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NEW YORK STATE 2020 -2021 LABORATORY PERMIT CATEGORY DESCRIPTIONS

The categorization of testing is determined by the intended clinical use of the testing, the test method employed, and the related Certificate of Qualification required for laboratory director and/or assistant director responsible for the testing. The laboratory director/assistant director is responsible for the design of laboratory developed tests (LDTs); initial validation of all tests; monitoring and verifying ongoing performance; and provision of consultation/interpretation to clients of the laboratory regarding the test. Note that the breadth of testing allowed under a given permit category may be limited based on the restrictions placed on the responsible individual's Certificate of Qualification (CQ) in the corresponding CQ category.

The following guidance is intended to assist laboratories in selecting the appropriate permit category for molecular testing. In the Andrology, Cytogenetics, Immunohematology, Histocompatibility, Genetic Testing, Parentage/Forensic Identity and Oncology categories, molecular testing means analyses intended to identify/evaluate human nucleic acid (DNA, RNA) as well as gene expression. In the microbiology categories, molecular testing means analyses for the identification of microbial pathogens and determination of antimicrobial resistance/susceptibility (DNA and RNA) and includes MALDI-TOF spectrometry to identify microbial organisms via analysis of constituent proteins. In Histopathology and Cytopathology, molecular testing includes *in-situ* hybridization (ISH)-based testing of tissue and exfoliated cells, as directed (and where required, reported) by pathologists.

ANDROLOGY

This category is for laboratories that perform tests of male fertility on patient or donor specimens. These tests include, but are not limited to, semen analysis (sperm concentration/count, sperm motility, and sperm morphology), semen biochemical tests, sperm DNA fragmentation assays, cervical mucus penetration tests, anti-sperm and anti-ovary antibody tests, sperm-egg interaction tests, and other sperm function tests.

Qualitative testing for the presence or absence of viable sperm in semen may be performed under the categories of either Andrology or Hematology. Measurements of reproductive hormones, such as testosterone, FSH or LH activity, are included in the Endocrinology category. Testing to detect genetic markers of infertility and preimplantation genetic diagnosis of embryos is included in the Genetic Testing – Molecular category.

BACTERIOLOGY

This category is for laboratories that examine clinical specimens for the presence of bacteria. Methodologies include, but are not limited to, culture, gram stains, antimicrobial susceptibility testing, molecular assays and/or direct detection techniques.

BLOOD pH AND GASES

This category is for laboratories performing measurements of blood pH, pCO_2 and/or pO_2. Blood gas laboratories may also perform testing for carboxyhemoglobin, oxyhemoglobin, methemoglobin and carbon monoxide under this category or they may be performed by a laboratory holding the category of Clinical Chemistry.

Additional permit categories may be needed if testing in the areas of Clinical Chemistry or Hematology are being performed on a Blood Gas analyzer. These tests may include, but are not limited to, electrolytes, hemoglobin, etc.

BLOOD SERVICES

Blood Services categories are for blood banks that collect, process, and/or issue blood for transfusion. One or more categories may be appropriate based on the scope of services. Additional permit categories may be needed if testing of donor specimens is performed on-site: Immunohematology (red blood cell, granulocyte, and/or platelet-related testing for blood collection, transfusion, or pregnancy-associated purposes), Diagnostic Immunology – Donor Services Serology (serologic tests for specific markers of infectious disease), Hematology (for donor and/or unit qualification), Virology (nucleic acid testing for viruses), and Bacteriology (bacteria detection).

COLLECTION: This category is for blood banks that collect, process, store, and distribute allogeneic and/or autogeneic blood for transfusion or fractionation purposes.

COLLECTION - AUTOGENEIC ONLY: This category is for blood banks that collect only blood for autogeneic (autologous) transfusion and do not cross over these units or their components for allogeneic use.

TRANSFUSION SERVICE: This category is for blood banks that perform pre-transfusion testing and issue blood for transfusion. Such sites must also hold Immunohematology. A hospital's permit in Blood Services – Transfusion covers transfusions performed at any location that is owned and operated by, and physically attached to, the hospital.

TRANSFUSION - STORAGE ONLY: This category is for facilities that issue blood for transfusion, but rely on a blood bank holding a permit in Blood Services – Transfusion and Immunohematology to perform pre-transfusion testing.

Non-hospital sites and satellite sites that are not otherwise required to hold a clinical laboratory or blood bank permit must be approved as a LIMITED TRANSFUSION SERVICE in order to perform transfusions. Inquiries regarding Limited Transfusion Services should be directed to the Blood Resources Program at brp@health.ny.gov or (518) 485-5378.

PLASMA PROCESSING: This category is for facilities that fractionate plasma into infusable derivatives and/or perform viral reduction/inactivation of pooled plasma.

CELLULAR IMMUNOLOGY

Laboratories analyzing the function and/or phenotype of cells of the immune system must hold any or all of the categories below that describe the scope of their services.

LEUKOCYTE FUNCTION: This category is for laboratories testing any leukocyte function with *in vitro* assays (e.g., antigen-induced proliferation, alloantigen-stimulated proliferation, mitogen-stimulated proliferation, cytolytic assays, cytokine or immunoglobulin production, neutrophil generation of reactive oxygen species, and phagocytosis). If determination of the immunophenotype of the leukocytes being assayed is included as part of the assay (e.g., *in vitro* culturing to induce cytokine synthesis with the purpose of identifying the cell type expressing a cytokine), the analysis also requires the Non-malignant Leukocyte Immunophenotyping category.

NOTE: The determination of cytokines in serum, plasma, CSF, or culture supernatants from Leukocyte Function analysis must also include the Cytokine category.

MALIGNANT LEUKOCYTE IMMUNOPHENOTYPING: This category is for laboratories performing identification and characterization of leukemia or lymphomas from blood and tissue specimens based on cell phenotype, including cell surface and cytoplasmic antigens, with or without ploidy analysis.

CELLULAR IMMUNOLOGY - continued

NON-MALIGNANT LEUKOCYTE IMMUNOPHENOTYPING: This category is for laboratories performing Lymphoid and T-Lymphoid Immunophenotyping. This includes the identification and enumeration of non-malignant lymphocytes that bear different surface and/or intracellular markers for the purpose of assessing the immunological status of an individual (e.g., quantifying $CD4^+$ T-lymphocytes, T regulatory cells, or interferon-gamma expressing lymphocytes).

NOTE: If leukocytes are stimulated *in vitro* to induce a change in cell phenotype, the analysis also requires the Leukocyte Function category.

This category also includes Non-Lymphoid Immunophenotyping. Example methodologies include quantification of viable $Lin^-/CD34^+$ stem cells, deficiency of glycophosphatidylinositol linked surface markers (e.g., CD24, CD14, CD59) for Paroxysmal Nocturnal Hemoglobinuria, deficiency of CD15s, CD11a, b, c & CD18 expression for Leukocyte Adhesion Deficiency, and TLR expression(s) for innate immunity. Laboratories performing white blood cell counts and manual differentials for calculation of absolute numbers of lymphocyte/leukocyte subsets must also hold a Hematology permit.

CLINICAL CHEMISTRY

This category is for laboratories performing diagnostic clinical chemistry tests including substrates, enzymes, electrolytes, and metal analyses. Laboratories issued a Clinical Chemistry permit may perform a full scope of clinical chemistry testing except in those areas defined by the Blood pH and Gases, Trace Elements, Therapeutic Substance Monitoring/Quantitative Toxicology, Endocrinology and/or the Genetic Testing - Biochemistry categories.

CYTOGENETICS

Cytogenetics is the analysis of the chromosome complement of human cells for constitutional or acquired changes in chromosome number or structure. Laboratories may perform prenatal, preimplantation, postnatal, and cancer testing under this category. The Cytogenetics category includes standard methods, laboratory developed tests, and FDA approved/cleared tests. Methods include metaphase chromosome analysis by G-banding, chromosomal microarray (CMA) testing, array comparative genomic hybridization (aCGH), and metaphase and interphase fluorescence in situ hybridization (FISH).

CMA and aCGH testing for constitutional disorders also may be performed under the Genetic Testing – Molecular category. CMA, aCGH, or FISH testing for acquired aberrations also may be performed under the Oncology - Molecular and Cellular Tumor Markers category. Confirmation of abnormal CMA results, if performed, requires the appropriate permit category.

CYTOKINES

This category is for laboratories performing the quantification of cytokines and chemokines in biological fluids or cell culture supernatants with methods such as ELISA, FIA, or RIA. Cytokines and chemokines include both immunoregulatory molecules as well as molecules that influence the activity of other organ systems.

NOTE: If the measurement of cytokines and chemokines produced by leukocytes is involved, the assays must also include the Cellular Immunology – Leukocyte Function category. If cytokine(s) expressed within a leukocyte population are measured, the analyses are in the Non-Malignant Leukocyte Immunophenotyping category and not Cytokines.

CYTOPATHOLOGY

This category is for laboratories preparing and examining cells and tissue fragments that have exfoliated freely from tissue surfaces or that have been collected by brushing, scraping, washing, lavage or needle aspiration. The laboratory that performs both the technical and professional components, or the laboratories that performs each component individually, must hold each appropriate subcategory for the testing being performed as described below. Testing of cytology specimens for HPV is performed under the category of Virology.

GYNECOLOGICAL TESTING: This category is for laboratories that perform gynecological cytopathology testing on patient specimens for diagnostic or prognostic purposes.

NON-GYNECOLOGICAL TESTING: This category is for laboratories that perform non-gynecological cytopathology testing on patient specimens for diagnostic or prognostic purposes. Approved laboratories may offer the FDA-cleared UroVysion™ assay under this category.

DIAGNOSTIC IMMUNOLOGY

The Diagnostic Immunology categories are for laboratories performing the following types of tests: serologic tests for autoantibodies (excluding tests for antibodies against blood cells performed under the categories of Hematology, Immunohematology, and Histocompatibility and excluding tests for antibodies against spermatozoa performed under the category of Andrology), serologic tests for specific markers of infectious diseases or exposure to such diseases (e.g., antibody/antigen), and tests for nonspecific indicators of infectious diseases or exposure to such diseases (e.g., immunoglobulin or complement levels).

DIAGNOSTIC SERVICES SEROLOGY: This category is for laboratories that perform any diagnostic immunologic test on patient specimens for diagnostic or prognostic purposes.

DONOR SERVICES SEROLOGY: This category is for donor banks, and laboratories under contract to donor banks, that perform tests on donors of human organs, tissues and/or blood for transfer, transfusion or transplantation. Mandated tests include syphilis-reagin or treponemal antibody, hepatitis B surface antigen (HBsAg), hepatitis B core antibody (anti-HBc), hepatitis C antibody (anti-HCV), human T lymphotropic virus I/II antibody and human immunodeficiency virus (HIV). However, donor banks that perform any additional serologic tests, e.g., cytomegalovirus (CMV) antibody, must also hold this category. Donor Services laboratories must also hold the category Diagnostic Services Serology if they perform tests on patient specimens for diagnostic or prognostic purposes.

ENDOCRINOLOGY

This category is for laboratories evaluating endocrine function and vitamin status in the body by measuring hormones, vitamins and related analytes in body fluids.

FETAL DEFECT MARKERS

This category is for laboratories performing prenatal screening for risk assessment of chromosomal abnormalities or other defects of the fetus (e.g., neural tube defects) in the first and/or second trimester. Analytes are measured in maternal serum and amniotic fluid, and methodologies used include radioimmunoassay (RIA), enzyme immunoassay (EIA) or chemiluminoassay (CIA). Mass values obtained must be compared to the individual laboratory normative data of weekly values and converted to multiple of the medians (MOM). One of several algorithms is then used to calculate an individual's risk.

Laboratories that measure gestational age-dependent alpha-fetoprotein (AFP) in amniotic fluid must confirm the result by electrophoretic identification of acetylcholinesterase.

Please note that prenatal screening for chromosomal abnormalities by assessing plasma-derived DNA or RNA (e.g. Non-Invasive Prenatal Testing or NIPT) is performed under the category of Genetic Testing - Molecular.

FORENSIC IDENTITY

This category is for laboratories that perform DNA-based procedures for the determination of identity, or for the determination of parentage, for forensic purposes. Also included under this category are screening procedures to determine the presence of body fluids on evidentiary materials for forensic purposes. At this time, the standards for this category are those based on 1) the New York State DOH Clinical Laboratory Standards of Practice, 2) the New York State DOH Forensic Identity Standards; and 3) current and relevant Federal Bureau of Investigation (FBI) standards including the "Quality Assurance Standards for Forensic DNA Testing Laboratories" and the "Quality Assurance Standards for DNA Databasing Laboratories".

The NYS General and Forensic Identity Standards can be accessed via the Program website at https://www.wadsworth.org/regulatory/clep/clinical-labs/laboratory-standards
The FBI standards can be accessed at the FBI's CODIS website at http://www.fbi.gov/about-us/lab/biometric-analysis/codis.

GENETIC TESTING

The Genetic Testing categories are for laboratories performing procedures that provide information for the diagnosis of a genetic disease or its carrier state, risk assessment for drug metabolism, disease susceptibility, hemostasis, and disease risk and lifestyle assessments in addition to screening tests intended broadly for asymptomatic individuals not yet presenting with disease. These categories are also for laboratories using molecular methods to confirm results generated by SNP-based comparative genomic hybridization tests.

Predisposition testing for inherited cancers, preimplantation diagnosis (including molecular analysis of cells from embryos to detect single gene disorders, haplotype analysis for complex mutations, or HLA haplotyping for a sibling match prior to implantation), non-invasive prenatal diagnosis and pharmacogenetics applications are all included in the Genetic Testing category. Also, this category includes the use of genetic markers to test for zygosity for pregnancy management and maternal cell contamination in the context of genetic diagnosis and tests using genetic markers to monitor disease progression.

Some applications of molecular methods are not included in the Genetic Testing categories. Laboratories may also need to hold the additional categories including Cytogenetics, Forensic Identity, Histocompatibility, Immunohematology, Parentage/Identity, and/or Oncology – Molecular and Cellular Tumor Markers (for somatic changes in tumor tissue), as appropriate.

> **GENETIC TESTING – MOLECULAR:** This category is for laboratories performing diagnostic and predictive genetic testing utilizing DNA and/or RNA-based methodologies.
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> **GENETIC TESTING – BIOCHEMISTRY:** This category is for laboratories performing genetic testing utilizing biochemical procedures in laboratories where a specific genetic diagnosis or carrier status is being determined.

HEMATOLOGY

This category is for laboratories performing cellular hematology tests, such as white cell count, red cell count, hemoglobin, hematocrit, and platelet count, with or without other tests such as red cell indices, reticulocyte count, and erythrocyte sedimentation rate; manual differentials, smear examinations, or automated differentials with manual confirmation performed on-site; coagulation tests, such as prothrombin time, activated partial thromboplastin time and quantitative fibrinogen, with or without other tests such as thrombin time, and factor assays.

Qualitative testing for the presence or absence of viable sperm in semen may be performed under the categories of either Andrology or Hematology. If blood-borne parasites are observed during the routine smear examination, they may be reported as presumptive, however, the examination of blood smears specifically for parasites or the identification of parasites requires a permit in Parasitology.

HISTOCOMPATIBILITY

This category is for laboratories performing histocompatibility testing for organ/tissue transplantation. Testing may include HLA antigen typing, antibody screening, or crossmatching. Laboratories performing HLA antigen typing for disease associations or pharmacogenetics may perform that testing under this category or under the Genetic Testing category.

Laboratories performing chimerism analysis, gene expression analysis or the Immuknow® assay to monitor the status of a patient following an organ or tissue transplant must hold the category of Transplant Monitoring.

HISTOPATHOLOGY

The Histopathology categories are for laboratories performing gross and microscopic examination of tissues, including special stains and immunohistochemistry. Certain in situ hybridization tests, such as FDA-cleared fluorescence *in situ* hybridization tests (FISH) for the detection of Her-2/neu and TOP2A gene amplifications can be performed under either the Histopathology – General or the Oncology – Molecular and Cellular Tumor Markers category.

GENERAL: This category is for testing of all tissue. Testing for HPV in tissue is performed under this category. All other HPV testing is performed under Virology.

ORAL PATHOLOGY: This category is for testing limited to the oral cavity.

DERMATOPATHOLOGY: This category is for testing limited to skin, including examining frozen sections of skin excised during Mohs surgery.

IMMUNOHEMATOLOGY

This category is for laboratories that perform red blood cell-, granulocyte- and/or platelet-related testing for blood collection, transfusion or pregnancy-associated purposes. Methodologies include serologic, molecular and flow cytometric techniques for tests such as: red blood cell antigen and antibody testing, direct antiglobulin testing, compatibility testing, granulocyte antigen and antibody testing, platelet antigen and antibody testing, and assessment of fetomaternal hemorrhage.

MYCOBACTERIOLOGY

This category is for laboratories that perform any technique for the detection and identification of mycobacteria to the extent of their abilities, including examination of smears for acid-fast bacilli, culture, molecular techniques, and drug susceptibility testing on Mycobacterium tuberculosis complex organisms.

MYCOLOGY

This category is for laboratories that perform any technique for the detection and identification of molds and yeast to the extent of their abilities, including antigen detection assays, culture, molecular and protein based assays, and antifungal drug susceptibility testing.

ONCOLOGY

The Oncology categories include tests used in tumor screening, diagnosis, prognosis and management, including the standard serum-based tumor markers, tests for tumor cell specific acquired genotypic and/or phenotypic alterations, and screening/detection of carcinogenic viruses. Due to the different methodologies used, there are two categories:

SOLUBLE TUMOR MARKERS: This category is for laboratories performing tests for soluble tumor markers found in body fluids such as serum, urine, etc. Results from these tests are generally quantitative. Methodologies used include radioimmunoassay (RIA), enzyme immunoassay (EIA), or chemiluminoassay (CIA), as well as mass spectrometry (MS).

MOLECULAR AND CELLULAR TUMOR MARKERS: This category is for laboratories performing tests on cellular or tumor tissue material to detect tumor-specific acquired (somatic) genetic or phenotypic alterations. It includes, but is not limited to, tests that detect gene rearrangements, chromosomal aberrations such as gain/loss of chromosome regions, translocations, mutations, altered gene/protein expression, and *ex vivo* determination of chemotherapeutic drug sensitivity. It also includes circulating tumor cell detection and cell free DNA/RNA analysis (liquid biopsy). Methodologies used are generally, though not exclusively, molecular biology-based, and results can be qualitative and/or quantitative. FISH and array comparative genomic hybridization (aCGH) assays for acquired chromosomal aberrations may be performed under this category or under Cytogenetics..

PARASITOLOGY

This category is for laboratories that test patient specimens in order to detect and identify parasitic agents. Laboratories holding this category may perform microscopy, antigen detection, or molecular detection methods. Techniques may include wet mounts, permanent stained smears prepared from blood, stool or tissues, immunofluorescent microscopy, antigen detection with later flow devices or by EIA, or nucleic acid amplification based methods.

PARENTAGE/IDENTITY TESTING

This category is for laboratories that perform procedures for the determination of parentage or relationship. Laboratories performing parentage and/or identity tests for forensic purposes must hold a permit in the Forensic Identity category.

THERAPEUTIC SUBSTANCE MONITORING/QUANTITATIVE TOXICOLOGY

This category is for laboratories providing quantitative analysis of drugs and/or metabolites (therapeutic or abused) in serum, plasma and/or whole blood for the purpose of monitoring concentrations of active drug and/or metabolites and of quantifying subtherapeutic and/or toxic substance concentrations. Quantitative Toxicology includes quantitation of ethanol, including breath alcohol for non-forensic purposes, as well as analysis of all clinically relevant matrices for exogenous, non-drug/non-elemental compounds that may affect human health.

TOXICOLOGY

BLOOD LEAD – COMPREHENSIVE: This category is for laboratories that perform blood lead measurements using reference methods based on atomic absorption spectrometry (AAS) and/or inductively coupled plasma mass spectrometry (ICP-MS). Laboratories holding this category may also perform testing using point-of-care lead analyzers based on anodic stripping voltammetry (ASV) with screen-printed sensors, provided they also perform reference methods. This category includes testing for erythrocyte protoporphyrin.

BLOOD LEAD – ASV USING SCREEN-PRINTED SENSORS: This category is for laboratories using point-of-care lead analyzers (e.g., LeadCare® II by Magellan Biosciences, Inc. that are based on ASV with single use, disposable sensors, i.e., screen-printed electrode technology. Laboratories holding this category must either refer positive specimens (≥5 ug/dL) (≥ 40 ug/dL for LeadCare Plus or

LeadCare Ultra cf. CLS 11) to a laboratory holding a Blood Lead - Comprehensive permit for confirmatory testing using a reference method or, when a confirmatory specimen is unavailable, identify on the report the method/manufacturer used and the need for confirmation by a reference method.

FORENSIC TOXICOLOGY: The Forensic Toxicology categories are for laboratories that provide the analysis of urine and alternative specimens, including hair, oral fluid, sweat and breath, for abused substances where the legal defensibility of laboratory services must be established and maintained. Such services include pre-employment screening; for cause (i.e., incident/accident-related) and return to work testing, random employment testing; any testing situation where employment, benefits or services may be terminated or denied as the result of positive finding; and postmortem toxicology testing conducted by private sector laboratories. Laboratories qualifying for these categories must have protocols for specimen chain-of-custody and laboratory security. Quantitative reporting of specimen validity testing (e.g., pH, creatinine, oxidants) requires a permit in Clinical Chemistry.

> **INITIAL TESTING ONLY:** This category is for laboratories performing forensic drug-testing limited to initial (screening) testing only. Laboratories holding this category must refer presumptive positive specimens to a laboratory holding a Forensic Toxicology-Comprehensive permit for confirmatory testing.
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> **COMPREHENSIVE:** This category is for laboratories performing on-site confirmation analysis of presumptive positive drug screens using confirmatory methods acceptable to the Department.

CLINICAL TOXICOLOGY: The Clinical Toxicology categories are for laboratories performing tests for the detection of drugs/metabolites, including ethanol. Quantitative reporting of specimen validity testing (e.g., pH, creatinine, oxidants) requires a permit in Clinical Chemistry.

> **QUALITATIVE TESTING ONLY:** This category is for laboratories providing clinical toxicology services that are limited to qualitative tests using methods including, but not limited to, immunoassays, e.g., EIA, CIA, ELISA, and EMIT.
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> **COMPREHENSIVE:** This category is for laboratories performing quantitative tests suitable for confirmation of qualitative presumptive positive drug/metabolite tests. Methods typically include, but are not limited to chromatographic methods, e.g. LC-MS/MS or GC-MS. Laboratories permitted in this category may also perform qualitative tests and confirm with suitable quantitative tests, when available.

TRACE ELEMENTS

This category is for laboratories performing testing for trace elements (e.g., arsenic, cadmium, mercury, copper, zinc, selenium, aluminum) in clinical specimens, including whole blood, serum or urine. Testing for blood lead is included under the Toxicology – Blood Lead categories. Testing for electrolytes such as sodium, potassium, calcium and magnesium is performed under the Clinical Chemistry category.

TRANSPLANT MONITORING

This category is for laboratories performing chimerism analysis following a stem cell or bone marrow transplant, gene expression analysis for organ rejection, or the FDA-cleared Cylex ImmunKnow® assay for monitoring immune function following transplant.

VIROLOGY

> This category is for laboratories that perform any technique for the detection and identification of any viral agents routinely encountered in a clinical virology laboratory. Laboratories holding this category may perform antigen detection, virus culture, or molecular detection methods.

Techniques may include methods for the assessment of antiviral drug susceptibility, subtyping, or other virus characterization techniques.
Note: HPV testing that was previously performed under the category of Oncology – Human Papilloma Virus Testing is now included in the category of Virology.

WET MOUNTS

This category is for laboratories performing a direct, unstained examination of urogenital specimens (vaginal and urethral secretions) for the presence or absence of *Trichomonas vaginalis*, yeast, or bacteria, or to identify clue cells. It also includes tests for vaginal pH. Laboratories performing Gram stains on urogenital specimens must also hold the category of Bacteriology.