



3415A 3 Ave NW, Calgary, Alberta, T2N 0M4, Canada

**Patient Name:** Patient, Name**Specimen ID (SID):** 25-001-0000**DOB:** 01-Jan-2000**PHN:** AB 0000000**Reason for Testing:** Long COVID**Relevant Medications:** -**External SID:** 123456789**Doctor:** Dr. Doctor**Report Date:** 12-Mar-2025**Specimen Type:** Serum**Date/Time Collected:** 01-Jan-2025 / 00:00**Specimen Source:** MitogenDx**Cytokine, Chemokine & Growth Factor Panel****Laboratory Developed Test (LDT)****Report Summary:****Sample Comments:**

-

Results Summary:**High Analytes:** 6CKine, CCL28, FGF-2, I-309, IFN γ , IFN ω , IL-1 α , IL-1 β , IL-1RA, IL-2, IL-12p70, IL-13, IL-15, IL-16, IL-17A, IL-17F, IL-23, IL-29, IL-33, IL-35, LIF, Lymphotoctin, sFas, sFasL, TSLP**Moderate High Analytes:** Fractalkine, GM-CSF, IFN β , PDGF-AA, PDGF-AB/BB, TGF α **Low Analytes:** M-CSF, SCF**Results Interpretation:**

The grouping profile indicates a significant elevation in group A1, which may reflect innate or autoimmune inflammation with significant activity, and a moderate elevation in group D1, suggesting possible evidence of moderate lymphocyte activation.

The immune activation profile reveals an active type 1 response characterized by initiation/propagation factors (IL-12p70, IL-2) and effector cytokines (IFN γ), an active type 2 response with initiation/propagation factors (IL-33, TSLP), and a type 3 response showing potential pathogenic Th17 activity with initiation/propagation factors (IL-23, IL-1 α , IL-1 β) and effector cytokines (IL-17A, IL-17F). Additionally, there are active immunosuppressive factors, notably IL-35 (high) and IL-1RA (high), indicating a complex immune response.

The cytokine profile suggests potential involvement of various immune cells, including T cells (IL-15, IL-2), cytotoxic T cells (GM-CSF, IL-12p70, IL-2, Lymphotoctin), NK cells (IL-12p70, IL-15, IL-2), and basophils (GM-CSF, IL-33, TSLP).

Disclaimer:

The interpretation of these test results should be correlated with clinical findings and other diagnostic tests. Biomarker levels can vary due to many biological, physiological, and diurnal factors; their clinical significance must be assessed by a qualified healthcare professional. This information is not intended to be used as the sole basis for diagnosis or treatment decisions.

Reviewed by: DP**Eve Technologies Corporation is a CLIA certified High Complexity International Laboratory**



3415A 3 Ave NW, Calgary, Alberta, T2N 0M4, Canada

**Patient, Name**

PHN: AB 0000000; DOB: 01-Jan-2000; SID: 25-001-0000; External SID: 123456789

Cytokine, Chemokine & Growth Factor Panel**Laboratory Developed Test (LDT)**

Analyte	Results (pg/ml)	Reference Interval†	Analyte	Results (pg/ml)	Reference Interval†
6CKine	1599 HIGH	325 - 1345	IL-20	63.5	12 - 126
APRIL	1597	180 - 5514	IL-21	15.7	0 - 32.5
BAFF	1005	329 - 2260	IL-22	87.5	0 - 164
BCA-1	138	28 - 249	IL-23	41735 HIGH	0 - 6719
CCL28	3039 HIGH	0 - 800	IL-24	1082	24 - 2732
CTACK	1024	235 - 1379	IL-27	1482	167 - 4330
EGF	99.7	0 - 191	IL-28A	32.0	0 - 76.3
ENA-78	710	207 - 1563	IL-29	32.5 HIGH	0 - 31.8
Eotaxin	40.7	7.5 - 90.9	IL-31	33.7	0 - 55.3
Eotaxin-2	338	73 - 1309	IL-33	39.5 HIGH	0 - 36.5
Eotaxin-3	73.9	7.7 - 93.2	IL-34	90.3	6 - 149
FGF-2	232 HIGH	16 - 215	IL-35	564 HIGH	0 - 371
FLT-3L	13.8	1.0 - 51.1	IP-10	191	19 - 334
Fractalkine	426	35 - 441	I-TAC	75.7	18 - 220
GCP-2	104	30 - 258	LIF	32.4 HIGH	0 - 24.3
G-CSF	41.2	0 - 88.5	Lymphotactin	150 HIGH	0 - 100
GM-CSF	95.7	0 - 99.4	MCP-1	270	72 - 723
Granzyme A	29.5	9 - 120	MCP-2	61.5	5.7 - 88.5
Granzyme B	17.4	0.9 - 26.3	MCP-3	31.1	4.3 - 41.2
GRO α	32.0	3.5 - 62.3	MCP-4	107	22 - 156
HMGB1	2562	0 - 4078	M-CSF	< 1.6 LOW	2 - 321
I-309	128 HIGH	0.8 - 66.4	MDC	519	167 - 1214
IFN- α 2	59.3	4 - 139	MIG	901	380 - 6176
IFN β	142	0 - 161	MIP-1 α	42.7	9.4 - 88.1
IFN γ	19.6 HIGH	0.2 - 18.3	MIP-1 β	39.0	8 - 115
IFN ω	69.8 HIGH	0 - 67.3	MIP-1 δ	3132	1166 - 7149
IL-1 α	258 HIGH	3.4 - 82.5	MIP-3 α	7.7	2.7 - 44.3
IL-1 β	144 HIGH	0 - 89.4	MIP-3 β	120	26 - 237
IL-1RA	43.4 HIGH	0.9 - 40.9	MPIF-1	176	69 - 715
IL-2	16.0 HIGH	0 - 9.9	PDGF-AA	4160	202 - 4693
IL-3	< 0.4	0 - 1.1	PDGF-AB/BB	> 18750	11200 - 34600
IL-4	5.7	0.1 - 8.1	Perforin	4479	1119 - 10192
IL-5	8.9	0.4 - 18.4	RANTES	528	389 - 2464
IL-6	4.4	0.2 - 10.6	sCD137	26.7	3.7 - 40.4
IL-7	4.9	0 - 17.4	sCD40L	6166	361 - 11200
IL-8	3.3	1.0 - 26.0	SCF	184 LOW	382 - 1908
IL-9	12.2	0.8 - 27.2	SDF-1	2662	868 - 4506
IL-10	0.9	0 - 21.6	sFas (ng/ml)	73.7 HIGH	2.9 - 44.8
IL-11	19.2	0 - 41.2	sFasL	658 HIGH	24 - 428
IL-12p40	80.2	14 - 186	TARC	99.0	7 - 245
IL-12p70	48.5 HIGH	0 - 25.2	TGF α	25.3	1.1 - 30.5
IL-13	256 HIGH	9 - 229	TNF α	88.8	15 - 167
IL-15	68.9 HIGH	1.4 - 65.1	TNF β	26.5	0 - 54.7
IL-16	807 HIGH	19 - 788	TPO	132	36 - 1231
IL-17A	50.7 HIGH	0 - 23.3	TRAIL	27.1	4.4 - 87.6
IL-17E/IL-25	641	66 - 1785	TSLP	2.9 HIGH	0 - 2.6
IL-17F	102 HIGH	0 - 69.8	VEGF-A	184	13 - 495
IL-18	38.6	6 - 283			

† Reference intervals estimated by data-mining ≥ 1000 SERUM samples drawn from both healthy and pathological subjects.

Patient, Name

PHN: AB 0000000; DOB: 01-Jan-2000; SID: 25-001-0000; External SID: 123456789

Cytokine Groupings - Immune Signatures

Groupings represent co-expressing cytokines identified by non-biased clustering of >130 clinical plasma-EDTA samples

Analyte	Results (pg/ml)	Reference Interval†	Analyte	Results (pg/ml)	Reference Interval†
GROUP A1 - INNATE/AUTOIMMUNE INFLAMMATION			GROUP D1 - LYMPHOCYTE RECRUITMENT/ACTIVATION		
FGF-2	232 HIGH	16 - 215	BCA-1	138	28 - 249
IFN- α 2	59.3	4 - 139	CCL28	3039 HIGH	0 - 800
IL-1 α	258 HIGH	3.4 - 82.5	I-309	128 HIGH	0.8 - 66.4
IL-1 β	144 HIGH	0 - 89.4	IL-16	807 HIGH	19 - 788
IL-1RA	43.4 HIGH	0.9 - 40.9	IL-23	41735 HIGH	0 - 6719
IL-2	16.0 HIGH	0 - 9.9	IL-35	564 HIGH	0 - 371
IL-17A	50.7 HIGH	0 - 23.3	Lymphotactin	150 HIGH	0 - 100
GROUP A2 - PRO-INFLAMMATORY/T CELL BIOMARKERS			sCD137	26.7	3.7 - 40.4
Fractalkine	426	35 - 441	sFasL	658 HIGH	24 - 428
IFN γ	19.6 HIGH	0.2 - 18.3	TPO	132	36 - 1231
IL-4	5.7	0.1 - 8.1	GROUP D2 - MUCOSAL INFLAMMATION/DAMAGE		
IL-5	8.9	0.4 - 18.4	Eotaxin-3	73.9	7.7 - 93.2
IL-9	12.2	0.8 - 27.2	HMGB1	2562	0 - 4078
IL-12p40	80.2	14 - 186	IFN β	142	0 - 161
IL-12p70	48.5 HIGH	0 - 25.2	IFN ω	69.8 HIGH	0 - 67.3
IL-13	256 HIGH	9 - 229	IL-11	19.2	0 - 41.2
IL-17F	102 HIGH	0 - 69.8	IL-17E/IL-25	641	66 - 1785
IL-22	87.5	0 - 164	IL-20	63.5	12 - 126
MCP-3	31.1	4.3 - 41.2	IL-21	15.7	0 - 32.5
MIP-1 α	42.7	9.4 - 88.1	IL-24	1082	24 - 2732
TGF α	25.3	1.1 - 30.5	IL-28A	32.0	0 - 76.3
TNF α	88.8	15 - 167	IL-29	32.5 HIGH	0 - 31.8
TNF β	26.5	0 - 54.7	IL-31	33.7	0 - 55.3
GROUP A3 - HEMATOPOIETIC GROWTH FACTORS			IL-33	39.5 HIGH	0 - 36.5
GM-CSF	95.7	0 - 99.4	IL-34	90.3	6 - 149
G-CSF	41.2	0 - 88.5	LIF	32.4 HIGH	0 - 24.3
IL-3	< 0.4	0 - 1.1	TSLP	2.9 HIGH	0 - 2.6
IL-7	4.9	0 - 17.4	GROUP E - IMMUNE CELL TRAFFICKING/ACTIVATION		
GROUP B - INNATE INFLAMMATION/CYTOKINE STORM			6CKine	1599 HIGH	325 - 1345
BAFF	1005	329 - 2260	CTACK	1024	235 - 1379
FLT-3L	13.8	1.0 - 51.1	Eotaxin	40.7	7.5 - 90.9
IL-27	1482	167 - 4330	Eotaxin-2	338	73 - 1309
IL-6	4.4	0.2 - 10.6	MDC	519	167 - 1214
IL-8	3.3	1.0 - 26.0	MIP-1 δ	3132	1166 - 7149
IP-10	191	19 - 334	MPIF-1	176	69 - 715
I-TAC	75.7	18 - 220	RANTES	528	389 - 2464
IL-10	0.9	0 - 21.6	SCF	184 LOW	382 - 1908
IL-15	68.9 HIGH	1.4 - 65.1	SDF-1	2662	868 - 4506
IL-18	38.6	6 - 283	GROUP F - PLATELET ACTIVATION/WOUND HEALING		
MCP-1	270	72 - 723	APRIL	1597	180 - 5514
MCP-2	61.5	5.7 - 88.5	EGF	99.7	0 - 191
M-CSF	< 1.6 LOW	2 - 321	ENA-78	710	207 - 1563
MIG	901	380 - 6176	GCP-2	104	30 - 258
MIP-1 β	39.0	8 - 115	GRO α	32.0	3.5 - 62.3
MIP-3 α	7.7	2.7 - 44.3	MCP-4	107	22 - 156
MIP-3 β	120	26 - 237	PDGF-AA	4160	202 - 4693
GROUP C - CELL DEATH BIOMARKERS			PDGF-AB/BB	> 18750	11200 - 34600
Perforin	4479	1119 - 10192	sCD40L	6166	361 - 11200
sFas (ng/ml)	73.7 HIGH	2.9 - 44.8	TARC	99.0	7 - 245
TRAIL	27.1	4.4 - 87.6	VEGF-A	184	13 - 495

† Reference intervals estimated by data-mining ≥ 1000 SERUM samples drawn from both healthy and pathological subjects.

Cytokine Groupings Descriptions

GROUP A1 - INNATE / AUTOIMMUNE INFLAMMATION
The analytes in this group are associated with innate immunity (IL-1 α / β , IL-17E/IL-25, IFN α 2), type 1 (IFN α 2, IL-2, MIP-1 α), and type 3 (IL-17A, IL-1) immune responses. IL-1, type I interferons, IL-17, MIP-1 α , and FGF-2 contribute to autoimmune diseases, while IL-2 and IL-17E/IL-25 can either promote or suppress autoimmunity. IL-17A and FGF-2 synergistically drive inflammation in autoimmune arthritis. IL-1, IL-17, and FGF-2 potentiate Th17-mediated immunity, a key driver of autoimmunity, whereas IL-2 and IL-17E/IL-25 negatively regulate Th17 activity. IFN α 2 exacerbates Th17-mediated inflammation, as seen in systemic lupus erythematosus (SLE), where IFN α 2 and IL-17A form a pathogenic signaling axis. IL-1 α / β also drive innate inflammatory responses and autoinflammatory conditions, and IL-1RA is expressed as a negative regulator of IL-1 signaling.
GROUP A2 - PRO-INFLAMMATORY/T CELL BIOMARKERS
This group of analytes includes pro-inflammatory cytokines involved in initiating innate inflammation and adaptive immune responses. The cytokine profile reflects Th1 (IFN γ , IL-12p70, TNF β ; intracellular pathogens/autoimmunity), Th2 (IL-4, IL-5, IL-13, IL-9; helminths/allergy/tissue repair), Th17 (IL-17F, IL-22; extracellular pathogens/autoimmunity), Th9 (IL-9), and Th22 (IL-22, IL-13) responses, which influence allergy and autoimmunity. Mixed T cell cytokine patterns may indicate diverse inflammatory responses, T cell heterogeneity and plasticity, or hybrid cells expressing multiple cytokines (e.g., IL-4 with IFN γ , IFN γ with IL-17A). These patterns may also reflect regulatory mechanisms, such as type 2 cytokine release following tissue damage from type 1 or type 3 responses.
GROUP A3 - HEMATOPOIETIC GROWTH FACTORS
The analytes in this group are hematopoietic growth factors and could indicate the expansion and activation of lymphocytes (IL-7) and/or leukocytes (GM-CSF, G-CSF, IL-3).
GROUP B - INNATE INFLAMMATION/CYTOKINE STORM
High levels of these analytes may indicate innate immune responses. IL-6 drives acute phase protein release, IL-18 acts as a pro-inflammatory alarmin via inflammasome activation, and Flt-3L supports innate lymphoid cell development. Elevated levels can signify severe systemic inflammation, such as cytokine storm (CRS). Key cytokines involved in CRS include IL-6, IL-10, IL-18, IL-8, MIG, IP-10, MIP-1 β , and MCP-1. IL-10, despite its anti-inflammatory role, is upregulated in CRS, reflecting an insufficient regulatory response. High analyte levels are common in CRS-related conditions like macrophage activation syndrome (MAS), adult-onset Still's disease (AOSD), systemic arthritis, hemophagocytic lymphohistiocytosis (HLH), and lymphocytic leukemia.
GROUP C - CELL DEATH BIOMARKERS
The analytes in this group promote cell death through facilitating (perforin) or directly inducing apoptosis (sFas, TRAIL).
GROUP D1 - LYMPHOCYTE RECRUITMENT/ACTIVATION
Elevated levels of these analytes may reflect the recruitment and activation of NK, T, and B cells. Granzyme A and B are cytotoxic mediators from NK and CD8+ T cells. sCD137 indicates NK and T cell activity, while sFasL regulates apoptosis and is shed by NK and CD8+ T cells. Lymphotactin (CD8+ T cells), CCL28 (NK and T cells), I-309 and IL-16 (CD4+ T cells) recruit lymphocytes to inflammation sites. IL-23 has context-specific pro-inflammatory effects on NK cells, CD4+ and CD8+ T cells, while IL-35 suppresses inflammation and cytotoxic cell function.
GROUP D2 - MUCOSAL INFLAMMATION/DAMAGE
Elevated levels of these analytes may indicate tissue injury and mucosal inflammation. IL-17E/IL-25, TSLP, and IL-33 are epithelial alarmins that activate type 2 immune responses. IFN β and IFN ω (type 1 interferons) and IL-28A and IL-29 (type 3 interferons) are linked to innate antiviral responses and mucosal immunity. HMGB1, released by damaged cells, promotes interferon expression. IL-34 supports mucosal-resident macrophages, while IL-11, IL-20, and IL-21 contribute to epithelial defense and tissue repair.
GROUP E - IMMUNE CELL TRAFFICKING/ACTIVATION
The analytes in this group drive the recruitment, homing and activation of leukocytes and lymphocytes.
GROUP F - PLATELET ACTIVATION/WOUND HEALING
High levels of these analytes suggest platelet activation and wound healing, as they are released by platelets and involved in angiogenesis, tissue remodeling, and inflammation. Elevated levels are seen in conditions linked to vascular injury, angiogenesis, and thrombocytosis, such as AOSD, Kawasaki disease, juvenile arthritis, FMF, COVID-19, and Crohn's disease. Lower levels are associated with thrombocytopenia-related conditions like HLH, lymphocytic leukemia, and hematopoietic stem cell transplantation. Notably, serum samples show significantly higher analyte levels than plasma samples from the same individuals.

Descriptions of the analytes and groupings with citations are available from Eve Diagnostics.

Clusters of co-expressing cytokines were determined with unsupervised clustering analysis of >130 plasma-EDTA specimens, using a similar approach as described in our publication: [Polley DJ, et al. \(2023\) Identification of novel clusters of co-expressing cytokines in a diagnostic cytokine multiplex test. Front. Immunol. 14:1223817. doi: 10.3389/fimmu.2023.1223817](#). The designations of physiological/pathological significance assigned to each grouping are speculative, based on an analysis of the immune signatures in our database of clinical specimens and on the functional/pathological roles of the analytes in each grouping established in the scientific literature.