

How ImmunDx supports clinical practice

Clinical interpretation of tear biomarkers



i-ImmunDx™ Analyzer

OBJECTIVE • QUANTITATIVE • PoC



i-ImmunDx Analyzer

A rapid point-of-care platform that quantifies tear biomarkers and supports differential assessment of dry eye, ocular allergy and ocular surface inflammation.

- LTA** Dry eye and mucin / goblet-cell function
- IgE** IgE-mediated ocular allergy
- MMP-9** Ocular surface inflammation

LTA

DRY EYE
ASSESSMENT

≤ 0.11 ng/mL

**Severe mucin /
goblet-cell deficiency**

Support mucin secretion
and ocular surface repair

0.11–0.55 ng/mL

**Mucin / goblet-cell
deficiency**

Support tear-film stability
and tissue repair

0.55–2.50 ng/mL

Reference range

Manage according to
symptoms and clinical
findings

≥ 2.50 ng/mL

**Increased T-cell
immune activity**

Assess inflammation and
consider
immunomodulation

IgE

OCULAR
ALLERGY
ASSESSMENT

< 1.0 IU/mL

**No significant
elevation**

Consider dry eye,
infection or non-IgE
inflammation

1.0–2.50 IU/mL

**Borderline / mildly
elevated**

Correlate with signs,
symptoms and other
findings

2.5–22.08 IU/mL

**Mild-to-moderate IgE
allergy**

Consider antihistamine
and/or mast-cell stabilizer

> 22.08 IU/mL

**Moderate-to-severe
IgE allergy**

Reduce allergen exposure
and consider added
anti-inflammatory therapy

MMP-9

INFLAMMATION

< 38 ng/mL

**No significant
elevation**

Interpret with other
biomarkers and clinical
findings

38–135 ng/mL

**Mild-to-moderate
inflammation**

Treat the cause and
support ocular surface
repair

135–358 ng/mL

**Moderate-to-severe
inflammation**

Consider appropriate
anti-inflammatory
therapy

> 358 ng/mL

**Severe inflammation
with epithelial
damage**

Identify the cause and
support epithelial repair

Biomarker combinations

Clinical interpretation and management considerations

● ● ● LTA IgE MMP-9

● ● IgE + LTA Ocular allergy and dry eye phenotypes

CONCENTRATION	CLINICAL INTERPRETATION	MANAGEMENT
IgE > 2.50 IU/mL LTA > 2.50 ng/mL	IgE allergy with increased T-cell immune activity	Treat allergy. Assess need for anti-inflammatory or immunomodulatory therapy.
IgE > 2.50 IU/mL LTA < 0.55 ng/mL	IgE allergy with mucin / goblet-cell deficient dry eye	Treat allergy and tear-film deficiency. Support mucin secretion and surface repair.
IgE < 1.0 IU/mL	IgE allergy less likely	Interpret with signs, symptoms and LTA to assess dry eye or other disease.

● ● LTA + MMP-9 Dry eye phenotype and inflammation

CONCENTRATION	CLINICAL INTERPRETATION	MANAGEMENT
LTA > 2.50 ng/mL MMP-9 > 38 ng/mL	T-cell activity with inflammation and epithelial damage	Consider immunomodulatory and anti-inflammatory therapy. Support epithelial repair.
LTA < 0.55 ng/mL MMP-9 > 38 ng/mL	Mucin / goblet-cell deficient dry eye with inflammation	Address inflammation while supporting mucin secretion, repair and tear-film stability.
LTA < 0.55 ng/mL MMP-9 < 38 ng/mL	Mucin / goblet-cell deficiency without significant MMP-9 elevation	Promote mucin secretion, surface repair and tear-film stability.

● ● IgE + MMP-9 Ocular allergy and inflammation

CONCENTRATION	CLINICAL INTERPRETATION	MANAGEMENT
IgE > 2.50 IU/mL MMP-9 > 38 ng/mL	IgE allergy with surface inflammation and epithelial damage	Treat allergy. Consider added anti-inflammatory therapy and epithelial repair.
IgE > 2.50 IU/mL MMP-9 < 38 ng/mL	IgE allergy without significant MMP-9 elevation	Initiate appropriate anti-allergic therapy.
IgE < 2.50 IU/mL MMP-9 > 38 ng/mL	Surface inflammation without significant IgE elevation	Evaluate dry eye, infection, irritation or other inflammatory disease.
IgE < 1.0 IU/mL MMP-9 < 38 ng/mL	No significant IgE or MMP-9 elevation	Manage according to clinical findings and consider other etiologies.

● ● ● IgE + LTA + MMP-9 Comprehensive ocular surface assessment

CONCENTRATION	CLINICAL INTERPRETATION	MANAGEMENT
IgE > 2.50 IU/mL LTA > 2.50 ng/mL MMP-9 > 38 ng/mL	IgE allergy with T-cell activity and concurrent inflammation	Treat allergy and inflammation. Assess need for additional immunomodulatory therapy.
IgE > 2.50 IU/mL LTA < 0.55 ng/mL MMP-9 > 38 ng/mL	IgE allergy with mucin / goblet-cell deficient dry eye and inflammation	Treat allergy and inflammation. Address tear-film deficiency and support surface repair.

ImmunDx scientific publications

Tear biomarkers: LTA, IgE and MMP-9

PEER-REVIEWED EVIDENCE

01 Recent Developments in Tear Fluid Biomarkers: An Expert Perspective on Clinical Translation

Gijs M, Enríquez-de-Salamanca A, Hagan S, Grzybowski A, Versura P

[Taylor & Francis, 2026](#)

02 Anti-inflammatory and dry eye benefits of accelerated epi-off corneal cross-linking in pediatric keratoconus with allergic ocular surface disease and elevated MMP-9

Mazzotta C, Gagliano C, D'Esposito F, et al.

[Eye and Vision. 2026;13\(1\):2](#)

03 Tear lymphotoxin-alpha deficiency is associated with conjunctival epitheliopathy in patients with dry eye disease

Yang Y, Lin T, Gong L

[The Ocular Surface. 2025;38:209–218](#)

04 Exploring the Diagnostic Utility of Tear IgE and Lid Wiper Epitheliopathy in Ocular Allergy Among Individuals with Hay Fever

Thomas R, Azizoglu S, Suphioglu C, Mikhail E, Gokhale M

[Int J Mol Sci. 2025;26\(18\):9116](#)

05 Correlations between tear lymphocytotoxin- α (LT- α) level and disease severity in adult keratoconus

Qin X, Luo S, Fang X, et al.

[Front Med. 2025;12:1591159](#)

06 Tear matrix metalloproteinases-9 and ocular surface parameters in diabetics: a cross-sectional study in Shenyang, China

Qu Z, Pazo EE, Yang L, et al.

[BMJ Open. 2025;15:e087530](#)

07 Inflammation due to ocular surface homeostasis imbalance caused by pterygia: tear lymphotoxin-alpha study and a literature review

Fang X, Lan G, Lin Y, et al.

[J Ophthalmic Inflamm Infect. 2024;14\(1\):28](#)

08 Evaluation of lymphotoxin-alpha in pterygium and diagnostic value in active and inactive pterygium states

Lan G, Fang X, Zhong Y, et al.

[Scientific Reports. 2024;14\(1\):1866](#)

09 Role of lymphotoxin alpha as a new molecular biomarker in revolutionizing tear diagnostic testing for dry eye disease

Li CR

[Int J Ophthalmol. 2023;16\(11\):1883–1889](#)

10 Exploration of efficacy and mechanism of 0.05% cyclosporine eye drops (II) monotherapy in allergic conjunctivitis-associated dry eye

Jiao X, Qi Y, Gao N, Zhang C, Zhao S, Yang R

[Eye. 2024;38\(5\):937–944](#)

11 Significantly reduced level of lymphotoxin-alpha in tears from dry eye patients with Sjögren's syndrome or other systemic immune disease detected with a Point-of-Care LTA test

Huang JF, Li H, Li L, Xiao AY, Liao C, Li Y

[IOVS. 2023;64\(8\):3946](#)

12 Management of inflammation in dry eye disease: Recommendations from a European panel of experts

Messmer EM, Ahmad S, Benítez Del Castillo JM, et al.

[Eur J Ophthalmol. 2023;33\(3\):1294–1307](#)

13 Effects of Diquafosol Sodium Ophthalmic Solution on Tear Film Matrix Metalloproteinase-9 and Corneal Nerve Density in Patients with Type 2 Diabetic Dry Eye

Qin G, Chen J, Li L, et al.

[J Ocul Pharmacol Ther. 2024;40\(6\):370–378](#)

14 Executive summary: Japanese guidelines for allergic conjunctival diseases 2021

Miyazaki D, Fukushima A, Uchio E, et al.

[Allergol Int. 2022;71\(4\):459–471](#)

15 Diagnosis, Management, and Treatment of Vernal Keratoconjunctivitis in Asia

Mehta JS, Chen WL, Cheng ACK, et al.

[Front Med. 2022;9:882240](#)

16 Total IgE in tears accurately reflects the severity and predicts the prognosis of seasonal allergic conjunctivitis

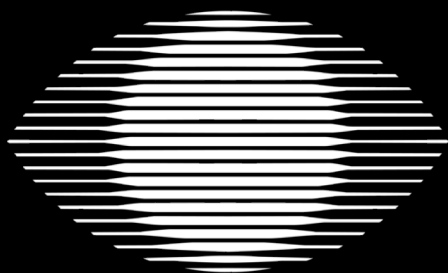
Bao J, Tian L, Meng Y, et al.

[Clin Transl Allergy. 2022;12\(3\):e12139](#)

17 Ophthalmic manifestations are associated with reduced tear lymphotoxin- α levels in chronic ocular graft-versus-host disease

Ma J, Li C, Zhao Y, Shen Z, Hu B, Peng R, Hong J

[BMC Ophthalmol. 2022;22\(1\):18](#)



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