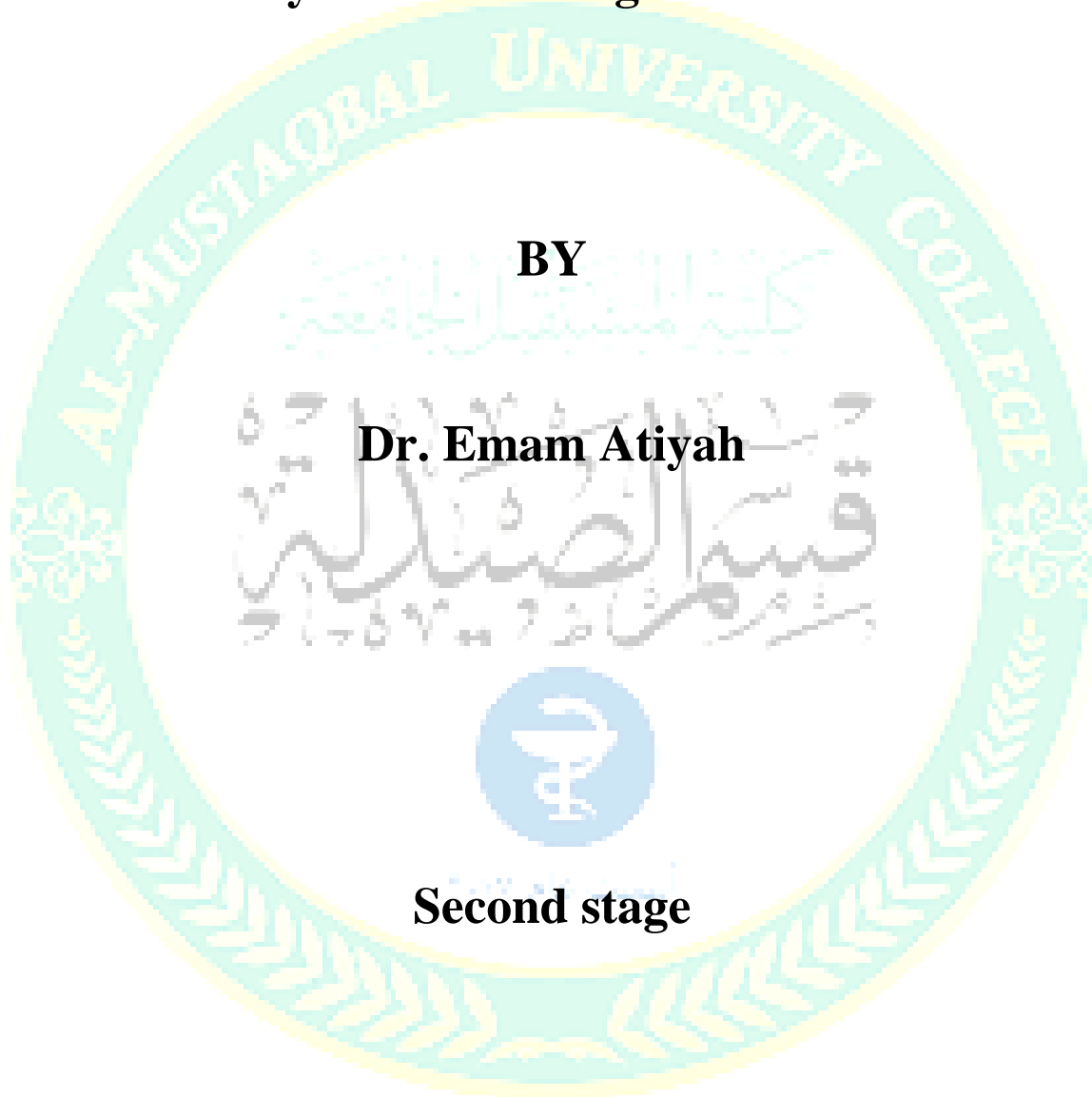


Biosafety in microbiological laboratories



Over the past two decades, Biosafety in Microbiological and Biomedical Laboratories (BMBL) has become the code of practice for biosafety—the discipline addressing the safe handling and containment of infectious microorganisms and hazardous biological materials.

The principles of biosafety include **containment and risk assessment**. The fundamentals of containment represent microbiological practices, safety equipment, and facility safeguards that protect laboratory workers, the environment, and the public from exposure to infectious microorganisms that are handled and stored in the laboratory.

While, risk assessment is the process that enables the appropriate selection of microbiological practices, safety equipment, and facility safeguards that can prevent laboratory-associated infections (LAI).

Recent efforts have been devoted to societies that deal with microorganisms because of their danger to public health, in addition to the precise and important conditions that must be followed when dealing with these microorganisms.

Some of the equipment used in the microbiology laboratory

	<p>مؤسدة Autoclave وتستخدم لتعقيم معظم البيئات الغذائية التي تتحمل درجات الحرارة المرتفعة مثل الشاش والقماش والقطن والسدادات وكذلك للتخلص من المزارع الميكروبية القديمة</p>		<p>حاضنة Incubator تستخدم لتوفير درجة حرارة مناسبة لنمو الأحياء المجهرية كما يمكن استخدامها في عمليات البحوث الحياتية العامة.</p>
	<p>صفحة التسخين Hot Plate تستخدم لتسخين السوائل والمحاليل، كالأوساط الزرعية والصبغات وغيرها.</p>		<p>غرفة الأبخرة Hood تستخدم في سحب الغازات والأبخرة وتنقيتها وإرسالها إلى الخارج، لذا تستخدم كغرف آمنة للتعامل مع الأحياء المجهرية.</p>
	<p>جهاز طرد مركزي Centrifuge يستخدم في فصل المواد ذات الكثافات المختلفة، يستعمل لفصل العالق عن المحلول</p>		<p>الفرن Oven تستخدم في تجفيف بعض المواد الكيميائية والزجاجيات والنماذج لتخليصها من الرطوبة، كما يستخدم كوسيلة تعقيم بالحرارة الجافة في تعقيم بعض الأدوات الزجاجية.</p>
	<p>جهاز تقطير الماء Water distillation يستخدم لإنتاج الماء المقطر الخالي من الأملاح.</p>		<p>حمام مائي Water Bath يستخدم في رفع درجة حرارة المحاليل الكيميائية باستخدام الماء كموزع جيد للحرارة.</p>
	<p>موازين مختلفة Balances يستخدم في إيجاد الأوزان للمواد الكيميائية المستخدمة في التحضير وهو ذو أربعة مراتب بعد الفارزة 0.0000</p>		<p>جهاز لقياس الرقم الهيدروجيني PH Meter يستخدم في إيجاد الدالة الحامضية للسوائل.</p>
	<p>المجهر Microscope الجهاز الأهم في مختبر الأحياء المجهرية لمعاينة الأحياء المجهرية تحت قوة تكبير تصل إلى 1000 مرة</p>		<p>الثرموميتر Thermometer يستخدم لقياس درجة الحرارة</p>

Some of the tools used in the microbiology lab

	<p>لهب بنزن Bunsen Burner يستخدم في عملية التسخين والتعقيم المباشر باللهب.</p>		<p>اطباق بتري Petri dishes تصب فيها البينات المعقمة والتي تستعمل فيما بعد كمزارع للميكروبات .</p>
	<p>انابيب اختبار Test tubes تستخدم في الكثير من الاختبارات مثل الاختبارات البايوكيميائية وكذلك في زراعة وحفظ الميكروبات.</p>		<p>ملاقط ومقصات Forceps مقصات مختلفة الاحجام Scissors تستخدم للمسك والقص في مختلف التجارب.</p>
	<p>ورق ترشيح Filter Paper يستخدم لترشيح السوائل والحصول على سائل رائق خالي من الشوائب .</p>		<p>ابرة تلقح Inoculation ابرة تلقح ذات عقد Needles ابرة تلقح Inoculation Loop تستخدم في عملية تلقح البكتريا والفطريات .</p>
	<p>دوارق زجاجية Flasks قياس الاحجام الثابتة , تحضير محاليل لها تركيزات محددة .</p>		<p>ماصات Pipettes تستخدم لسحب قياس محدد ومعروف من السوائل المختلفة .</p>
	<p>كؤوس زجاجية Beakers قياس احجام السوائل ونقلها .</p>		<p>قلم شمع Wax Pen يستخدم للتعليم على العينات والسلايدات لكونه لا يتأثر بالماء .</p>
	<p>شرائح زجاجية Slides واغطيتها Cover Slides يوضع عليها العينة المراد فحصها .</p>		<p>مخبر مدرج Cylinder يستخدم في قياس حجوم السوائل وكذلك في نقلها .</p>

Contamination in microbiology laboratories

Contamination in the clinical microbiology laboratory is one of the most important reasons for **the inaccuracy in the results of the tests, due to the lack of pure colonies of microorganisms, and thus the lack of accurate identification of the pathogenic microbe.**

The causes of contamination in the microbiology laboratory may be varied and may be caused by:-

1. Microbiology unit staff: where the staff does not perform the correct sterilization of equipment and tools before using them, or poor sterilization during the preparation of the media.
2. Contamination may occur during the transfer of samples to the microbiological department.
3. During the incubation period of the samples.
4. By water used in the work.

Therefore, the quality control department in the microbiology laboratory is based on continuous follow-up of the steps of the examination process, the extent of sterilization, and the avoidance of any sources that may lead to contamination of samples and results.

Therefore, we can define microbiological contamination **as the introduction of substances or impurities that affect the**

growth of microorganisms into one of the work steps, whether during collection, transportation, storage, or processing.



Types of cellular contamination in the clinical microbiology department:

1-Physical pollutants:

They are natural or artificial substances or components that are considered sources of pollution, or they can be described as undesirable foreign substances and objects such as glass fragments, plastics, metals, stones, indoor plant materials, fibers, storage equipment or aluminum foil Or the remnants of paper or dust, especially in incubators and storage places.

2-Chemical pollution:

Chemical pollution is defined as the presence of any non-living substance that results in undesirable effects on the microbial cultivation system in the microbiological unit, and among the effects of this pollution leads to the death of colonies of microbial growth, and examples of chemical pollutants are impurities in the materials, Serums, water, endotoxins, detergents, bactericides or residues of these pesticides, impurities resulting from some gases that are used in incubators and refrigerators such as carbon dioxide.

3-Biological pollution:

Biological pollution is defined as pollution resulting from living and microorganisms, and the causes of this pollution may include bacteria, fungi, molds and yeasts, viruses, algae, invertebrates, protozoa, and this type of pollution may spread through reagents. Or by biological contact, either direct or indirect, by microbiological laboratories sensitive to biological contamination, or by improperly sterilized equipment, instruments and incubators.



Cell culture contaminated



Cell culture pure

**WE CAN DISTINGUISH BETWEEN THEM WITH A
MICROSCOPE**

Sources of Contamination in the Clinical Microbiology Unit:

- 1- The tools used to collect the sample, or the sample transfer containers may not be completely sterile. The presence of materials from natural materials inside the laboratory may cause pollution such as moisture, dust particles, air, and water sources.
- 2- The presence of insects or mites inside the laboratory may spread to microbial culture media.
- 3- The use of materials, equipment, and reagents that do not adequately meet the sterilization requirements.
- 4- Processing a large number of samples at one time due to lack of staff, this leads to the breakdown of the sterilization protocol imposed by the Quality Control Department.
- 5- Inadequate sterilization during work, whether equipment, reagents, or surfaces, or failure to wear gloves and masks by employees, or failure to sterilize hands while culturing samples.
- 6- Inadequate lighting and ventilation in the place or lack of air purification systems.
- 7- The lack of a sufficient number of washbasins or sanitary drains inside the laboratory.
- 8- Poor sterilization of incubators, refrigerators, storage places for reagents, equipment, and tools.

- 9- Failure to continuously sterilize the automated devices used in the cultivation of microbes.
- 10- Wrong practices by the microbiology department staff such as eating foods inside the department.

Causes of media pollution in the microbiology department:

There are many sources of media pollution. If any sources of media pollution are noticed, they should not be used during cultivation and work to damage this media in medical waste. The most important sources and causes of media pollution are:

- 1- Use of media with a short storage life.
- 2- Media placed in incubators or refrigerators that are not sufficiently sterile.
- 3- Use of non-sterile reagents, equipment, and tools during media preparation.
- 4- Failure to follow the correct sterilization protocol during media preparation.
- 5- The presence of mites inside the laboratory and its spread to the media.

Contamination control mechanism inside the microbiological unit:

- 1- Staff must follow department quality control laws to avoid any sources of contamination.
- 2- Apply all legitimate sterilization methods within the microbiological department.
- 3- Avoid leaving reagents and storage areas open for long periods.
- 4- Correct use of the equipment and continuous sterilization of it.
- 5- Commitment to wearing gloves and masks while taking samples or while working.
- 6- Maintaining the laboratory environment and continuous sterilization of surfaces and floors.
- 7- Correct disposal of medical waste.