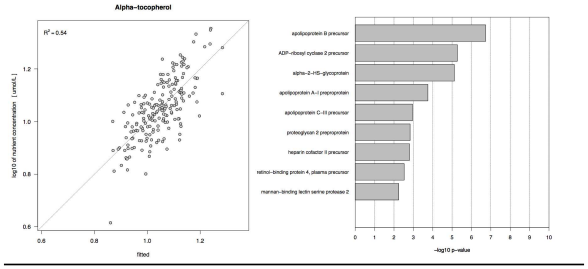


Does it work..?

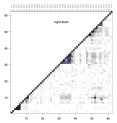


The most striking correlations are observed between the C-reactive protein measured independently as an inflammation marker in the serum and by iTraq ($r = 0.83, p < 10^{-40}$), and between retinol measured in the serum and the retinol binding protein quantified by iTraq ($r = 0.78, p < 10^{-40}$).

Prediction (alpha-tocopherol)



While many proteins appear to be co-expressed and thus are correlated, some relative abundances contribute independent information about the nutrient concentration, and thus, can be used for modeling and prediction.



http: //biostat.jhsph.edu/∼iruczins/

ingo@jhu.edu

Alpha-tocopherol

110823.196.log10.atocs.csv

	A	B	C	D	E	F
1		name	p	q	r2	r
2	gi4557321	apolipoprotein A-I preproprotein	1.51E-11	2.17E-09	0.20962777	0.45785125
3	gi4502149	apolipoprotein A-II preproprotein	1.59E-08	8.26E-07	0.15215365	0.39006878
4	gi4557323	apolipoprotein C-III precursor	1.72E-08	8.26E-07	0.15148774	0.38921426
5	gi197333755	interferon-related developmental regulator 2	2.55E-08	9.19E-07	0.1587073	0.39838085
6	gi55743122	retinol-binding protein 4, plasma precursor	2.31E-07	6.65E-06	0.12913973	0.35936017
7	gi32130518	apolipoprotein C-II precursor	2.87E-07	6.88E-06	0.1272512	0.35672286
8	gi4502161	apolipoprotein C-IV precursor	4.10E-07	8.25E-06	0.12412622	0.35231551
9	gi22091452	apolipoprotein M	4.58E-07	8.25E-06	0.12315996	0.35094154
10	gi189181724	proteoglycan 4 isoform D	7.35E-07	1.18E-05	0.12319958	0.35099798
11	gi10599032	apolipoprotein B precursor	8.26E-07	1.19E-05	0.1179936	0.3435197
12	gi46276889	proteoglycan 2 preproprotein	2.85E-05	0.00037273	0.10525685	-0.32443312
13	gi4502157	apolipoprotein C-I precursor	0.00053118	0.00637529	0.06014477	0.24524431
14	gi4506115	protein C preproprotein	0.00082365	0.00912515	0.05617441	0.23701141
15	gi16761506	plastin-2	0.00105849	0.01065496	0.05390453	-0.23217348
16	gi4506121	vitamin K-dependent protein Z precursor	0.00117451	0.01065496	0.05921668	0.24334478
17	gi16418467	leucine-rich alpha-2-glycoprotein 1 precursor	0.00118367	0.01065496	0.05289343	-0.22998572
18	gi4507725	transthyretin precursor	0.00135436	0.01147425	0.05167527	0.22732196
19	gi4507899	tissue inhibitor of metalloproteinase 1	0.00145027	0.01160419	0.06474316	-0.2544677
20	gi4826772	insulin-like growth factor binding protein,	0.00163967	0.01224974	0.04994732	0.22348898
21	gi205277441	serine (or cysteine) proteinase inhibitor,	0.00170105	0.01224974	0.04961525	-0.22274481
22	gi4757826	beta-2-microglobulin precursor	0.00349793	0.0235699	0.04469439	-0.21141049
23	gi21071030	carnosinase 1 precursor	0.00360032	0.0235699	0.04285333	0.20707046
24	gi10518503	coagulation factor VII isoform b	0.00396277	0.0248148	0.0454377	0.21316122
25	gi4757960	cadherin 1, type 1 preproprotein	0.00425644	0.02485371	0.05769314	-0.24019397
26	gi4502133	serum amyloid P component precursor	0.00431411	0.02485371	0.04122702	0.20304437
27	gi89189868	von Willebrand factor preproprotein	0.00456029	0.0252647	0.04072853	-0.2018131
28	gi4503635	prothrombin preproprotein	0.00505979	0.02636908	0.03979555	0.19948821
29	gi44889963	scavenger receptor cysteine-rich type 1	0.00512641	0.02636908	0.04465269	-0.21131183
30	gi4502511	complement component 9 precursor	0.00539909	0.02681402	0.03921341	-0.19802377
31	gi133929809	inter-alpha (globulin) inhibitor H3 preproprotein	0.00613171	0.02943744	0.0380733	-0.1951238
32	gi68299759	ecotropic viral integration site 5	0.00663732	0.03083688	0.04542465	-0.21313058
33	gi55925576	insulin-like growth factor-binding protein 2	0.0074594	0.03357327	0.03805789	-0.19508431

Alpha 1-Acid Glycoprotein

110823.196.agp.csv

	A	B	C	D	E	F
1		name	p	q	r2	r
2	gi167857790	orosomucoid 1 precursor	2.34E-19	3.92E-17	0.34178222	0.58462143
3	gi116256481	TNFAIP3-interacting protein 1	2.27E-18	1.90E-16	0.38259382	0.61854169
4	gi4505529	orosomucoid 2 precursor	2.47E-17	1.38E-15	0.30971375	0.55651932
5	gi16418467	leucine-rich alpha-2-glycoprotein 1 precursor	1.86E-13	7.81E-12	0.24406652	0.49403089
6	gi68299759	ecotropic viral integration site 5	1.72E-11	5.79E-10	0.2483866	0.49838399
7	gi4505047	lumican precursor	1.13E-09	3.17E-08	0.17438673	-0.4179637
8	gi4501987	afamin precursor	1.78E-08	4.27E-07	0.15119398	-0.3888367
9	gi55770842	C-reactive protein, pentraxin-related precursor	2.31E-08	4.85E-07	0.17873945	0.42277589
10	gi21361302	serine (or cysteine) proteinase inhibitor,	5.08E-08	8.83E-07	0.14221942	-0.37711991
11	gi50659080	serpin peptidase inhibitor, clade A,	5.26E-08	8.83E-07	0.14191733	0.37671916
12	gi4502511	complement component 9 precursor	7.15E-08	1.09E-06	0.13927886	0.37320083
13	gi67782358	complement factor B preproprotein	9.79E-08	1.37E-06	0.13656947	0.36955307
14	gi40217843	cartilage oligomeric matrix protein precursor	2.79E-07	3.61E-06	0.12747863	-0.35704149
15	gi119392081	complement factor I preproprotein	6.59E-07	7.90E-06	0.11997316	0.34637142
16	gi156627579	tetranectin precursor	1.02E-06	1.15E-05	0.11610444	-0.34074102
17	gi70778918	inter-alpha globulin inhibitor H2 polypeptide	1.74E-06	1.83E-05	0.1114166	-0.33379125
18	gi70780384	peptidase inhibitor 16 precursor	2.32E-06	2.29E-05	0.10889321	-0.32998971
19	gi40316912	serum amyloid A protein preproprotein	3.58E-06	3.34E-05	0.11276275	0.33580166
20	gi4557321	apolipoprotein A-I preproprotein	5.13E-06	4.33E-05	0.10185867	-0.31915306
21	gi55743106	alpha 3 type VI collagen	5.16E-06	4.33E-05	0.11796676	-0.3434629
22	gi156523970	alpha-2-HS-glycoprotein	5.88E-06	4.70E-05	0.10064223	-0.3172416
23	gi197333755	interferon-related developmental regulator 2	7.72E-06	5.89E-05	0.10546394	-0.32475211
24	gi4502133	serum amyloid P component precursor	9.87E-06	7.21E-05	0.0960271	0.3098824
25	gi166795301	prenylcysteine oxidase 1 precursor	1.94E-05	0.00013575	0.10036997	-0.3168122
26	gi10835095	serum amyloid A-4 protein precursor	2.12E-05	0.00014258	0.08917855	0.29862777
27	gi4502261	serpin peptidase inhibitor, clade C,	2.54E-05	0.00016387	0.08757901	-0.2959375
28	gi133925809	inter-alpha (globulin) inhibitor H3 preproprotein	3.79E-05	0.00023098	0.08398293	0.28979808
29	gi156616294	N-acetylmuramoyl-L-alanine amidase precursor	3.85E-05	0.00023098	0.08383158	-0.28953683
30	gi31652249	lipopolysaccharide-binding protein precursor	4.16E-05	0.00024082	0.08314108	0.28834195
31	gi4507725	transthyretin precursor	5.58E-05	0.00031237	0.08049543	-0.28371717
32	gi50363217	serine proteinase inhibitor, clade A,	6.91E-05	0.00037437	0.08139504	0.28529816
33	gi40549451	lymphatic vessel endothelial hyaluronic acid	0.00013724	0.00071982	0.08083133	-0.28430852

Vitamin B6

110823.196.b6.csv

	A	B	C	D	E	F
1		name	p	q	r2	r
2	gi44889963	scavenger receptor cysteine-rich type 1	5.41E-07	8.17E-05	0.13621	-0.36906639
3	gi167857790	orosomucoid 1 precursor	1.05E-05	0.00079143	0.09550565	-0.30903989
4	gi16418467	leucine-rich alpha-2-glycoprotein 1 precursor	5.70E-05	0.00287511	0.08030196	-0.283376
5	gi4501987	afamin precursor	0.00010601	0.00289636	0.07471611	0.27334248
6	gi70778918	inter-alpha globulin inhibitor H2 polypeptide	0.00011905	0.00289636	0.07366962	0.27142148
7	gi4826772	insulin-like growth factor binding protein,	0.00012133	0.00289636	0.07349785	0.27110487
8	gi40316912	serum amyloid A protein preproprotein	0.0001341	0.00289636	0.0780297	-0.27933797
9	gi4502511	complement component 9 precursor	0.00019488	0.00359195	0.0692169	-0.26309105
10	gi4502149	apolipoprotein A-II preproprotein	0.00021381	0.00359195	0.06837854	0.2614929
11	gi119392081	complement factor I preproprotein	0.00025693	0.0038846	0.06671737	-0.25829706
12	gi156119625	inter-alpha (globulin) inhibitor H1 isoform	0.00034733	0.00433745	0.06398991	0.25296227
13	gi116256481	TNFAIP3-interacting protein 1	0.00035027	0.00433745	0.0774663	-0.27832769
14	gi133925809	inter-alpha (globulin) inhibitor H3 preproprotein	0.00037294	0.00433745	0.06334591	-0.25168613
15	gi115583663	alpha-2-antiplasmin isoform a precursor	0.00052696	0.00569095	0.06021696	0.24539143
16	gi62243068	insulin-like growth factor binding protein	0.00087714	0.00884122	0.055605	0.23580712
17	gi38016947	complement component 5 preproprotein	0.00106572	0.00950213	0.05384296	-0.23204086
18	gi67782358	complement factor B preproprotein	0.0010684	0.00950213	0.05382023	-0.23199187
19	gi31652249	lipopolysaccharide-binding protein precursor	0.00124751	0.01021001	0.05241837	-0.22895059
20	gi21361302	serine (or cysteine) proteinase inhibitor,	0.00128306	0.01021001	0.05216431	0.22839506
21	gi4507725	transthyretin precursor	0.00150307	0.01136277	0.05073343	0.22524082
22	gi55770842	C-reactive protein, pentraxin-related precursor	0.00168323	0.01211875	0.06034959	-0.24566154
23	gi166795301	prenylcysteine oxidase 1 precursor	0.00206743	0.01420835	0.05352042	0.2313448
24	gi68299759	ecotropic viral integration site 5	0.00234637	0.01542422	0.05672802	-0.23817645
25	gi16761506	plastin-2	0.00297862	0.01832812	0.04456015	-0.21109275
26	gi55743122	retinol-binding protein 4, plasma precursor	0.00303056	0.01832812	0.0444044	0.2107235
27	gi4502133	serum amyloid P component precursor	0.00397842	0.02313513	0.0419551	-0.20482945
28	gi4557485	ceruloplasmin precursor	0.00570795	0.03196325	0.03871477	-0.19676068
29	gi4504489	histidine-rich glycoprotein precursor	0.00663893	0.03584876	0.037362	0.19329252
30	gi4557321	apolipoprotein A-I preproprotein	0.00720141	0.03754517	0.03663483	0.19140107
31	gi1940184472	plasma serine protease inhibitor	0.00748677	0.03773182	0.03628762	0.19049311
32	gi4504383	HGF activator preproprotein	0.00834233	0.04068738	0.03532179	0.18794093
33	gi4557287	angiotensinogen preproprotein	0.00954203	0.04508426	0.03412449	0.18472814

Copper

110823.196.copper.csv

	A	B	C	D	E	F
1		name	p	q	r2	r
2	gi4557485	ceruloplasmin precursor	1.95E-16	4.13E-14	0.29502781	0.54316462
3	gi116256481	TNFAIP3-interacting protein 1	6.87E-09	7.27E-07	0.1908696	0.43688625
4	gi4505047	lumican precursor	2.00E-05	0.00098543	0.08971105	-0.29951804
5	gi50363217	serine proteinase inhibitor, clade A,	2.14E-05	0.00098543	0.09230051	0.30380999
6	gi4501987	afamin precursor	2.76E-05	0.00098543	0.08682348	-0.29465824
7	gi62243068	insulin-like growth factor binding protein	2.79E-05	0.00098543	0.0867274	-0.29449516
8	gi4507725	transthyretin precursor	3.74E-05	0.00113262	0.08409284	-0.28998766
9	gi4826772	insulin-like growth factor binding protein,	9.57E-05	0.00235285	0.07564271	-0.27503219
10	gi167857790	orosomucoid 1 precursor	1.00E-04	0.00235285	0.07524569	0.27430947
11	gi58331240	fetuin-B precursor	0.00032548	0.00689428	0.06457775	0.25412152
12	gi4503625	coagulation factor X preproprotein	0.00126675	0.02299342	0.05227995	0.2286481
13	gi55743122	retinol-binding protein 4, plasma precursor	0.00130263	0.02299342	0.05202742	-0.2280952
14	gi115583663	alpha-2-antiplasmin isoform a precursor	0.00145445	0.0231473	0.0510307	-0.22589975
15	gi39725934	pigment epithelium-derived factor precursor	0.00183504	0.0231473	0.04893032	-0.22120198
16	gi21071030	alpha 1B-glycoprotein precursor	0.00185359	0.0231473	0.04883947	0.22099653
17	gi15622759	tetranectin precursor	0.0018835	0.0231473	0.0486949	-0.2206692
18	gi68299759	ecotropic viral integration site 5	0.00195631	0.0231473	0.05871002	0.2423015
19	gi16418467	leucine-rich alpha-2-glycoprotein 1 precursor	0.00196702	0.0231473	0.0483031	0.21977967
20	gi166362713	cadherin 5, type 2 preproprotein	0.00268451	0.02992788	0.04549715	-0.2133006
21	gi133925809	inter-alpha (globulin) inhibitor H3 preproprotein	0.00322639	0.03417031	0.04384049	0.2093812
22	gi4507467	transforming growth factor, beta-induced, 68kDa	0.00381346	0.0384649	0.04388952	0.20949826
23	gi40217843	cartilage oligomeric matrix protein precursor	0.00403269	0.03882729	0.0418333	-0.2045319
24	gi4557321	apolipoprotein A-I preproprotein	0.00435128	0.04007321	0.04114994	-0.20285449
25	gi4505529	orosomucoid 2 precursor	0.00511163	0.04511418	0.03970409	0.19925886
26	gi42740907	clusterin isoform 2 preproprotein	0.00596428	0.04918984	0.03832123	-0.19575808
27	gi4502261	serpin peptidase inhibitor, clade C,	0.00603787	0.04918984	0.0382114	-0.19547737
28	gi4502165	apolipoprotein F precursor	0.00681255	0.05212821	0.03713109	0.1926943
29	gi50659080	serpin peptidase inhibitor, clade A,	0.00690646	0.05212821	0.03700867	0.19237638
30	gi4502149	apolipoprotein A-II preproprotein	0.00713684	0.05212821	0.03671533	-0.19161246
31	gi55770842	C-reactive protein, pentraxin-related precursor	0.00781516	0.05451615	0.04365703	0.20894265
32	gi153266841	apolipoprotein H precursor	0.00811242	0.05451615	0.0355711	-0.18860302
33	gi10835095	serum amyloid A-4 protein precursor	0.00823588	0.05451615	0.03543634	0.18824543

C-reactive protein

110823.196.log10.crp.csv

	A	B	C	D	E	F
1		name	p	q	r2	r
2	gi55770842	C-reactive protein, pentraxin-related precursor	3.70E-42	5.38E-40	0.6888836	0.82999012
3	gi16418467	leucine-rich alpha-2-glycoprotein 1 precursor	4.38E-23	3.19E-21	0.39705169	0.63012038
4	gi4502511	complement component 9 precursor	1.29E-22	6.24E-21	0.39037488	0.62479987
5	gi31652249	lipopolysaccharide-binding protein precursor	2.64E-18	9.62E-17	0.32527346	0.5703275
6	gi40316912	serum amyloid A protein preproprotein	1.32E-17	3.85E-16	0.33396889	0.57790041
7	gi167857790	orosomucoid 1 precursor	3.94E-15	9.56E-14	0.2731143	0.52260338
8	gi4502133	serum amyloid P component precursor	2.86E-14	5.93E-13	0.25833089	0.50826262
9	gi21361302	serine (or cysteine) proteinase inhibitor,	1.76E-13	2.76E-12	0.24563539	-0.49561617
10	gi68299759	ecotropic viral integration site 5	1.38E-12	2.23E-11	0.27150686	0.52106321
11	gi50659080	serpin peptidase inhibitor, clade A,	2.50E-12	3.64E-11	0.22388196	0.47316166
12	gi116256481	TNFAIP3-interacting protein 1	3.01E-12	3.98E-11	0.26444131	0.51423857
13	gi67782358	complement factor B preproprotein	1.85E-09	2.24E-08	0.17029677	0.41267029
14	gi4505047	lumican precursor	5.09E-09	5.69E-08	0.1618094	-0.40225539
15	gi119392081	complement factor I preproprotein	7.97E-09	8.28E-08	0.15801793	0.39751469
16	gi4505529	orosomucoid 2 precursor	9.29E-09	9.01E-08	0.15671691	0.39587487
17	gi21083595	serum amyloid A-4 protein precursor	1.24E-08	1.12E-07	0.15430208	0.39281313
18	gi156523970	alpha-2-HS-glycoprotein	2.32E-07	1.99E-06	0.12907536	-0.3592706
19	gi38016947	complement component 5 preproprotein	5.58E-07	4.51E-06	0.12143726	0.3484785
20	gi156627579	tetranectin precursor	6.84E-07	5.24E-06	0.11965164	-0.34590698
21	gi4501987	afamin precursor	1.37E-06	9.96E-06	0.11629677	-0.3395411
22	gi4502261	serpin peptidase inhibitor, clade C,	3.01E-06	2.05E-05	0.10658821	-0.32647849
23	gi133925809	inter-alpha (globulin) inhibitor H3 preproprotein	3.09E-06	2.05E-05	0.106347	0.32610888
24	gi70778918	inter-alpha globulin inhibitor H2 polypeptide	4.49E-06	2.84E-05	0.10304765	-0.32101035
25	gi119034024	SPARC-like protein 1 precursor	6.03E-06	3.65E-05	0.10399463	-0.32248199
26	gi4557391	complement component 8, beta polypeptide	6.28E-06	3.66E-05	0.10005909	0.31632118
27	gi156616294	N-acetylmuramoyl-L-alanine amidase precursor	7.59E-06	4.10E-05	0.09837695	-0.31365099
28	gi154759291	serine (or cysteine) proteinase inhibitor,	7.61E-06	4.10E-05	0.09835044	0.31360874
29	gi71773110	apolipoprotein A-IV precursor	2.28E-05	0.00011835	0.08855056	-0.29757446
30	gi13540563	complement factor H-related 5 precursor	2.75E-05	0.00013772	0.09332612	0.30549323
31	gi7382460	sex hormone-binding globulin isoform 1	3.34E-05	0.00016205	0.08816074	-0.29691873
32	gi51896037	g protein-coupled receptor kinase 6	5.59E-05	0.00026214	0.11138431	0.33374288
33	gi4507725	transthyretin precursor	9.07E-05	0.00040745	0.07612001	-0.27589856

Retinol

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	A	B	C	D	E	F
1		name	p	q	r2	r
2	gi55743122	retinol-binding protein 4, plasma precursor	5.69E-41	8.71E-39	0.60481557	0.77769889
3	gi4507725	transthyretin precursor	1.09E-17	8.31E-16	0.31548309	0.56167882
4	gi4557321	apolipoprotein A-I preproprotein	1.24E-12	6.31E-11	0.22940926	0.47896687
5	gi4502149	apolipoprotein A-II preproprotein	1.56E-09	5.97E-08	0.17172393	0.41439586
6	gi4826772	insulin-like growth factor binding protein,	1.75E-08	5.36E-07	0.15133691	0.38902045
7	gi4502511	complement component 9 precursor	5.91E-08	1.51E-06	0.14091446	-0.37538575
8	gi197333755	interferon-related developmental regulator 2	9.26E-08	2.03E-06	0.14691656	0.38329696
9	gi16418467	leucine-rich alpha-2-glycoprotein 1 precursor	2.81E-07	5.24E-06	0.12741449	-0.35695167
10	gi32130518	apolipoprotein C-II precursor	3.08E-07	5.24E-06	0.12662089	0.3558383
11	gi4501987	afamin precursor	5.43E-07	7.56E-06	0.12167304	0.34881663
12	gi4502161	apolipoprotein C-IV precursor	5.43E-07	7.56E-06	0.12166952	0.34881158
13	gi4557323	apolipoprotein C-III precursor	9.40E-07	1.20E-05	0.11685782	0.34184473
14	gi31652249	lipopolysaccharide-binding protein precursor	4.74E-06	5.58E-05	0.10257137	-0.32026766
15	gi4503635	prothrombin preproprotein	7.53E-06	8.24E-05	0.09843884	0.31374965
16	gi16761506	plastin-2	1.29E-05	0.00013163	0.09364461	-0.30601407
17	gi1940184472	plasma serine protease inhibitor	1.59E-05	0.00015192	0.09178512	0.3029606
18	gi62243068	insulin-like growth factor binding protein	1.78E-05	0.0001606	0.09074546	0.30123986
19	gi67782358	complement factor B preproprotein	2.03E-05	0.00017299	0.08956746	-0.29927823
20	gi21361302	serine (or cysteine) proteinase inhibitor,	2.38E-05	0.00019172	0.08816145	0.29691994
21	gi133925809	inter-alpha (globulin) inhibitor H3 preproprotein	3.44E-05	0.00024956	0.08485491	-0.29129866
22	gi68299759	ecotropic viral integration site 5	3.51E-05	0.00024956	0.10236301	-0.3199422
23	gi22091452	apolipoprotein M	3.59E-05	0.00024956	0.08447905	0.2906528
24	gi119392081	complement factor I preproprotein	4.03E-05	0.00026812	0.0834349	-0.28885101
25	gi21071039	carnosinase 1 precursor	7.82E-05	0.00049907	0.07745823	0.27831319
26	gi4507509	tissue inhibitor of metalloproteinase 1	0.0001205	0.00073809	0.09297576	-0.30491926
27	gi71773110	apolipoprotein A-IV precursor	0.00013722	0.00080816	0.07238645	0.2690473
28	gi211938442	apolipoprotein L1 isoform c precursor	0.00030907	0.00175281	0.06504589	0.25504095
29	gi41393602	complement component 1, s subcomponent	0.00032142	0.00175777	0.06469123	-0.2543447
30	gi62000702	diacylglycerol kinase kappa	0.00034506	0.00182198	0.0889422	0.29823179
31	gi50659080	serpin peptidase inhibitor, clade A,	0.00047557	0.00241308	0.06114577	-0.24727671
32	gi167857790	orosomucoid 1 precursor	0.00048853	0.00241308	0.06090243	-0.24678418
33	gi4502157	apolipoprotein C-I precursor	0.00066472	0.00310527	0.05811476	0.24107003