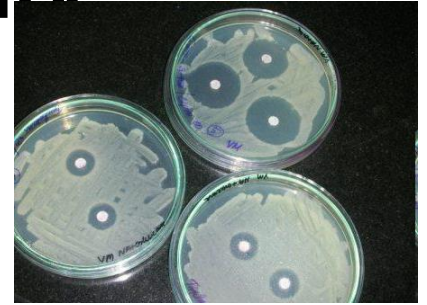


# **Antibiotic sensitivity**

# Antibiotic sensitivity

- is a term used to describe the susceptibility of [bacteria](#) to [antibiotics](#).
- Antibiotic susceptibility testing (AST) - to determine which antibiotic will be most successful in treating a bacterial infection *in vivo*.
- Ideal antibiotic therapy - determination of the aetiological agent and its relevant antibiotic sensitivity.
- Empiric treatment - is started before laboratory microbiological reports are available - when treatment should not be delayed (due to the seriousness of the disease).

# Disk diffusion antibiotic sensitivity testing

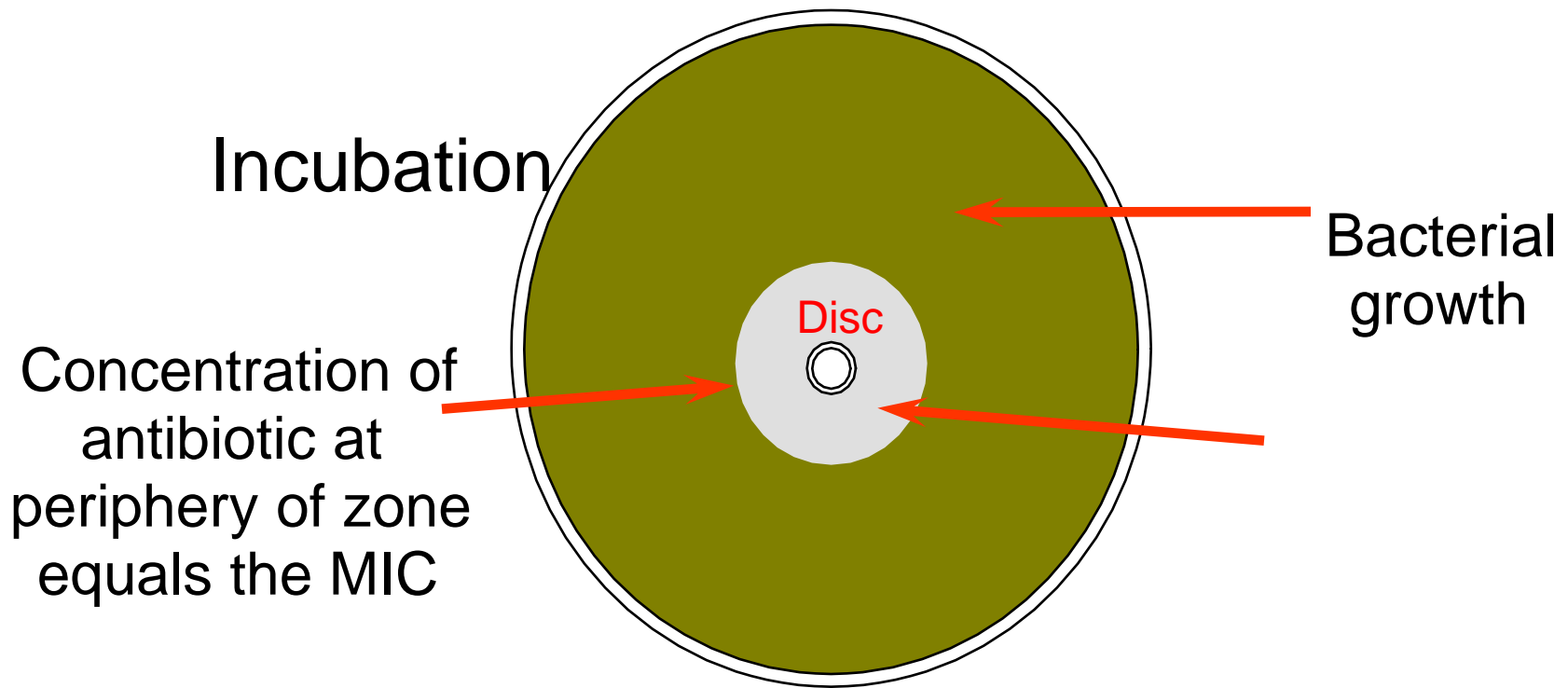
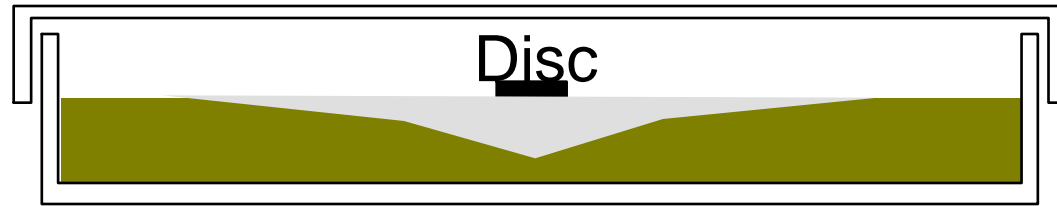


- is a test which uses antibiotic-impregnated wafers to test whether particular bacteria are susceptible to specific antibiotics.
- A known quantity of bacteria are grown on agar plates in the presence of thin wafers containing relevant antibiotics.
- If the bacteria are susceptible to a particular antibiotic, an area of clearing surrounds the wafer where bacteria are not capable of growing (called a zone of inhibition).

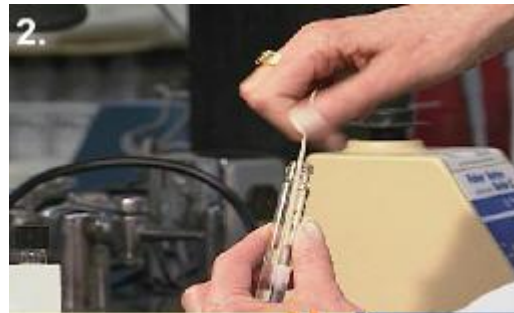
# Disk diffusion antibiotic sensitivity testing

- The test is performed under standardized conditions and standard zones of inhibition have been established for each antibiotic.
- **If the zone of inhibition is equal to or greater** than the standard, the organism is considered to be **sensitive** to the antibiotic.
- **If the zone of inhibition is less** than the standard, the organism is considered to be **resistant**.

# Diffusion of antibiotic from a paper disc

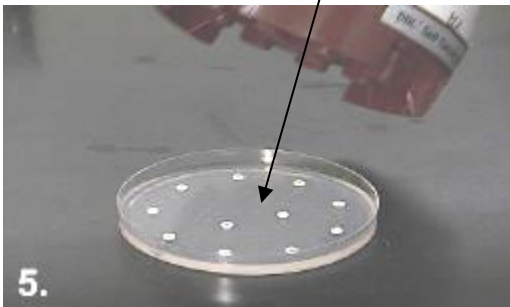


# Disk diffusion antibiotic sensitivity testing

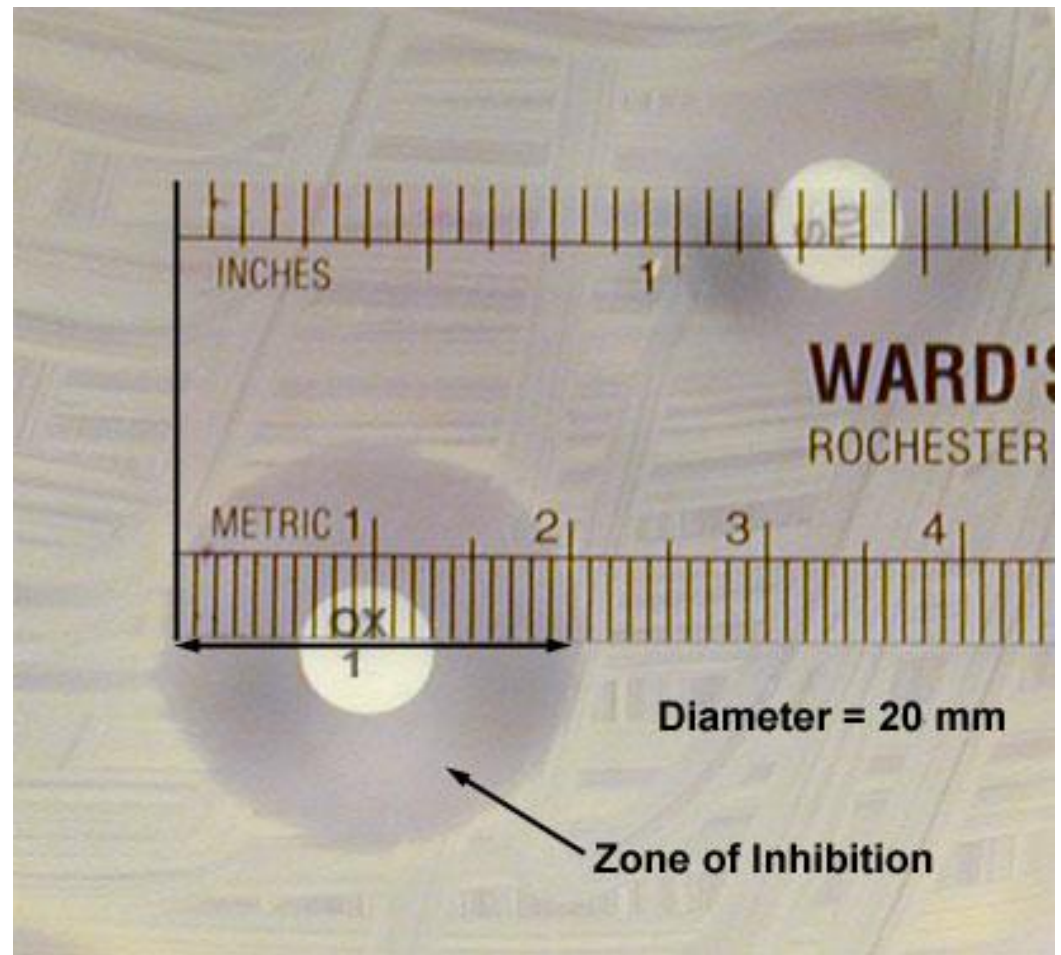


- Placing antibiotic disk on agar plates streaked with bacterial suspension

[www.old.lf3.cuni.cz/mikrobiol](http://www.old.lf3.cuni.cz/mikrobiol)



# Disk diffusion antibiotic sensitivity testing



# Disk diffusion antibiotic sensitivity testing

TABLE 1  
Details of the antibiotics that were used in the study to test for antibiotic resistance

Group	Antibiotic	Abbreviation	Generally accepted antibiotic disc concentrations ( $\mu\text{g}$ )	Inhibition zone (mm)		
				Resistant	Intermediate resistant	Susceptible
Aminoglycosides	Streptomycin	S	10	$\leq 11$	12 – 14	$\geq 15$
Macrolides	Erythromycin	E	15	$\leq 13$	14 – 22	$\geq 23$
Tetracyclines	Oxytetracycline	OT	30	$\leq 14$	15 – 18	$\geq 19$
Beta-lactams	Ampicillin	AP	10	$\leq 11$	12 – 14	$\geq 15$
	Penicillin G	PG	10	$\leq 20$	21 – 28	$\geq 29$
	Methicillin	MT	5	$\leq 9$	10 – 13	$\geq 14$
Glycopeptides	Vancomycin	V	30	$\leq 9$	10 – 11	$\geq 12$
	Nitrofurantoin	NI	300	$\leq 14$	15 – 18	$\geq 19$
Sulphonamides	Sulphamethoxazole	Smx	300	$\leq 10$	11 – 15	$\geq 16$

Source: The concentration used as well as the inhibition zone measurements were according to the National Committee on Clinical Laboratory Standards<sup>2,3</sup>

Note: The abbreviations are as they appeared on the antibiotic discs.

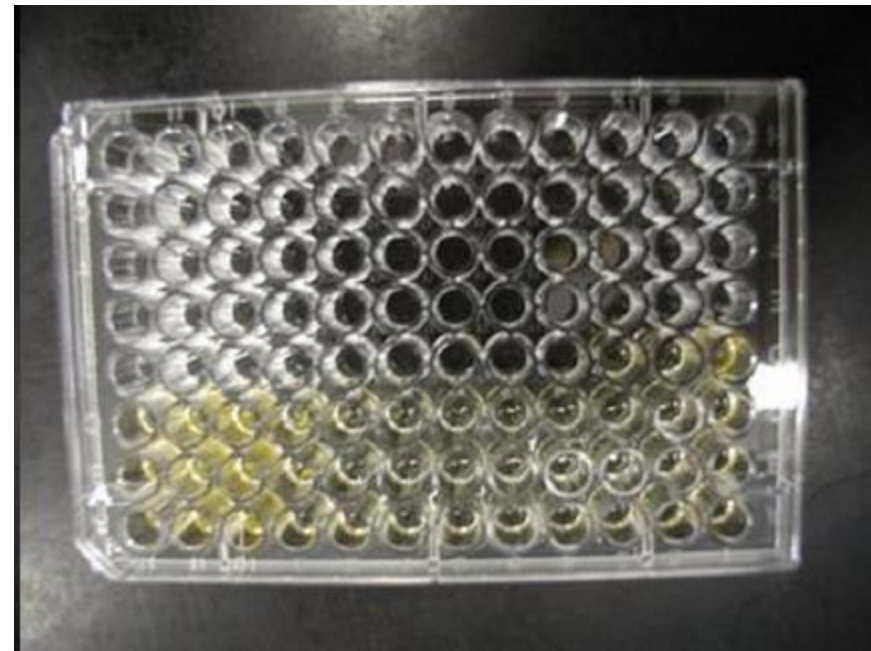
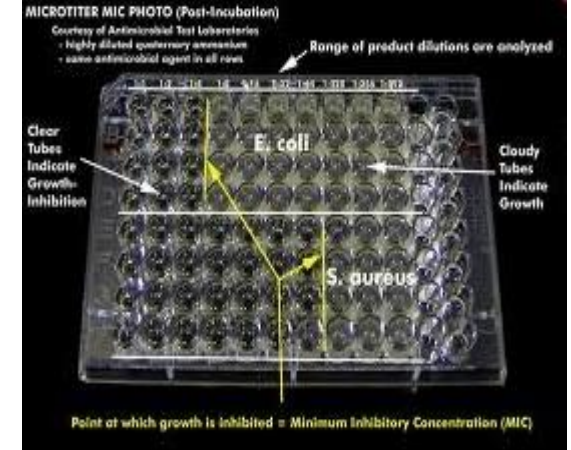


# MIC

- The basic quantitative measures of the *in vitro* activity of antibiotics are the minimum inhibitory concentration (MIC) and the minimum bactericidal concentration (MBC).
- The MIC is the lowest concentration of the antibiotic that results in inhibition of visible growth (*i.e.* colonies on a plate or turbidity in broth culture) under standard conditions.
- The MBC is the lowest concentration of the antibiotic that kills 99.9% of the original inoculum in a given time. Figure 1 illustrates how to determine the MIC of an antibiotic.

# MIC — quantitative test

- A pure culture of a single microorganism is grown in Mueller-Hinton broth
- a volume of the standardized inoculum is added to each dilution vessel
- The inoculated, serially diluted antimicrobial agent is incubated at an appropriate temperature for the test organism for a pre-set period, usually 18 hours.
- After incubation, the series of dilution vessels is observed for microbial growth, usually indicated by turbidity and/or a pellet of microorganisms in the bottom of the vessel.
- **The last tube in the dilution series that does not demonstrate growth corresponds with the minimum inhibitory concentration (MIC) of the antimicrobial agent.**



# E test (Epsilometer test) – quantitative test

- test used to determine whether or not a specific strain of bacterium or fungus is susceptible to the action of a specific antibiotic.
- The principle of the epsilometer test was first described in 1988

# E test - Principle



- The E test is basically an agar diffusion method.
- rectangular strip that has been impregnated with the drug to be studied.
- bacteria is spread and grown on an agar plate
- the E test strip is laid on top;
- the drug diffuses out into the agar, producing an exponential gradient of the drug to be tested. There is an exponential scale printed on the strip.
- After 24 hours of incubation, an elliptical zone of inhibition is produced and the point at which the ellipse meets the strip gives a reading for the minimum inhibitory concentration (MIC) of the drug.

# E test

