Antibiotic susceptibility test

The treatment of microbial infections is often associated with the use of antibiotics . Today, there is a wide range of antibiotics, so there are methods in microbiology used to determine the most appropriate, and thus the most effective type of antibiotic.

You can find more detailed information on the Antibiotics page .

Methods

Antibiotics (ATB) are used in sets, which are chosen both according to the type of processed material (urine , sputum, swab) and according to the type of bacteria being examined . The result of determining the susceptibility of the tested bacterium to antimicrobials (ATB) is the so-called antibiogram , which will allow the selection of the most suitable antibiotic for the treatment of a particular patient.

We divide into:

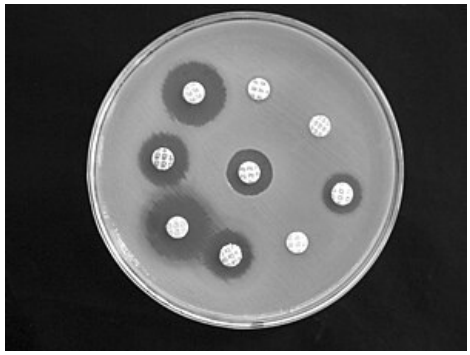
1. Diffusion methods
2. Dilution methods

Diffusion methods

Characteristics : These are qualitative tests. We use it to determine either the sensitivity or resistance of the bacterium to a given ATB.

Principle : It consists in the diffusion of ATB into agar with inoculated bacterial test strain. If the growth of the bacterial strain is suppressed by an antibiotic, a so-called inhibition zone is created.

Disk diffusion method



Disk diffusion method

Description : A qualitative method whose result tells us whether the antibiotic is effective or whether the tested strain is resistant to ATB. The evaluation is based on measuring the size of the inhibition zones, followed by comparison with reference values.

Result:

1. The tested strain is resistant to antibiotics: ie. that ATB diffusing from the ATB disk does not stop the growth of the bacterial strain and does not create an inhibition zone.
2. The tested strain is sensitive to ATB: ie. that the ATB diffusing from the disk stops the growth of the bacterial strain and creates an inhibition zone. Here, however, it is necessary to start from reference values.
    - The size of the inhibition zone is smaller than the reference range = the bacteria are resistant to ATB
    - The size of the inhibition zone is larger (exceeds) the reference range = the bacterium is sensitive to ATB

Test execution:

1. From the pure, isolated colony we want to test, prepare a microbe suspension by removing the bacterial strain colony with a bacterial loop and transferring to saline. Here it is necessary to adhere to the specified turbidity evaluated using McFarland units. The recommended turbidity value is 0.5 McFarland.
2. The microbe suspension is inoculated with a sterile swab over the entire surface of the agar medium , most often Müller-Hinton soil.
3. We add ATB disks using special dispensers
4. We cultivate - most often 24 hours / 37 ° C
5. After incubation, the diameter of the inhibition zones is measured. The result is compared to the NCCLS table to determine if the strain is antibiotic sensitive or resistant.

E-test

Description : Quantitative method, the result of which will provide us with information about the appropriate concentration of antibiotic that is effective against the tested strain. It is basically a method of determining the minimum inhibitory concentration (MIC: The concentration of ATB that is able to stop the growth of bacteria). A special strip impregnated with increasing concentrations of antibiotics, equipped with a scale, is used.

Result : In the case of ATB sensitivity, an elliptical growth inhibition zone is created that intersects the antibiotic strip at the MIC.

Test procedure: The test procedure corresponds to the procedure of the disk diffusion method, with the difference that ATB disks are not used, but the already mentioned ATB-impregnated strip

Dilution methods

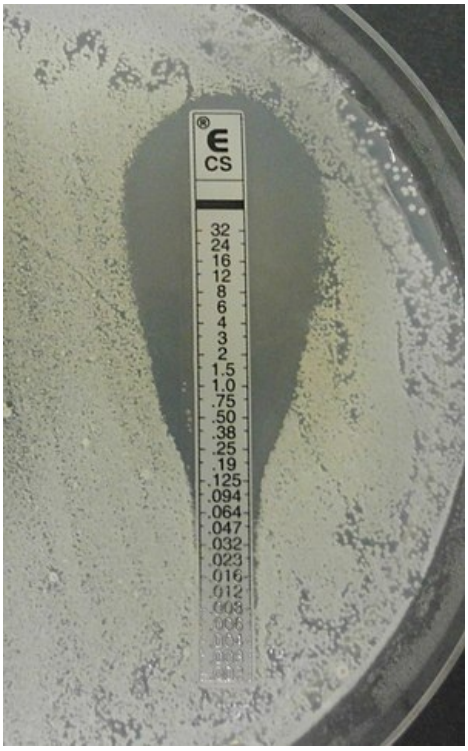
Characteristics : These are quantitative tests. It is used to determine the minimum inhibitory concentration (MIC), ie the minimum concentration of ATB that is able to stop the growth of bacteria. They are more accurate than diffusion methods.

Principle : It consists in the inhibition of bacterial growth by a given concentration of ATB.

Description : ATBs diluted by the so-called geometric series are used. The diluted ATBs are mixed with liquid broth, which in this case replaces the solid soil (agar). The ATB solutions with broth prepared in this way are dosed into a microtiter plate (today the plates and ATB are delivered to the laboratory already prepared). Bacterial growth is manifested by turbidity. When ATB is inhibited, the turbidity disappears.

Result : The well in which growth stops is evaluated as the so-called minimum inhibitory concentration.

Procedure: The monitored bacterium is inoculated into an already prepared microtiter plate. This is followed by cultivation (usually 24 hours / 37 ° C) and MIC reading.

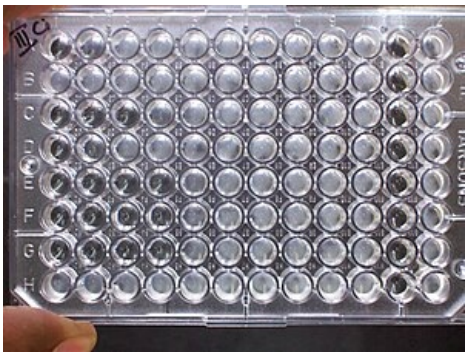


E-test

Links

Related articles

- Disk diffusion test
- Minimum inhibitory concentration


Determination of MIC

References

-
-
- SCHINDLER, Jiří. *Mikrobiologie : Pro studenty zdravotnických oborů.* 1. vydání. Praha : Grada, 2010. 224 s. ISBN 978-80-247-3170-4.
- BEDNÁŘ, Marek. *Příručka mikrobiologie pro bakaláře 3.LF UK* [online]. Ústav mikrobiologie 3.LF UK, [cit. 2012-04-29]. <http://mikrobiologie.lf3.cuni.cz/mikrobiologie/>.