Client: Example Client ABC123
123 Test Drive
Salt Lake City, UT 84108
UNITED STATES

Physician: Doctor, Example

Patient: Patient, Example

DOB	8/1/1988
Gender:	Female
Patient Identifiers:	01234567890ABCD, 012345
Visit Number (FIN):	01234567890ABCD
Collection Date:	00/00/0000 00:00

Laminin 332 and p200 Antibodies, IgG by IIF

ARUP test code 3020664

Laminin 332 and p200 Ab, IgG/IgG4 by IIF

See Note

CLINICAL INFORMATION
No clinical information available.

Specimen Details
S26-IP0003784 - ; Collected: 4/20/2026; Received: 4/20/2026

DIAGNOSTIC INTERPRETATION

Consistent with anti-laminin 332 pemphigoid and/or anti-p200 (laminin beta4) pemphigoid:

- Positive IgG/IgG4 laminin 332 serum antibodies, providing support for the diagnosis of anti-laminin 332 pemphigoid with the possibility of associated malignancy, and

- Positive IgG/IgG4 laminin beta4 serum antibodies, providing support for the diagnosis of anti-p200 pemphigoid and/or overlapping/cross-reactive expression with laminin 332 antibodies

(See Results and Comments including recommendations for correlating with other testing and malignancy evaluation)

RESULTS
Indirect Immunofluorescence (IIF)

Laminin 332 IgG/IgG4 Antibodies

Positive, titer 1:10 or greater (H)

Reference Range:
Negative - Titer less than 1:10/no antibody detection
Indeterminate - Possible, not definite, detection
Positive (H) - Titer 1:10 and greater

(H) = high/positive

p200 (laminin beta4) IgG/IgG4 Antibodies

Positive, titer 1:10 or greater (H)

Reference Range:
Negative - Titer less than 1:10/no antibody detection
Indeterminate - Possible, not definite, detection
Positive (H) - Titer 1:10 and greater

(H) = high/positive

H=High, L=Low, *=Abnormal, C=Critical

COMMENTS

Specific

Positive IgG/IgG4 laminin 332 antibodies are detected by indirect immunofluorescence (IIF) testing with substrate consisting of transfected cells expressing whole-length recombinant heterotrimeric laminin 332. The positive findings provide support for the diagnosis of anti-laminin 332 pemphigoid, a type of mucous membrane pemphigoid (MMP). Important to note is that up to 30 percent of patients who demonstrate positive antibodies to laminin 332 have an associated malignancy or will develop one in 1-3 years. The sensitivity of the test in detecting IgG/IgG4 laminin 332 antibodies in patients with MMP is reported at 84 percent with specificity greater than 99.5 percent (Goletz 2019 Reference).

Positive IgG/IgG4 laminin beta4 (p200) antibodies also are detected by IIF testing with substrate consisting of transfected cells expressing the laminin beta4 subunit. Most patients with anti-p200 pemphigoid have antibodies to the laminin gamma1 subunit, and this pemphigoid variant previously was known alternatively as anti-laminin gamma1 pemphigoid. However, in vitro and ex vivo findings showed that laminin beta4, instead of laminin gamma1, was the relevant pathophysiologic antigenic target. Positive findings provide support for the diagnosis of anti-p200 pemphigoid and/or overlapping or cross-reacting expression of antibodies to more than one antigenic basement membrane zone (BMZ) target, commonly referred to as epitope spreading. The sensitivity of this test in detecting IgG/IgG4 laminin beta4 (p200) antibodies in patients with anti-p200 pemphigoid is reported at 99 percent with specificity at 99 percent (Goletz 2024 Reference).

The qualitative results reported herein as "positive" or "negative" are derived from testing one concentration of patient serum with appropriate positive and negative controls. Serum levels of laminin 332 and laminin beta4 (p200) IgG/IgG4 antibodies have been reported to correlate with disease activity, but only small numbers of patients with the respective diseases have been studied. Serial serum dilution testing to determine antibody levels is not performed in the IgG/IgG4 laminin 332 and IgG/IgG4 laminin beta4 (p200) testing procedures with the attendant possibility of false negative findings because of theoretical "hook" or prozone effects. Concomitant IIF testing with monkey esophagus substrate and, specifically, with human BMZ split skin substrate (also known as salt split skin) showing dermal-localizing (floor) BMZ antibodies can provide a surrogate semiquantitative antibody level with the limiting-dilution, end-point titer.

Dermal-localizing BMZ antibodies with split skin substrate by IIF are found by serum testing in patients with epidermolysis bullosa acquisita and in a subset of patients with bullous lupus erythematosus in addition to patients with anti-laminin 332 pemphigoid and anti-p200 (laminin beta4) pemphigoid. Mucosal involvement may be a part of the clinical presentation in all of these disorders. Patients with epidermolysis bullosa acquisita and bullous lupus erythematosus can be distinguished by increased levels of characteristic serum IgG antibodies to type VII collagen by ELISA and, for patients with bullous lupus erythematosus, by other serologic markers of systemic lupus. However, epitope spreading with autoantibody reactivity to more than one antigenic target of the cutaneous BMZ is observed, particularly in patients with p200 antibodies (Holtsche 2021 Reference). Moreover, co-expression of IgG and IgA or predominant or exclusive IgA BMZ antibodies may develop in patients, which has implications for disease severity and treatment approach.

Correlation with other serum BMZ antibody testing by IIF (IgG, IgG4, IgA) and by ELISAs (BP180, BP230, and type VII collagen) provides additional immunopathological/diagnostic assessment, including general BMZ antibody reactivity with semiquantitative antibody levels when positive/increased, and is recommended. If such testing has not been done and is clinically indicated to evaluate the immunopathological profile, further testing may be performed on this serum specimen by contacting ARUP Client Services at 1-800-242-2787, option 2, with add-on test request for:
- Basement Membrane Zone Antibody Panel (ARUP test number 3001410).

Detection, patterns, and levels of diagnostic antibodies may fluctuate with disease manifestations. Clinical correlation is needed, including with direct immunofluorescence findings on a biopsy specimen and treatment status with further clinical evaluation as appropriate for the association of laminin 332 antibodies with malignancy. Monitoring antibody profiles may aid in assessing disease expression and activity, particularly with persistent, progressive, or changing disease, and in response to therapy.

If it would be helpful to discuss the patient case with this report, contact ARUP Client Services at 1-800-242-2787, option 2, and ask to speak with the Immunodermatology Laboratory at the University of Utah regarding patient results.

References:

Goletz S, et al. A sensitive and specific assay for the serological diagnosis of antilaminin 332 mucous membrane pemphigoid. Br J Dermatol, 2019;180:149-56. doi:10.1111/bjd.17202 https://pubmed.ncbi.nlm.nih.gov/30216412/

Goletz S, et al. Sensitive and specific assay for the serological diagnosis of anti-p200 pemphigoid based on the recombinant laminin beta4 subunit. Br J Dermatol. 2024 Jun 20;191(1):140-141. doi: 10.1093/bjd/ljae136. PMID: 38544457. https://pubmed.ncbi.nlm.nih.gov/38544457/

Holtsche MM, et al. Serologic characterization of anti-p200 pemphigoid: Epitope spreading as a common phenomenon. J Am Acad Dermatol. 2021 Apr;84(4):1155-1157. doi: 10.1016/j.jaad.2020.07.076. Epub 2020 Jul 22. PMID: 32711089. https://pubmed.ncbi.nlm.nih.gov/32711089/

General

Pemphigoid is a diagnostic category encompassing multiple disease variants characterized by autoantibodies directed against structural components of the basement membrane zone (BMZ) of skin and mucous membranes, often resulting in blistering and erosions. Direct immunofluorescence testing of mucocutaneous biopsy specimens from patients with pemphigoid characteristically demonstrates linear IgG and/or IgG4 reactivity and/or linear C3 localization along the BMZ. Serum testing by indirect immunofluorescence (IIF) with human skin split at the BMZ (also known as salt split skin) as a tissue substrate distinguishes BMZ antibody localization and aids in determining pemphigoid variants. About 15 percent of serum specimens with BMZ antibodies are dermal-localizing (floor), and the remainder are epidermal-localizing (roof) or combined epidermal-dermal-localizing (roof and floor). Scarring in patients with pemphigoid correlates with the BMZ autoantibody target and the resulting depth and persistence of inflammation. Pemphigoid variants characterized by dermal-localizing (floor) BMZ antibodies as compared to epidermal-localizing (roof) are more frequently associated with scarring and permanent tissue changes.

Dermal-localizing BMZ antibodies target p200 (laminin beta4, laminin gamma1) most commonly (approximately 80 percent), characteristic of anti-p200 pemphigoid. Smaller subsets target type VII collagen (11 percent), as in epidermolysis bullosa acquisita and bullous lupus erythematosus, and laminin 332 (3.5 percent) as in patients with anti-laminin 332 mucous membrane pemphigoid (MMP). In approximately 11 percent of the patients with p200 antibodies, dual reactivity was observed with either type VII collagen or laminin 332 antibodies (Lau 2019 Reference). In other testing, autoantibodies targeting BP180, BP230, laminin 332, and type VII collagen, in addition to laminin beta4, were found in almost 40 percent of patients with anti-p200 pemphigoid (Kasperkiewicz 2026 Reference).

Approximately 20 percent of patients with MMP have IgG/IgG4 antibodies to laminin 332 detected in their sera. Oral mucosa is predominantly affected in anti-laminin 332 MMP but conjunctival, anogenital, nasal, pharyngeal, and, rarely, laryngeal and esophageal mucosae also may be affected; skin (non-mucosal) lesions develop in 20 percent of patients. In patients with positive antibodies to laminin 332, up to 30 percent have an associated malignancy or will be found to have a malignancy in 1-3 years. Solid tumor adenocarcinomas and carcinomas are the most commonly associated malignancies, including lung, stomach, colon, pancreas, ovary, endometrium, cervix, kidney, prostate, thyroid, and liver, as well as non-Hodgkin lymphomas, B-cell lymphoma, and cutaneous T-cell lymphoma/mycosis fungoides. Patients with MMP and associated malignancy who have no detectable antibodies to laminin 332 have been described. Patients with MMP and other disorders who are positive for laminin 332 IgG/IgG4 antibodies must be carefully evaluated and followed for development of a malignancy (Shi 2022 Reference).

Anti-p200 pemphigoid clinically mimics other pemphigoid diseases, particularly bullous pemphigoid and the inflammatory variant of epidermolysis bullosa acquisita, but also linear IgA disease and dermatitis herpetiformis, and can be easily misdiagnosed without specific testing. Mucosal involvement is found in about 40 percent of patients. An association with psoriasis also has been described in up to one third of patients; psoriasis typically precedes anti-p200 pemphigoid.

Laminins play a crucial role at the cutaneous basement membrane, assisting in cell adhesion and migration. Laminin 332 (previously known as laminin 5, epiligrin, nicein, and kalinin) is a major component of the anchoring filaments in skin and mucous membranes and is essential for maintaining integrity of the epidermal-dermal junction. Laminins are heterotrimeric glycoproteins, and the three different alpha, beta, and gamma chains are the basis of the current laminin-naming convention. Laminin 332 is composed of alpha3, beta3, and gamma2 subunits. Laminin 332 mediates cell adhesion by interaction with integrins, syndecans, BP180 (type XVII collagen), and type VII collagen. Pathogenic effects of laminin 332 antibodies have been shown in mouse models. The target antigen in anti-p200 pemphigoid initially was identified as laminin gamma1, and 70-90 percent of patients have IgG laminin gamma1 subunit antibodies. Three laminins with gamma1 chains, laminins 311, 321, and 511 (previously known as laminins 6, 7, and 10, respectively), are in the epidermal-dermal junction. When ex vivo and in vivo findings failed to support pathogenic effects from laminin gamma1 antibodies, the laminin beta4 subunit emerged as the relevant pathogenic antigenic target. Laminin beta4 is present in skin, but its physiological function is still unknown; an actual trimer containing laminin beta4 has been postulated but is unverified. The functional consequences of IgG/IgG4 laminin beta4 antibodies in patients with anti-p200 pemphigoid remain to be determined, and there may be structural relationships between laminin beta4 and laminin gamma1 subunits that contribute to antibody development.

Clinical entities with BMZ antibodies exhibit overlapping

manifestations, including skin and mucosal involvement with blistering and erosions, often accompanied by pruritus, and may resemble more common inflammatory disorders such as eczema or urticaria, and other types of mucositis. Drug-induced variants have been described, and these conditions are recognized among autoimmune adverse events associated with immune checkpoint inhibitor therapy. Identification of the specific pemphigoid variant based on its autoantibody target is clinically relevant as antigen specificity may be associated with differences in prognosis, associated conditions, and treatment responses.

References:

Lau I, et al. Anti-p200 pemphigoid is the most common pemphigoid disease with serum antibodies against the dermal side by indirect immunofluorescence microscopy on human salt-split skin. J Am Acad Dermatol. 2019 Nov;81(5):1195-1197. Doi: 10.1016/j.jaad.2019.03.077. Epub 2019 Apr 3. PMID: 30953703. https://pubmed.ncbi.nlm.nih.gov/30953703/https://pubmed.ncbi.nlm.nih.gov/30953703/

Kasperkiewicz M, Pigors M, Holtsche MM, Goletz S, Schmidt E. Anti-p200 pemphigoid. Br J Dermatol. 2026 Jan 6;194(1):10-17. Doi: 10.1093/bjd/ljaf324. PMID: 40853220. https://pubmed.ncbi.nlm.nih.gov/40853220/

Shi L, Li X, Qian H. Anti-Laminin 332-Type Mucous Membrane Pemphigoid. Biomolecules. 2022 Oct 12;12(10):1461. Doi: 10.3390/biom12101461. PMID: 36291670; PMCID: PMC9599625. https://pubmed.ncbi.nlm.nih.gov/36291670/

TESTING METHODS
Indirect Immunofluorescence (IIF)

Laminin 332 IgG/IgG4 antibodies and laminin beta4 (p200) IgG/IgG4 antibodies

Specific IgG/IgG4 antibodies to laminin 332 are identified by indirect immunofluorescence (IIF) performed with patient serum overlaid on a substrate consisting of human embryonic kidney (HEK)293 cells expressing whole-length recombinant heterotrimeric laminin 332 on cover glass "biochips" (Biochip Euroimmun, Luebeck Germany). Specific IgG/IgG4 antibodies to laminin beta4 (p200) are detected by IIF performed with patient serum overlaid on a substrate consisting of HEK293 cells expressing whole-length recombinant laminin beta4 subunit (p200) on cover glass "biochips" (Biochip Euroimmun). IgG/IgG4 binding to each substrate is detected by addition of fluorescein-labeled anti-IgG conjugate (antibody recognizing all four human IgG subclasses) supplemented with fluorescein-labeled IgG4 conjugate (anti-IgG and anti-IgG4 to enhance detection sensitivity). The biochips are examined with fluorescence microscopy for positive immunostaining that indicates the presence of IgG/IgG4 laminin 332 antibodies and/or IgG/IgG4 laminin beta4 (p200) antibodies. Qualitative results, reported as "positive" or "negative", are derived from testing one concentration of patient serum with appropriate positive and negative controls. The performance characteristics of this indirect immunofluorescence test have been assessed by the University of Utah Immunodermatology Laboratory and meet specifications required by the Clinical Laboratory Improvement Amendment of 1988 (CLIA). The laminin 332 IgG/IgG4 serum antibody testing is designated as an "in vitro diagnostic" and has CE Mark certification (EUROIMMUN Medizinische Labordiagnostika AG, Luebeck, Germany). The testing has not been cleared or approved by the US Food and Drug Administration (FDA). The testing was performed in a CLIA-certified laboratory and is intended for clinical purposes. The results are not intended to be used as the sole means for clinical diagnosis or patient management decisions.[Indirect immunofluorescence, one antibody on two substrates (IIF X 2)]

Electronically signed by Kristin M Leiferman, MD, on 04/21/26 at 3:52 PM.
Performed At: IMMUNODERMATOLOGY LABORATORY
417 S. WAKARA WAY, SUITE 2151
SALT LAKE CITY, UT 84108
Medical Director: KRISTIN M. LEIFERMAN, MD
CLIA Number: 46D0681916

EER Laminin 332/p200 Ab, IgG/IgG4 by IIF	See Note

Authorized individuals can access the ARUP Enhanced Report with an ARUP Connect account using the following link.

Your local lab can assist you in obtaining the patient report if you don't have a Connect account.

VERIFIED/REPORTED DATES

Procedure	Accession	Collected	Received	Verified/Reported
Laminin 332 and p200 Ab, IgG/IgG4 by IIF	26-110-112878	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00
EER Laminin 332/p200 Ab, IgG/IgG4 by IIF	26-110-112878	00/00/0000 00:00	00/00/0000 00:00	00/00/0000 00:00

END OF CHART

H=High, L=Low, *=Abnormal, C=Critical