

Faculty of Science
Sample Microbiology Examination Questions and Model Answers

Microbiology Part I Written Examination

Question

Discuss the serological assays that are available for the diagnosis of Hepatitis B viral infection, and how they indicate the patient's infectious status.

Answer

Six commonly used HBV markers are: HBsAg, HBV DNA, HBeAg and anti-HBsAg, anti-core and anti-e.

Five of the above six serological markers commonly use immunoassays and HBV DNA by PCR that is used to monitor viral load.

The markers can be used to differentiate two main features of HBV disease viz. acute and chronic/persistent infection.

Acute infection:

HBsAg or HBeAg or IgM anti-core positive.

Patient may be considered immune or have past HBV infection: Presence of anti-HBsAg or total antibody pos to HBV core (but core IgM negative)

Chronic, persistent infection:

HBsAg and HBeAg pos with total antibodies to HBV core pos

Chronic HBV can lead to liver cirrhosis with high levels of HBV DNA, >10⁵ copies/ml

Microbiology Part I Oral Examination

Question

The following questions pertain to the testing of antibiotic susceptibility of a clinical isolate:

- a) Comment on the antibiotic susceptibility tests commonly used in clinical laboratories.
- b) Define "susceptibility", "resistance" and "intermediate susceptibility".
- c) Comment on how methods are calibrated for susceptibility/resistance.
- d) What are the limitations of these methods?

Answer

a)

- Disc diffusion
- Broth dilution

Examples:

- EUCAST disc diffusion and broth assays
- CLSI disc diffusion and broth assays
- Calibrated Dichotomous Sensitivity diffusion
- Commercial broth dilution assays (i.e. Sensititre)
- Automated methods to measure MIC (i.e. Vitek, BioMerieux)
- MALDI-TOFF MS for antibiotic degradation

b) Definition of susceptibility / resistance (EUCAST)

Clinically susceptible (S)

- A microorganism is defined as susceptible by a level of antimicrobial activity associated with a high likelihood of therapeutic success.
- A microorganism is categorized as susceptible (S) by applying the appropriate breakpoint in a defined phenotypic test system.
- This breakpoint may be altered with legitimate changes in circumstances.

Clinically intermediate (I)

- A microorganism is defined as intermediate by a level of an antimicrobial agent activity associated with uncertain therapeutic effect. It implies that an infection due to the isolate may be appropriately treated in body sites where the drugs are physically concentrated or when a high dosage of a drug can be used; it also indicates a buffer zone that should prevent small, uncontrolled, technical factors from causing major discrepancies in interpretations.
- A microorganism is categorized as intermediate (I) by applying the appropriate breakpoints in a defined phenotypic test system.
- These breakpoints may be altered with legitimate changes in circumstances.

Clinically resistant (R)

- A microorganism is defined as resistant by a level of antimicrobial activity associated with a high likelihood of therapeutic failure.
- A microorganism is categorized as resistant (R) by applying the appropriate breakpoint in a defined phenotypic test system.
- This breakpoint may be altered with legitimate changes in circumstances.

c) Calibration of antibiotic susceptibility tests for interpretation of susceptibility/resistance

- Gold standard or reference method (i.e. Agar dilution method of Sherris).
- Reference population (i.e. known resistance mechanisms).

d) Limitations

- May take 24-48 h for results.
- Not all microorganisms are calibrated.
- Fastidious or poor growing microorganisms.
- Poorly expressed resistance mechanisms.

Discrepancy of interpretation (sensitivity/resistance) between methods.