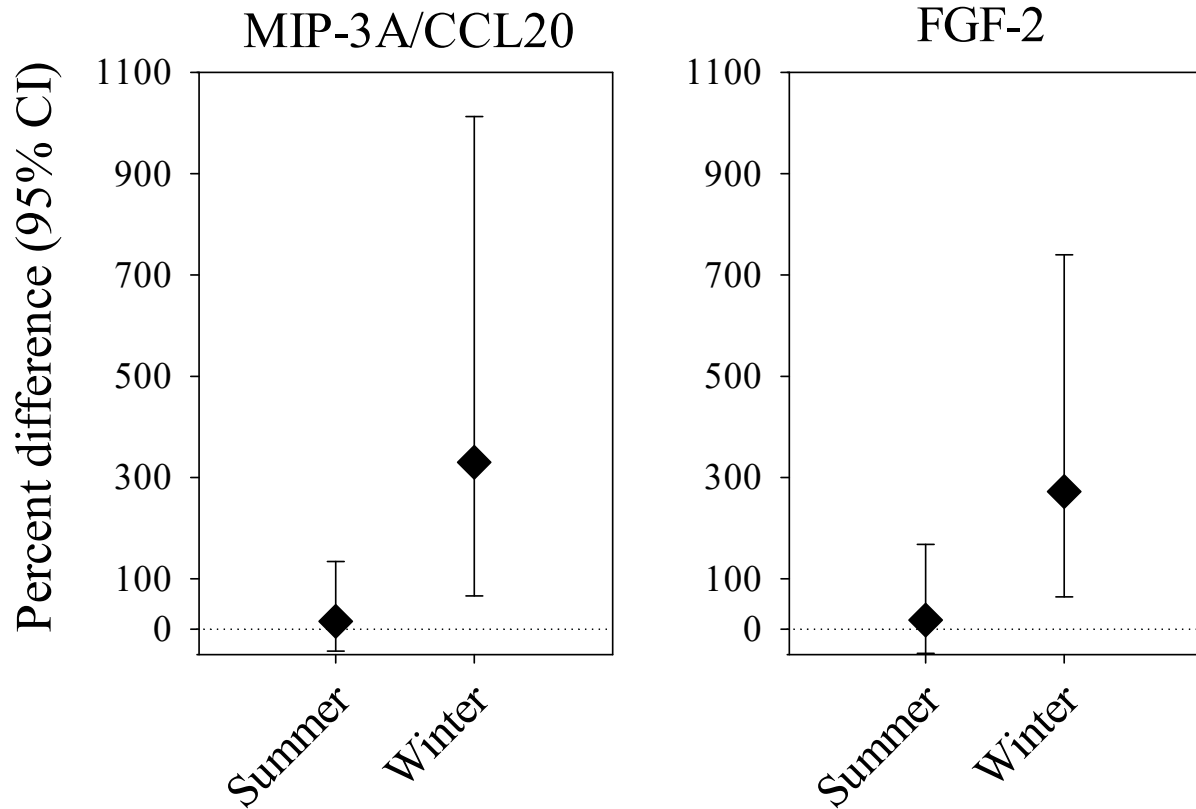


Supplementary material for “Industrial hog farming is associated with altered circulating immunologic markers”



Supplementary Figure 1. Differences in natural log-transformed marker levels between hog farmers and controls, stratified by season ($P_{\text{interaction}} = 0.02$ and 0.07 for MIP-3A/CCL20 and FGF-2, respectively).

Supplementary Table 1. Percent detection and reproducibility of 58 immune markers

Marker	Percent detection	Overall CV
6Ckine/CCL21	91.8	8.75
BCA-1/CXCL13	100	4.26
CRP	100	1.16
CTACK	100	2.91
EGF	100	1.89
ENA-78/CXCL5	100	1.28
EOTAXIN/CCL11	100	6.03
EOTAXIN-2/CCL24	100	1.02
FGF-2	66.4	10.44
Fractalkine/CX3CL1	79.5	5.29
G-CSF	70.5	5.47
GCP-2/CXCL6	100	2.61
GM-CSF	92.6	2.75
GRO/CXCL1,2,3	100	1.92
I-TAC/CXCL11	100	2.56
IL-1B	95.1	5.02
IL-1RA	73.8	6.78
IL-5	84.4	5.33
IL-6	100	2.31
IL-7	91.0	3.50
IL-8	100	1.74
IL-10	94.3	4.35
IL-12(p70)	86.9	3.81
IL-13	90.2	3.03
IL-16	94.3	3.32
IL-17A	91.0	4.01
IL-21	68.0	10.16
IL-23	93.4	2.22
IP-10/CXCL10	100	3.09
MCP-1/CCL2	100	2.76
MCP-2/CCL8	94.3	3.08
MCP-4/CCL13	91.8	8.89
MDC/CCL22	100	3.53
MIG/CXCL9	100	2.19
MIP-1A/CCL3	99.2	2.91
MIP-1B/CCL4	93.4	4.19
MIP-1D/CCL15	100	2.62
MIP-3A/CCL20	86.1	4.24
MIP-3B/CCL19	100	2.13
SAA	100	1.78
SAP	100	4.21

Marker	Percent detection	Overall CV
SCF	89.3	3.94
SDF-1A+B	100	2.85
sEGFR	100	8.00
sGP-130	100	5.29
sILRII	100	5.04
sIL-4R	99.2	5.84
sIL-6R	100	4.58
sTNFR1	100	4.22
sTNFR2	100	2.44
sVEGFR2	100	7.03
sVEGFR3	99.2	5.03
TARC/CCL17	100	0.95
TGF-A	81.1	4.52
TNF-A	100	4.31
TPO	97.5	1.59
TRAIL	100	2.43
VEGF	95.1	5.76

Notes: CV, coefficient of variation

Supplementary Table 2. Comparison of results from linear and Tobit regression models for selected markers^a

Marker	Linear regression		Tobit regression	
	Beta (SE)	P-value	Beta (SE)	P-value
MIP-3A/CCL20	0.746 (0.288)	0.011	0.740 (0.279)	0.009
FGF-2	0.658 (0.285)	0.023	0.796 (0.335)	0.019
sIL-4R	0.114 (0.054)	0.038	0.103 (0.047)	0.031

^a Beta coefficients (standard errors) comparing natural log-transformed analyte levels between hog farmers and controls, based on regression models adjusted for age, season of phlebotomy, BMI, recent history of respiratory infection, recent NSAID use, and raising cattle.

Supplementary Table 3. Comparisons of other immune markers among hog farmers and controls

Marker	Bivariate analyses ^a			Multivariate analyses ^b	
	Hog farmers, median (IQR)	Controls, median (IQR)	P-value	Beta (SE)	P-value
6Ckine/CCL21	291.9 (192.4-370.1)	247.0 (173.6-416.4)	0.53	0.015 (0.165)	0.93
BCA-1/CXCL13	24.2 (18.8-28.2)	27.3 (19.2-37.0)	0.10	-0.126 (0.103)	0.23
CRP ^c	14368.0 (8647.7-22638.0)	14630.0 (8431.9-34438.0)	0.46	-0.073 (0.153)	0.64
CTACK	673.3 (562.6-741.3)	658.9 (549.7-859.7)	0.56	-0.062 (0.053)	0.25
EGF	416.1 (320.4-474.7)	402.0 (286.1-469.6)	0.77	0.021 (0.081)	0.79
ENA-78/CXCL5	958.1 (703.8-1283.6)	901.3 (691.0-1259.3)	0.64	0.112 (0.093)	0.23
EOTAXIN/CCL11	139.9 (108.9-171.9)	147.3 (116.5-169.4)	0.73	-0.009 (0.076)	0.91
EOTAXIN-2/CCL24	790.5 (493.9-1398.5)	770.4 (505.1-1291.9)	0.84	0.035 (0.132)	0.79
Fractalkine/CX3CL1	84.5 (45.3-114.6)	69.3 (4.6-102.0)	0.10	0.357 (0.240)	0.14
G-CSF	30.4 (8.0-69.6)	26.0 (8.0-45.1)	0.21	0.197 (0.211)	0.35
GCP-2/CXCL6	101.5 (82.9-140.7)	108.7 (82.3-154.2)	0.71	-0.026 (0.085)	0.76
GM-CSF	51.6 (26.7-92.0)	44.1 (21.3-72.6)	0.30	0.094 (0.312)	0.77
GRO/CXCL1,2,3	720.5 (575.7-959.9)	759.6 (633.9-982.6)	0.76	-0.017 (0.073)	0.81
I-TAC/CXCL11	58.5 (42.6-84.5)	63.0 (48.2-87.0)	0.40	-0.098 (0.113)	0.39
IL-1B	1.7 (0.7-3.0)	1.7 (1.0-3.6)	0.50	-0.221 (0.201)	0.27
IL-1RA	68.6 (19.5-190.4)	54.2 (8.0-121.2)	0.25	0.122 (0.300)	0.69
IL-5	1.9 (0.7-3.0)	1.6 (0.8-2.5)	0.25	0.002 (0.225)	0.99
IL-6	2.0 (1.0-3.0)	2.0 (1.3-3.0)	0.79	0.042 (0.132)	0.75
IL-7	4.7 (3.2-5.9)	4.6 (2.6-5.8)	0.97	0.005 (0.230)	0.98
IL-8	4.8 (3.6-6.0)	4.7 (3.7-6.5)	0.66	-0.031 (0.076)	0.68
IL-10	6.1 (3.0-13.0)	7.0 (3.3-12.2)	0.68	-0.094 (0.209)	0.65
IL-12(p70)	2.9 (1.8-4.3)	2.9 (1.6-4.1)	0.74	0.141 (0.250)	0.57
IL-13	4.7 (2.4-8.6)	5.0 (2.0-8.8)	0.76	0.046 (0.293)	0.88
IL-16	53.2 (29.8-89.0)	46.6 (30.6-89.3)	0.69	-0.027 (0.188)	0.89
IL-17A	6.3 (3.5-11.0)	5.4 (2.1-8.0)	0.13	0.144 (0.254)	0.57
IL-21	1.1 (0.1-2.6)	1.4 (0.1-2.5)	0.63	-0.384 (0.315)	0.23
IL-23	122.5 (75.7-210.0)	115.2 (59.8-244.7)	0.59	0.049 (0.247)	0.84
IP-10/CXCL10	479.0 (336.8-677.6)	541.9 (437.5-704.5)	0.12	-0.059 (0.086)	0.49

Marker	Bivariate analyses ^a			Multivariate analyses ^b	
	Hog farmers, median (IQR)	Controls, median (IQR)	P-value	Beta (SE)	P-value
MCP-1/CCL2	808.7 (679.0-965.9)	766.0 (658.0-967.0)	0.68	0.054 (0.066)	0.41
MCP-2/CCL8	37.1 (30.8-53.2)	42.6 (36.7-53.8)	0.11	-0.203 (0.140)	0.15
MCP-4/CCL13	100.5 (74.4-138.6)	111.2 (64.0-144.6)	0.67	-0.021 (0.123)	0.87
MIG/CXCL9	816.8 (579.0-1103.9)	860.2 (633.0-1337.3)	0.37	-0.063 (0.116)	0.59
MIP-1A/CCL3	15.7 (12.0-19.1)	15.4 (10.9-19.9)	0.94	0.102 (0.126)	0.42
MIP-1B/CCL4	51.9 (36.5-67.6)	46.2 (30.5-56.5)	0.08	0.212 (0.120)	0.08
MIP-1D/CCL15	2006.4 (1497.9-2390.1)	2043.7 (1647.6-2873.3)	0.14	-0.149 (0.087)	0.09
MIP-3B/CCL19	108.8 (80.7-142.4)	118.5 (91.8-161.8)	0.11	-0.117 (0.082)	0.16
SAA ^c	5755.0 (4328.2-10049.0)	6643.7 (2671.5-12135.0)	0.96	0.039 (0.173)	0.82
SAP ^c	61715.0 (54722.0-72896.0)	65990.0 (54339.0-76917.0)	0.27	0.007 (0.044)	0.87
SCF	19.7 (5.8-31.5)	18.7 (10.0-25.2)	0.53	-0.406 (0.244)	0.10
SDF-1A+B	2263.1 (1965.7-2714.4)	2157.1 (1811.3-2753.7)	0.65	0.045 (0.065)	0.49
sEGFR ^c	100.3 (90.4-115.0)	97.3 (91.7-109.5)	0.60	0.011 (0.030)	0.71
sGP-130 ^c	250.5 (231.7-282.4)	257.3 (231.7-290.9)	0.51	-0.021 (0.038)	0.58
sILRII	8612.9 (7214.6-10547.0)	8208.8 (6881.5-10079.0)	0.31	0.090 (0.072)	0.22
sIL-6R ^c	38.9 (30.5-45.4)	37.9 (31.4-44.3)	0.71	0.025 (0.052)	0.64
sTNFR1	2175.2 (1880.2-2480.0)	2255.5 (1903.2-2574.2)	0.53	0.002 (0.049)	0.96
sTNFR2	8510.0 (7227.3-9877.7)	8308.3 (6819.2-10493.5)	0.75	0.042 (0.071)	0.55
sVEGFR2 ^c	21.9 (19.0-25.4)	23.3 (21.1-26.1)	0.16	-0.060 (0.037)	0.10
sVEGFR3	3227.7 (2257.1-5511.0)	3919.7 (2905.0-4909.2)	0.34	-0.082 (0.108)	0.45
TARC/CCL17	76.2 (54.5-122.7)	96.5 (61.2-131.2)	0.20	-0.098 (0.114)	0.39
TGF-A	1.9 (0.9-4.3)	1.7 (1.0-3.9)	0.76	-0.133 (0.231)	0.57
TNF-A	14.1 (11.0-17.9)	15.0 (11.0-18.1)	0.77	-0.057 (0.079)	0.47
TPO	179.8 (98.5-402.2)	227.1 (110.0-374.0)	0.53	-0.249 (0.256)	0.33
TRAIL	32.8 (25.4-45.0)	41.6 (30.1-52.9)	0.04	-0.139 (0.091)	0.13
VEGF	238.6 (123.7-438.7)	221.1 (132.5-326.7)	0.50	0.028 (0.207)	0.89

^a Levels of immune markers are expressed as pg/mL unless otherwise noted.

^b Beta coefficient (standard error) comparing natural log-transformed analyte levels between hog farmers and controls, based on multivariate linear regression models adjusted for age, season of phlebotomy, BMI, recent history of respiratory infection, recent NSAID use, and raising cattle.

^c Levels of immune markers are expressed as ng/mL.