

BSC 2011L - Integrated Principles of Biology II Laboratory Syllabus – SPRING 2023

Course Information

Laboratory Locations: B-11, B-22 and B-23 Bartram Hall

Biology Office: 220 Bartram Hall, 392-1175

Lab Coordinator: Kent A. Vliet, PhD, Department of Biology, 208 Carr Hall, 392-8130, kvliet@ufl.edu

Office hours: Wednesdays 9:30-11:30am and by appointment in person or ZOOM:

<https://ufl.zoom.us/j/4336756706>

A. Required Texts: (1) Vliet, K.A., 2019. *BSC 2011L: Integrated Principles of Biology II Lab Manual, Fifth Edition*. Macmillan Learning Curriculum Solutions, Plymouth, Michigan. 241 pp. – available from the Campus Welcome Center Bookstore.

(2) *Principles of Life, 3rd Edition*, by David M. Hillis; Mary V. Price; Richard W. Hill; David W. Hall; Marta J. Laskowski. Sinauer Associates and Macmillan (publisher).

CANVAS: <http://elearning.ufl.edu>

Your Instructor

Your BSC 2011L lab is taught by a Biology graduate teaching assistant. Record your TA's contact information and office hours in the spaces below and [use this email address when communicating about the lab course.](#)

My TA: _____

Office: _____

Office Hours: _____

Email: _____

Course Goals and Objectives

The primary goal of this course is to establish a coherent foundation of knowledge in biology and to prepare students for comprehension in advanced biology courses and science in general. Fundamental concepts discussed include the scientific methods by which we come to know things in science, the chemical composition and processes that make up all life, genetic processes and the means of inheritance of traits, the mechanisms and processes of natural selection, and adaptation and evolution of life on Earth. An additional course goal is to develop critical thinking skills for development of reasoned thought and for evaluation of life experiences.

Objectives of the course will be achieved if, by its conclusion, students can:

- Form scientific hypotheses, develop testable predictions, and design experiments that logically follow
- Understand the proper use and function of key types of laboratory equipment, such as microscopes, spectrophotometers, balances, and centrifuges
- Understand the importance of statistics in scientific sampling, discriminate between descriptive and inferential statistics and correctly identify situations in which the use of each is appropriate, understand the meaning of statistical significance, interpret statistical results and draw appropriate conclusions from them
- Identify the primary structural elements of various plant groups, their associated functions, and explain the processes of plant growth and structural development
- Define sexual reproduction and explain the general reproductive life cycles of plants and animals
- Describe the major patterns and developments in the evolution of plant clades
- Identify the primary organs of a representative mammal and their associated functions
- Describe and discuss the variables that influence population growth and composition, interspecific interactions and community structure and relationships

- Read, evaluate, and construct a phylogenetic tree

General Education Objectives for Biological Sciences

Biological science courses provide instruction in the basic concepts, theories and terms of the scientific method in the context of the life sciences. Courses focus on major scientific developments and their impacts on society, science and the environment, and the relevant processes that govern biological systems. Students will formulate empirically-testable hypotheses derived from the study of living things, apply logical reasoning skills through scientific criticism and argument, and apply techniques of discovery and critical thinking to evaluate outcomes of experiments.

The General Education objectives and the associated Student Learning Outcomes for Biological Sciences are achieved through inquiry-based and active-learning exercises in the laboratory, including prelab assignments, experimental design, quizzes, oral presentations, and completion of weekly lab notes and data sheets. These exercises are designed to reinforce, augment, and accompany learning objectives in the companion BSC 2011 lecture course. In particular, the BSC 2011L lab exposes students to the development and testing of specific hypotheses, collection and presentation of biological data, and analysis of statistical significance.

General Education Student Learning Outcomes

The general education student learning outcomes (SLOs) describe the knowledge, skills and attitudes that students are expected to acquire while completing a general education course at the University of Florida. The SLOs fall into three categories: **content**, **communication** and **critical thinking**.

Every general education course must address all three SLOs. Note that the subject area objectives (detailed above) describe the context within which the SLOs are achieved.

Category	Institutional Definition	Institutional SLO
CONTENT	Content is knowledge of the concepts, principles, terminology and methodologies used within the discipline.	Students demonstrate competence in the terminology, concepts, methodologies and theories used within the discipline.
COMMUNICATION	Communication is the development and expression of ideas in written and oral forms.	Students communicate knowledge, ideas, and reasoning clearly and effectively in written or oral forms appropriate to the discipline.
CRITICAL THINKING	Critical thinking is characterized by the comprehensive analysis of issues, ideas, and evidence before accepting or formulating an opinion or conclusion.	Students analyze information carefully and logically from multiple perspectives, using discipline specific methods, and develop reasoned solutions to problems.

To assess student performance in meeting these student learning outcomes for this course, students are evaluated by a variety of instruments throughout the course: weekly quizzes and digital practical exams over laboratory exercises used to assess comprehension and reasoning, prelab assessments, weekly lab notes and datasheets emphasizing development of hypotheses, experimental design, collaborative discussions, collection of data, selection of proper statistics tests and interpretation of statistical results. The Communication SLO is assessed in graded written assessments and in oral presentations in the lab. Student Learning Outcomes are further assessed

in BSC 2011, the companion lecture course. In combination, BSC 2011 and BSC 2011L provide assessments of all categories of the General Education Student Learning Outcomes.

A minimum grade of C is required for general education credit.

Grading

Your BSC 2011L grade will be based on raw scores from quizzes, practical quizzes, data sheets and pre- and post-lab assignments. Specific assignments are detailed in a point breakdown sheet provided with this syllabus. While data sheets, pre-labs, and post-labs are each worth a certain number of points, not all questions in every assignment will be graded. Rather, a subset of the questions will be graded for accuracy, while all others will be graded for completeness. Since you do not know which questions are graded for accuracy or completeness, you should devote full effort to all questions on assignments. Please understand that this policy has been implemented to reduce TAs' grading time while still offering students engaging learning experiences. Quizzes generally cover material from the previous lab exercise as well as assigned readings for the present lab. Final letter grades will be assigned based on percentage of the total points earned. Minimum grade cutoffs are listed below. These may be lowered ("curved") at the discretion of the instructors, but they will not be raised. In other words, if you receive 94% of the possible points, you are guaranteed to earn an A grade.

Letter Grade	Point Range (%)
A	≥ 94.0%
A-	≥ 90.0%
B+	≥ 87.0%
B	≥ 84.0%
B-	≥ 80.0%
C+	≥ 77.0%
C	≥ 74.0%
C-	≥ 70.0%
D+	≥ 67.0%
D	≥ 64.0%
D-	≥ 61.0%
E	≤ 60.9%

Note that the current UF policy for assigning grade points is available at the following undergraduate catalog web page: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Extra Credit: There is no extra credit available in this course.

Special Treatment: Please do not request individual special treatment regarding grading at the end of the semester; **we do not adjust grades for individuals for any reason.** Plan to do well on all exams and other assessments from the beginning of the semester; if you are having difficulty in the class, please let your instructors know *before* the exams rather than after.

Material and Supplies Fee

There is a Materials and Supplies Fee of \$14.99 associated with this course. In addition, there is an Equipment Fee charge of \$30.00 associated with the course.

Lab Supplies

Dissecting kit (small probe and seeker, fine dissecting scissors, fine point forceps, scalpel with replaceable blade, teasing needles). The Welcome Center bookstore should carry good kits with these items. **All of these supplies must be furnished by the student.** They will not be available in lab.

Reading Assignments

You should review fully each laboratory assignment *prior* to the laboratory period. In most cases you will be unable to complete the observations and experiments fully and efficiently during the lab period unless you know exactly what is to be done before you walk into the laboratory. Reading assignments are included in this syllabus. Weekly quizzes are based partially on the reading assignments.

Expectations

Each student is solely responsible for reading and following the instructions, guidelines and schedules in this syllabus. Not having read the information in this syllabus will not constitute an excuse for missing an assignment, exam or other assessment.

Attendance

Policies on class attendance, make-up assignments, and excused absences are detailed below. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>.

Lab Policies

A. Excused absences

You are expected to attend the lab section for which you are registered. If you miss your lab, notify your instructor immediately by e-mail. You must have a **valid, documented excuse** for missing your regular lab section to be allowed to make up a lab without penalty. **The validity of excuses for missed labs or assignments will be determined by your instructor.** If you do not have documentation for missing your lab, you *may be* given the opportunity to make up assignments of graded materials **at the discretion of your instructor.** This work may be done outside of the laboratory and will be penalized 20% of the total points. In this case, missed quizzes cannot be made up. *Missed labs generally must be made up within the same week.* **If you know in advance that you are unable to make your regular sections, contact your lab TA earlier in the week.**

B. Illness

If you are ill with an infection that may be contagious by casual contact (e.g., a cold or flu), you should not attend class. Furthermore, if you have a fever associated with any illness, you should not attend class until you have been free of fever for at least 24 hours. The instructor reserves the right to ask any student to leave the

classroom at any time if there is a reasonable likelihood that the student's presence in the classroom places other students at substantial risk of infection. . If you miss three (3) or more assignments due to illness, you should apply for a medical withdrawal.

C. Assignment deadlines

Graded assignments are due at the *beginning* of the lab session one week after the actual lab work was done, unless otherwise noted. Assignments turned in after the start of the lab session will be considered late work. NOTE: Students who attend a lab session other than their officially registered section and perform an experiment which require a data sheet or lab report *must still turn in their work at the beginning of their officially registered section on the following week*. If you are unable to turn in your work during your regular lab section and are not able to hand it in directly to your instructor, DO NOT leave an assignment at your instructor's office. Rather, (1) make a photocopy of your lab report for safekeeping and (2) hand in the original to the staff of the departmental office (**220 Bartram Hall**) during regular office hours (**8 a.m.- 4 p.m.**).

D. Late work

Late work will be penalized 10% of the total points per day (weekends, *i.e.*, Friday to Monday, are counted as two days and U.F.-recognized holidays are not counted). NOTE: The weekends preceding and following the Semester Break holidays will be counted. Late work will not be accepted, unless there is written documentation from the Dean of Students Office (<https://care.dso.ufl.edu/instructor-notifications/>). If there is an issue with you completing your assignments on time, contact your instructor immediately. Do not wait until the last minute!

E. Participation

Students may be allowed to turn in assignments on which they did not participate in the collection of data, *at the discretion of the lab instructor*. These assignments will be penalized 20% of the points.

F. Lab cleanliness

No food or drink is permitted in the labs and students are expected to leave the lab as clean and orderly as it was when they arrived for class. NOTE: All scraps of paper, paper towels, broken cover slips and slides, masking tape, and any other trash must be properly disposed of by the students themselves.

G. Lab attire

Students are not allowed to wear sandals or open-toed shoes in the laboratories. *Masks are optional at UF. However, masks are always acceptable for those who wish to wear them. The CDC recommends that those not fully vaccinated for COVID-19 continue to wear masks, particularly indoors; and even those who are fully vaccinated may choose to wear masks for a variety of reasons. Thank you for supporting your fellow Gators as they balance health, comfort, and other considerations in their decision to wear or not to wear a mask.*

Accommodations for Students with Disabilities

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center. [Click here to get started with the Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Campus Resources

Health and Wellness

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu , 352-392-1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: [Visit the Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](#).

University Police Department: [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#).

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273-4450.

Academic Resources

E-learning technical support: Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at helpdesk@ufl.edu .

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information](#).

On-Line Students Complaints: [View the Distance Learning Student Complaint Process](#).

Online Course Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/> . Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/> . Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/> .

Academic Honesty

All UF students are bound by The Honor Pledge which states:

"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest

standards of honor and integrity by abiding by the Honor Code.” On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied.”

In addition, on all work submitted for credit the following pledge is either required or implied:

“On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor. A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session. Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

BSC 2011L Laboratory Schedule – SPRING 2023

Laboratory topics and reading assignments for this course are listed below. This is a tentative schedule; the dates and coverage of specific topics are subject to change.

Week	Week of	Laboratory Topic	Reading Assignment
1	9 Jan	**** NO LABS ****	Do Statistics Prelab before coming to 1 st lab
2	16 Jan M	**** NO LABS ****	Do Statistics Prelab before coming to 1 st lab
3	23Jan	**** NO LABS ****	Do Statistics Prelab before coming to 1 st lab
4	30 Jan	Introduction/ Science & Statistical Inference	Chapter 1 Complete Statistics Prelab before lab
5	27 Feb	Plant Diversity Quiz 1	Chapter 7 C-fern Prelab
6	6 Mar	Plant Anatomy Practical 1	Chapter 8
7	20 Mar	Photosynthesis Practical 2	Chapter 6
8	27Mar	Sensory Physiology Quiz 2	Chapter 5
9	3 Apr	Fetal Pig Dissection Quiz 3 *Bring your dissection kits*	Chapters 2 and 3 Lab Fetal Pig Dissection Prelab - URL incorrect, use http://www.youtube.com/watch?v=D0EhPMo06Kk
10	13 Mar	SPRING BREAK – NO CLASSES	
11	10 Apr	Surgery Exercise *Bring your dissection kits*	Chapter 4
12	6 Feb	Spatial Relationships Practical 3 Outdoor lab - Dress appropriately	Chapter 10 Spatial Relationships Prelab
13	13 Feb	Population Ecology / Plan project Quiz 4	Chapter 9
14	20 Feb	Species Interactions Quiz 5 Outdoor lab - Dress appropriately	Chapter 11 Species Interactions Prelab
15	17 Apr	**** NO LABS ****	
16	24 Apr	**** NO LABS ****	

Laboratory Assignment and Point Breakdown Sheet – SPRING 2023

WEEK	ASSIGNMENTS	POINTS
1	<p>**** NO LABS ****</p> <p>Statistics Pre-lab – complete before coming to first lab meeting</p>	
2	<p>**** NO LABS ****</p> <p>Statistics Pre-lab – complete before coming to first lab meeting</p>	
3	<p>**** NO LABS ****</p> <p>Statistics Pre-lab – complete before coming to first lab meeting</p>	
4	<p>Science & Statistical Inference: Scientific method, posing questions and hypothesis creation, determination of appropriate statistical tests based on data types</p> <p>Statistics Prelab – due at start of lab</p> <p>Statistics Lab Notes – due at end of lab</p>	<p>___/5</p> <p>___/10</p>
5	<p>Plant Diversity: characteristics of plant taxa, life cycles, adaptations to terrestrial existence inquiry, cladistic relationships based of synapomorphies</p> <p>C-fern Prelab – due at start of lab</p> <p>QUIZ 1</p> <p>Adaptations to a Terrestrial Existence Lab Notes – due in lab</p> <p>Plant Cladistics (Matrix) – due in lab</p>	<p>___/5</p> <p>___/10</p> <p>___/10</p> <p>___/5</p>
6	<p>Plant Anatomy: tissues and structures of plant stems, roots, and leaves, flower dissection, double fertilization, molecular phylogenetics</p> <p>LAB PRACTICAL 1 – due at start of lab</p> <p>Molecular Phylogenetics of Plants Lab Notes – due at end of lab</p>	<p>___/10</p> <p>___/15</p>
7	<p>Photosynthesis: Students use spectrophotometry to measure rates of photosynthetic oxidation by thylakoid membranes in various wavelengths and intensities of light</p> <p>LAB PRACTICAL 2 – due at start of lab</p> <p>Photosynthesis Lab Notes: Use the data you collect in lab to complete the lab notes. Due at end of lab</p>	<p>___/10</p> <p>___/15</p>
8	<p>Sensory Physiology: Students use various instruments to investigate senses of the eye, ear, mechanoreception, reflexes, and reaction time</p> <p>QUIZ 2 – due at start of lab</p> <p>Sensory Physiology Lab Notes – due at end of lab</p>	<p>___/10</p> <p>___/15</p>
9	<p>Fetal Pig Dissection: Dissection of a fetal pig to give students a practical understanding of mammalian (including human) anatomy, fetal adaptations, as well as practical experience with dissection techniques</p> <p>Fetal Pig Dissection Prelab: Complete the fetal pig prelab before lab. URL incorrect, use http://www.youtube.com/watch?v=DOEhPMo06Kk – due at start of lab</p> <p>QUIZ 3 – due at start of lab</p> <p>Human Reproduction Worksheet – due at end of lab</p>	<p>___/2</p> <p>___/10</p> <p>___/10</p>
10	<p>**** NO LABS ****</p>	
11	<p>Fetal Pig Surgery Exercise: Students perform mock surgical procedures on their pigs and then present their surgeries to the class, including patient histories, the procedure they performed, and the anatomical and physiological elements involved</p> <p>Surgery Lab Notes – due at end of lab</p> <p>Surgery Presentation: Your instructor will evaluate your presentation – given in lab</p>	<p>___/15</p> <p>___/10</p>
12	<p>Spatial Relationships – students collect data during a field trip to use various statistical tests to determine the spatial distribution of individuals in a population, and record their data in an online database of student results from the study area</p> <p>Spatial Relationships Prelab: Complete the prelab activities before coming to lab – due at start of lab</p> <p>LAB PRACTICAL 3 – due at start of lab</p> <p>Spatial Relationships Lab Notes – due at end of lab</p>	<p>___/10</p> <p>___/10</p> <p>___/15</p>

13	<p>Population Ecology / Plan Project – Students use an online simulation program to investigate the influence of variables on population growth on predator and prey populations. Students also develop questions, hypothesis, predictions, and statistical tests for a field-based project for which they will collect data in the next lab</p> <p>QUIZ 4 – due at beginning of lab ___/10</p> <p>Population Dynamics Handout – due in lab ___/5</p> <p>Species Interactions (Planning): Complete the planning exercise in Chapter 11 for your Species Interaction project – due at the end of lab ___/5</p>
14	<p>Species Interactions: Students collect data for the project they designed in the previous lab and then statistically analyze their results</p> <p>Species Interactions Prelab: Read the assigned news article and answer questions before coming to lab – due at start of lab ___/10</p> <p>QUIZ 5– due at start of lab ___/10</p> <p>Species Interactions (Data Collection): Complete the datasheet provided by your TA – due at the end of lab ___/15</p>
15	**** NO LABS ****
16	**** NO LABS ****
TOTAL POINTS: ___/257	

BSC Laboratory Safety

Work in the Biology laboratory may expose students to **inherently dangerous activities**. Students in the BSC laboratories may be exposed to chemicals (e.g., formaldehyde, organic solvents, acids, and other caustic chemicals), chemical fumes, laboratory equipment and supplies (e.g., scalpels, razor blades, glass slides, coverslips, and electrical equipment), toxic or irritating properties of living and dead animals, and other materials necessary to laboratory activities. Other possible hazards include broken glass on the floor or counters, combustible materials, and slippery spills.

1. Smoking, eating, and drinking are expressly forbidden and NOT allowed in the laboratory.
2. Locate the placement of safety equipment and supplies in the laboratory: safety shower, eye wash station, fire extinguisher, and first aid kit. Memorize these locations. You should understand the use of this equipment. Also note the locations of exits. Each laboratory has a chemical exposure manual. These include material safety data sheets on all hazardous chemicals or compounds to which you might be exposed in the BSC laboratory.
3. Students should follow instructions carefully, especially when hazardous conditions occur or hazardous materials are being used.
4. Students should dress appropriately in the lab. Gloves and protective aprons will be made available in the labs. Students may elect to supply their own gloves and protective aprons or laboratory coats. Only shoes that provide complete foot covering are allowed in the lab.
5. You should be familiar with fire procedures. Leave the building immediately should a major fire occur or if the fire alarm sounds. Notify the appropriate authorities -- don't assume someone else remembered to do it. Meet with other students and your instructor outside the building before leaving so that an accurate headcount may be made.
6. The safe use of specific equipment and tools (e.g., microscopes, slides, scalpels, and pipettes) will be demonstrated by the instructor during the laboratory sessions. Be sure you understand this usage and ask questions if you do not.
7. Never pipette by mouth. Always use a suction bulb or pipette aid.
8. Notify your T.A. IMMEDIATELY of any spills, breakages, or equipment malfunction.
9. Students should report all hazardous conditions to the instructor immediately.
10. All organisms, living or dead, should be treated with care and respect. Avoid direct handling when possible.
11. Students should clean up any supplies used and should return materials where they belong as instructed. Any material spilled should be cleaned appropriately. Report any hazardous spills or breakages.
12. Broken glass and sharp metal waste should be placed only in those receptacles marked for such disposal -- do not put these materials in normal trash receptacles.
13. Work areas must be left clean and dry prior to leaving the lab. Chemicals and reagents must be returned to their proper places.
14. You should always wash your hands before leaving the laboratory, even if you have not knowingly come in contact with any chemicals or biological fluids.