



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata
ACADEMIC YEAR	2024/2025
MASTER'S DEGREE (MSC)	MEDICINE AND SURGERY
INTEGRATED COURSE	LABORATORY MEDICINE - INTEGRATED COURSE
CODE	04988
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	BIO/12, MED/05
HEAD PROFESSOR(S)	BALISTRERI CARMELA Professore Associato Univ. di PALERMO RITA CIACCIO MARCELLO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	BALISTRERI CARMELA Professore Associato Univ. di PALERMO RITA CIACCIO MARCELLO Professore Ordinario Univ. di PALERMO SCOLA LETIZIA Professore Associato Univ. di PALERMO LO SASSO BRUNA Ricercatore a tempo determinato Univ. di PALERMO
CREDITS	6
PROPAEDEUTICAL SUBJECTS	13246 - SYSTEMATIC PATHOLOGY I - INTEGRATED COURSE 13248 - SYSTEMATIC PATHOLOGY II - INTEGRATED COURSE 13257 - SYSTEMATIC PATHOLOGY IV - INTEGRATED COURSE 13253 - SYSTEMATIC PATHOLOGY III - INTEGRATED COURSE
MUTUALIZATION	
YEAR	4
TERM (SEMESTER)	2° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	BALISTRERI CARMELA RITA Wednesday 10:00 12:00 Istituto di Patologia generale, Corso Tukory 211 CIACCIO MARCELLO Monday 10:00 12:00 Sezione di Biochimica Clinica Wednesday 10:00 12:00 Sezione di Biochimica Clinica LO SASSO BRUNA Tuesday 15:00 17:00 Sezione di Biochimica Clinica, Medicina Molecolare Clinica e Medicina di Laboratorio. Dipartimento di Biomedicina, Neuroscienze e Diagnostica avanzata Thursday 15:00 17:00 Sezione di Biochimica Clinica, Medicina Molecolare Clinica e Medicina di Laboratorio. Dipartimento di Biomedicina, Neuroscienze e Diagnostica avanzata SCOLA LETIZIA Tuesday 10:00 13:00 Sezione di Patologia Generale del Dipartimento di Biopatologia e Biotecnologie Mediche

<p>PREREQUISITES</p>	<p>The student will know the biochemistry and physiology of major organ systems that make up the human body and know the pathophysiology of major diseases.</p>
<p>LEARNING OUTCOMES</p>	<p>Objectives of the Laboratory Medicine Integrated course are to acquire the basic knowledge (theoretical and practical) to critically evaluate the biochemical data at the in relation to human disease.</p> <p>In particular:</p> <ul style="list-style-type: none"> • knowledge of the main laboratory tests and the cellular, molecular and pathophysiological basis which are prerequisites and foundation. • critical interpretation of laboratory tests results with regard to analytical and biological variation; reliability of diagnostic laboratory tests, examples of correct forms of laboratory reports. • basic concepts on the most relevant methodologies used in Clinical Biochemistry and their limitations. • appropriate use of laboratory tests in screening, staging and treatment of the disease. • correct interpretation of laboratory tests results and their critical correlation with molecular and cellular events induced by the disease. • acquisition of a proper programming prescription of tests in relation to the diagnosis or monitoring. <p>Knowledge of the main diagnostic tests used in the laboratory of Clinical Biochemistry and diagnostic significance of reference change values of the main laboratory parameters.</p> <p>Proper ordering for laboratory tests and using of guidelines and flowchart based on "Evidence Based Medicine".</p> <p>Be able to relate to colleagues and health operating in laboratory to understand and synthesize relevant information about all the problems, understanding their content and devising and agreeing on how to study.</p> <p>Perform adequately the request of the most common laboratory tests.</p> <p>Implement self-protection measures in the collection and handling of biological samples.</p>
<p>ASSESSMENT METHODS</p>	<p>The learning assessment consists in itinere evaluations and an oral examination. There is a oral test (pre-test) of the Clinical Biochemistry module in preparation for the final oral examination of the Integrated Course. Concerning the clinical pathology module, at the end of the lesson cycle, students will be able to verify their degree of learning by completing a questionnaire with multiple choice answers to clinical pathologies queries. The correct answer number will generate a vote expressed in thirtieth-rating. Students may use the rate awarded when they will face the Laboratory Medicine Integrated Course examination. Oral examination consists in a conversation, order to check competences and subject knowledge required from the course; the evaluation is expressed in thirtieths. The questions will tend to test the learning achieved by assessing a) the knowledge captured; b) the processing capacity, c) possession of adequate exhibition capacity. The pass mark will be reached when the student shows knowledge and understanding of the issues at least in general terms, and has minimal application knowledge in order to solve concrete cases; the student will also have presentation skills and of argument as to allow the transmission of his knowledge to the examiner. Below this threshold, the examination will be insufficient. he more the candidate will be able to interact with the examiner with his argumentative and presentation skills, and the more his knowledge and application capabilities will go into detail on the subjects under evaluation, the more the judgment will be positive, according to the following scheme:</p> <ul style="list-style-type: none"> - ECTS grade: A- A+ Excellent- Italian Grade: 30-30 cum laude Eccellente. Grade descriptors: Excellent knowledge of teaching contents; students should show high analytical and synthetic capabilities and should be able to apply their knowledge to solve highly complex problems. - ECTS grade: B Very good – Italian Grade: 27-29 Ottimo. Grade descriptors: Very good knowledge of the teaching contents and excellent language control; students should show analytical and synthetic skills and be able to apply their knowledge to solve problems of medium and, in some cases, even higher complexity. - ECTS grade: C Good – Italian Grade: 24-26 Buono. Grade descriptors: Good knowledge of teaching contents and good language control; the students should be able to apply their knowledge to solve problems of medium complexity. - ECTS grade: D Satisfactory – Italian Grade: 21-23 Discreto. Grade descriptors: Average knowledge of the teaching contents, in some cases limited to the main topics; acceptable ability to use the specific discipline language and independently apply the acquired knowledge. - ECTS grade: E Sufficient – Italian Grade: 18-20 Sufficiente. Grade descriptors: Minimum teaching content knowledge, often limited to the main topics; modest ability to use specific language of the disciplines and independently apply the acquired knowledge. - ECTS grade: F Fail – Italian Grade: 1-17 Insufficiente. Grade descriptors: Lack of an acceptable knowledge of the main teaching contents knowledge; very little or no ability to use the specific subject language and apply independently the

	<p>acquired knowledge. A sufficient grade in each module is necessary to pass the final exam. If the mark is insufficient in any of the modules, the student cannot pass the final examination. Link: http://www.unipa.it/scuole/dimedicinaechirurgia</p> <p>Compensatory tools and dispensatory measures will be guaranteed by the Disability and Neurodiversity Center - University of Palermo (Ce.N.Dis.) to students with disabilities and neurodiversity, based on specific needs and in implementation of current legislation.</p>
TEACHING METHODS	The didactic activity takes place through lectures.
DOCENTE: Prof.ssa CARMELA RITA BALISTRERI- Sede <i>HYPATIA</i>	
PREREQUISITES	The student must know the biochemistry, anatomy and physiology of the main systems that make up the human body, and possess the pathophysiological basis of the main pathologies
LEARNING OUTCOMES	<ol style="list-style-type: none"> 1. Knowledge of the main types of diagnostic tests in the Clinical Pathology, Clinical Biochemistry and Clinical Microbiology laboratories and diagnostic significance of the modification of laboratory parameters. 2. Correct use of the request for laboratory tests and use of guidelines and flowcharts based on "Evidence Based Medicine" to obtain laboratory data that can be used in the diagnostic-prognostic - therapeutic-results paths of patients. 3. Be able to relate to colleagues and healthcare workers working in the laboratory to understand and summarize the relevant information on all the problems, understanding the contents and developing and agreeing on the methods of further investigation.
ASSESSMENT METHODS	<p>Oral examination which consists of an interview aimed at verifying knowledge and full understanding of the topics addressed in the course, as well as the candidate personal capacity of explain and processing his/her knowledge. The use of the computer is also foreseen to verify the ability to create, modify, and manage a database with laboratory data. The vote is expressed in thirtieth, as detailed in the following scheme:</p> <p>30-30 laude: Excellent knowledge of teaching content; students demonstrate high analytical and synthetic capacity and can apply the knowledge to solve problems of high complexity</p> <p>27-29: Excellent knowledge of teaching content and excellent properties of language; students demonstrate analytical and synthetic skills and able to apply their knowledge to solve moderately complex and, in some cases problems, even high</p> <p>24-26: Good knowledge of teaching content and good properties of language, the student can apply the knowledge to solve problems of medium complexity</p> <p>21-23: Fair knowledge of teaching content, in some cases limited to the main topic; acceptable ability to use the specific language of the discipline and independently apply the knowledge acquired</p> <p>18-20: Minimum knowledge of teaching content, often limited to the main topic; modest ability to use the specific language of the discipline and independently apply the knowledge acquired</p> <p>1- 17: The student does not have an acceptable knowledge of the main teaching content, very little or no ability to use the specific language of the discipline and independently apply the knowledge acquired.</p> <p>In addition, "compensatory tools and dispensatory measures will be guaranteed by the Disability and Neurodiversity Center - University of Palermo (Ce.N.Dis.) to students with disabilities and neurodiversity, based on specific needs and in implementation of current legislation."</p>
TEACHING METHODS	Frontal lessons

**MODULE
CLINICAL BIOCHEMISTRY**

Prof. MARCELLO CIACCIO - Sede CHIRONE, - Sede IPPOCRATE

SUGGESTED BIBLIOGRAPHY

M. Ciaccio. Trattato di Biochimica Clinica e Medicina di Laboratorio. EdiSES, 2021. ISBN 9788836230440.
M. Ciaccio. Clinical and Laboratory Medicine Textbook. Springer, 2022.

AMBIT	50402-Medicina di laboratorio e diagnostica integrata
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INDIVIDUAL STUDY (Hrs)	45
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COURSE ACTIVITY (Hrs)	30
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EDUCATIONAL OBJECTIVES OF THE MODULE

Acquisition of basic and applied concepts of clinical biochemistry in order to evaluate methods and clinical applications of laboratory tests critically. Specific aim of the course is to be able to identify the correct tests in relation to clinical conditions of the patients and to be able to understand them in relation to the diagnosis.

Particularly, the students must:

- know the main laboratory tests and the biological, molecular and pathological basis for their use in medicine;
- use laboratory tests in screening, diagnosis, prognosis and therapy of diseases correctly;
- understand laboratory tests results and connect them to the molecular and cellular aspect of the pathologic state
- order laboratory tests appropriately in relation to diagnostic hypothesis or monitoring.

Knowledge of the molecular mechanisms underlying the main clinical syndromes arising from genetic alteration.

SYLLABUS

Hrs	Frontal teaching
3	Pre-analytical phase: preparation of the patient, collection of biological samples, processing and identification of biological samples. General laboratory techniques with descriptions of the principles - colorimetry, turbidimetry, nephelometry, fluorimetry, atomic absorption and emission, potentiometric electrochemical techniques, kinetic reactions, electrophoresis, immunoelectrophoresis, immunofixation, immunochemical analysis with monoclonal antibodies, isoelectric focusing, chromatography, radioimmunoassay, count cell, flow cytometry, clinical microscopy, mass spectrometry, HPLC, molecular biology and recombinant DNA technologies, multiple analyzers, magnetic resonance spectroscopy, PET.
2	Post-analytical phase: data collection, calculation, automatic processing. Analytical variation, analytical error, quality control systems. Intra-individual and inter-individual biological variation, reference values, nomenclature and reporting of laboratory tests. Clinical sensitivity and specificity, predictive laboratory tests. Methodological approaches in clinical biochemistry. The main analytical techniques, automation in clinical biochemistry.
2	Enzymes: tissue and organ profiles. Acid and alcalin phosphatase, aldolase, aminotrasferase, LDH, gammaGT, cholinesterase, amylase, lipase, protease, G-6-PD, piruvate kinase, lysozyme.
2	Metabolism of glucose: Diabetes: biochemistry of DMT1 and DMT2; biochemistry of diabetes complications; clinical biochemistry diagnostics (serum glucose, urine glucose, insulin, C-peptide, glucagon, cortisol, GH, glicated proteins and their significance, OGTT, ketone bodies in serum and urine, lactic acid, piruvic acid, dyslipidemia in diabetic patients, urine test in diabetic patients. Hypoglicemia: clinical biochemistry
2	Metabolism of lipids: Fatty acids, cholesterol, HDL-cholesterol, LDL-cholesterol, tryglicerides, phospholipids. Lipoprotein. Dyslipidemia. Hypercholesterolemia. Atherosclerosis and cardiovascular diseases. Metabolic syndrome. Myocardial infarction: risk factors, biochemical modification in the necrotic area; clinical enzymes, new markers of myocardial infarction. Stroke. Biomarkers in heart failure. Thrombophilia.
2	Metabolism of proteins: Plasma proteins. Electrophoresis of plasma proteins: interpretation of results. Laboratory evaluation of kidney function. Clinical biochemistry of kidney disease. Urinalysis. Hyperammonemia. Clinical biochemistry of liver failure. Urea metabolism: clinical biochemistry of enzymatic deficiency
2	Endocrine system: Clinical biochemistry of hypothalamus-pituitary axis: GH and growth, prolactin and amenorrhea, GnRH, LH, FSH and reproduction, ACTH, TSH e functional tests. Clinical biochemistry of endocrine pancreas: insulin and glucagon, somatostatin.
2	Clinical biochemistry of gastrointestinal hormones. Chronic Inflammatory Bowel Diseases (IBD). Helicobacter pylori infection. Stool examination. Clinical biochemistry of adrenal cortex hyperplasia and hypofunction. Clinical biochemistry of hyperthyroidism, thyreotoxicosis, hypothyroidism. Clinical biochemistry of testis, ovary and sex differentiation. Laboratory tests to monitoring pregnancy
2	Clinical biochemistry of bone metabolism. Clinical biochemistry of osteoporosis and osteomalacia. Calcium homeostasis. Hormone receptors and their importance in clinical biochemistry. Clinical biochemistry of arterial pressure regulation: ANF, catecholamines, glucocorticoids. Essential hypertension and secondary forms.

1	Clinical biochemistry of acid base balance. Arterial blood gas (ABG): interpretation and reporting.
2	Clinical Biochemistry of liver diseases. Clinical Biochemistry of jaundice. Clinical biochemistry of exocrine pancreas. Clinical Biochemistry of heme metabolism Clinical Biochemistry of rheumatic, connective and autoimmune diseases. Laboratory diagnostics of allergic diseases
2	Cancer diseases: biochemistry of cancer; metastasis, biomarkers. Liquid biopsy. Biochemistry of nutrition and its surveillance.
2	Laboratory tests in genetic diseases. Laboratory tests in myopathies. Clinical biochemistry of neuro-psychiatric diseases. Biochemistry of pain. Diagnosis of CNS and Psychiatric Diseases; Clinical biochemistry of the cerebrospinal fluid; Clinical Biochemistry of Alzheimer's Disease and other Neurodegenerative Dementias. Clinical biochemistry in shock, trauma and surgery.
2	Fever of unknown origin. Inflammatory biomarkers. Sepsis biomarkers. Laboratory Exercise Medicine. Preoperative examinations. Laboratory testing in Urgency / emergency. Biobank. HTA in Laboratory Medicine. Laboratory testing drug abuse. The role of laboratory medicine in the COVID-19 pandemic.
2	Clinical molecular biology: diagnostic techniques used for the diagnosis of the main genetic diseases. Main chromosomal abnormalities revealed by karyotyping. Monogenic diseases and DNA typing. DNA mutations analysis by direct and indirect analyzes (restriction polymorphism). PCR reaction (polymerase chain reaction) for the amplification of abnormal DNA sequences. In vivo clinical biochemistry.

**MODULE
CLINICAL BIOCHEMISTRY**

Prof.ssa BRUNA LO SASSO - Sede HYPATIA

SUGGESTED BIBLIOGRAPHY

M. Ciaccio. Trattato di Biochimica Clinica e Medicina di Laboratorio. EdiSES, 2021. ISBN 9788836230440.
M. Ciaccio. Clinical and Laboratory Medicine Textbook. Springer, 2022.

AMBIT	50402-Medicina di laboratorio e diagnostica integrata
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INDIVIDUAL STUDY (Hrs)	45
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COURSE ACTIVITY (Hrs)	30
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Acquisition of basic and applied concepts of clinical biochemistry in order to evaluate methods and clinical applications of laboratory tests critically. Specific aim of the course is to be able to identify the correct tests in relation to clinical conditions of the patients and to be able to understand them in relation to the diagnosis. Particularly, the students must: •know the main laboratory tests and the biological, molecular and pathological basis for their use in medicine; •use laboratory tests in screening, diagnosis, prognosis and therapy of diseases correctly; •understand laboratory tests results and connect them to the molecular and cellular aspect of the pathologic state •order laboratory tests appropriately in relation to diagnostic hypothesis or monitoring. Knowledge of the molecular mechanisms underlying the main clinical syndromes arising from genetic alteration.

SYLLABUS

Hrs	Frontal teaching
3	Pre-analytical phase: preparation of the patient, collection of biological samples, processing and identification of biological samples. General laboratory techniques with descriptions of the principles - colorimetry, turbidimetry, nephelometry, fluorimetry, atomic absorption and emission, potentiometric electrochemical techniques, kinetic reactions, electrophoresis, immunoelectrophoresis, immunofixation, immunochemical analysis with monoclonal antibodies, isoelectric focusing, chromatography, radioimmunoassay, count cell, flow cytometry, clinical microscopy, mass spectrometry, HPLC, molecular biology and recombinant DNA technologies, multiple analyzers, magnetic resonance spectroscopy, PET.
2	Post-analytical phase: data collection, calculation, automatic processing. Analytical variation, analytical error, quality control systems. Intra-individual and inter-individual biological variation, reference values, nomenclature and reporting of laboratory tests. Clinical sensitivity and specificity, predictive laboratory tests. Methodological approaches in clinical biochemistry. The main analytical techniques, automation in clinical biochemistry.
2	Enzymes: tissue and organ profiles. Acid and alkaline phosphatase, aldolase, aminotransferase, LDH, gammaGT, cholinesterase, amylase, lipase, protease, G-6-PD, pyruvate kinase, lysozyme.
2	Metabolism of glucose: Diabetes: biochemistry of DMT1 and DMT2; biochemistry of diabetes complications; clinical biochemistry diagnostics (serum glucose, urine glucose, insulin, C-peptide, glucagon, cortisol, GH, glycosylated proteins and their significance, OGTT, ketone bodies in serum and urine, lactic acid, pyruvic acid, dyslipidemia in diabetic patients, urine test in diabetic patients. Hypoglycemia: clinical biochemistry
2	Metabolism of lipids: Fatty acids, cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, phospholipids. Lipoprotein. Dyslipidemia. Hypercholesterolemia. Atherosclerosis and cardiovascular diseases. Metabolic syndrome. Myocardial infarction: risk factors, biochemical modification in the necrotic area; clinical enzymes, new markers of myocardial infarction. Stroke. Biomarkers in heart failure. Thrombophilia.
2	Metabolism of proteins: Plasma proteins. Electrophoresis of plasma proteins: interpretation of results. Laboratory evaluation of kidney function. Clinical biochemistry of kidney disease. Urinalysis. Hyperammonemia. Clinical biochemistry of liver failure. Urea metabolism: clinical biochemistry of enzymatic deficiency
2	Endocrine system: Clinical biochemistry of hypothalamus-pituitary axis: GH and growth, prolactin and amenorrhea, GnRH, LH, FSH and reproduction, ACTH, TSH e functional tests. Clinical biochemistry of endocrine pancreas: insulin and glucagon, somatostatin.
2	Clinical biochemistry of gastrointestinal hormones. Chronic Inflammatory Bowel Diseases (IBD). Helicobacter pylori infection. Stool examination. Clinical biochemistry of adrenal cortex hyperplasia and hypofunction. Clinical biochemistry of hyperthyroidism, thyrotoxicosis, hypothyroidism. Clinical biochemistry of testis, ovary and sex differentiation. Laboratory tests to monitoring pregnancy
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**MODULE
CLINICAL PATHOLOGY**

Prof.ssa CARMELA RITA BALISTRERI - Sede CHIRONE, - Sede HYPATIA

SUGGESTED BIBLIOGRAPHY

Medicina di Laboratorio _ Logica & Patologia Clinica – terza edizione-Ed. Piccin (DATA PUBBLICAZIONE: marzo 2019 ISBN: 978-88-299-2973-3; CODICE PICCIN: 0110091; NUMERO PAGINE: 1440; AUTORI: Antonozzi - Gulletta

Biochimica clinica e medicina di laboratorio_ terza edizione _Ed. Edises (data pubblicazione: 18 agosto 2020); EAN: 9788836230228; ISBN-10:8836230229; Numero PAGINE: 620; AUTORI: M. CIACCIO, G. LIPPI.

Trattato di Biochimica e medicina di laboratorio. Edises, 2021; ISBN9788836230440; pg. 894. Autore: Ciaccio M.

AMBIT	50402-Medicina di laboratorio e diagnostica integrata
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

Objectives of Clinical Pathology teaching are to enable students to acquire the basic techniques and application of clinical pathology that can allow them to use the most appropriate clinical procedures for the patient' s preparation to laboratory tests, collecting biological samples, management of reports and identifying the advantages and limitations.

SYLLABUS

Hrs	Frontal teaching
1	Biomarkers and their biological , pre-analytical, analytical variability and their applications in the functional assessment or tissue damage and organ
4	Blood and its components, their functions. Counts of blood cells and their applications in the diagnosis laboratory of blood disorders, such as anemia. Alterations in leukocyte formula and their applications in immune disorders
3	Pathophysiology of autoimmune diseases, their classification and diagnostic criteria. Biomarkers in their diagnosis laboratory
2	Systemic Inflammatory response and sepsis. Their laboratory diagnosis with SOFA score. The utility of inflammatory and emerging biomarkers
2	Immunohematology and transfusion medicine. Features of principal blood groups and their laboratory determinations. Recommendations and guidelines for blood components transfusions, laboratory pretransfusion evaluations and compatibility testing.
2	Allergy diseases and their laboratory diagnosis: CRD diagnosis and the use of classical and emerging biomarkers, algorithms
2	Liver diseases and their laboratory diagnosis: the classical and news biomarkers, and their utility in diagnostic and prognostic algorithms
2	Neurodegenerative diseases and laboratory diagnosis. Multiple sclerosis and its clinical management; dementia and its clinical management
2	Emostasis and related pathologies: laboratory diagnosis and guidelines
2	Urinalysis: description, collection and storage of the sample, investigation of the physicochemical characteristics. and microscopic evaluation of the sediment. Evaluation of kidney functionality and injury (i.e. acute or chronic) by assessing specific biomarkers
2	Laboratory diagnosis of hypertension and miocardial infarction. Heart failure and its management, and laboratory diagnosis: biomarkers of miocardial insult, cardiac necrosis, neuormonal activation, remodeling and of comorbidity
2	Laboratory diagnosis of chronic inflammatory bowel diseases
2	Cancer diseases and the use of different tumor biomarkers in their laboratory diagnosis, and algorithms
1	Clinical pathology in geriatrics: biomarkers
1	Point of care testing and evaluation of fluid biological samples

**MODULE
CLINICAL PATHOLOGY**

Prof.ssa LETIZIA SCOLA - Sede IPPOCRATE

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M.Ciaccio. Trattato di Biochimica Clinica e Medicina di Laboratorio. EdiSES, 2021.ISBN 9788836230440.
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ISBN: 978-88-299-2973-3; CODICE PICCIN: 0110091; NUMERO PAGINE: 1440; AUTORI: Antonozzi - Gulletta .

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2	Laboratory diagnosis of chronic inflammatory bowel diseases
2	Cancer diseases and the use of different tumor biomarkers in their laboratory diagnosis, and algorithms.
1	Clinical pathology in geriatrics: biomarkers.
1	Point of care testing and evaluation of fluid biological samples.