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Table 6: Types of microbiological examination[1-4]

Type	Mechanism	Resolution limit (maximum magnification)	Type of causative microorganism		Considerations for use
			Planktonic	Biofilm	
Light microscopy	Visible light	0.2 µm (1500x)	✓	✓	• Primarily used on isolated cultures or sections of tissue • Gram stain used to establish presumptive species identification • Impossible to obtain definitive identification of microbial species • Low-cost and readily available
Fluorescence microscopy (FISH)	Ultraviolet light	0.1 µm (2000x)	✓	✓	• Species can be identified and their relative locations mapped with fluorescent dyes/labels • Only fluorescent structures can be observed • Use is limited to microbial cell suspensions and thin tissue sections • Cost of dyes and probes is a limitation
Confocal laser scanning microscopy (CLSM)	Laser beam coupled to a light microscope	0.1 µm (2000x)	✓	✓	• Species can be identified and their relative locations mapped with fluorescent dyes/labels • Tissue blocks can be examined and images obtained at regular depths can be reconstructed to generate 2D or 3D structure of whole specimen • Only fluorescent structures are observed • Fluorescence decays relatively quickly • Cost of equipment, dyes, probes, and technical support is a limitation
Scanning electron microscopy (SEM)	Electrons beamed onto specimen from an angle and deflected electrons collected	10 µm (500,000x)	✓	✓	• Cannot examine living material • Minimal time required for sample preparation • Images of the surface layers of specimens provide insight into 3D structure • Dehydration of samples may cause changes • Cost of equipment and technical support is a limitation
Transmission electron microscopy (TEM)	Electrons beamed through a thin section of specimen	0.2 µm (5,000,000x)	✓	✓	• Images provide detailed information on internal cellular structures or organisms • Cannot examine living material • Specimen preparation is lengthy, and may introduce artefacts • Cost of equipment and technical support is a limitation
Polymerase chain reaction (PCR)	Amplifies specific regions of DNA	0.1 and 10 kilobase pairs	✓		• Can confirm genes of interest from bacteria, toxins, viruses and other microorganisms • Rapid and highly specific • Identifies non-cultivatable or slow growing micro-organisms such as mycobacteria, anaerobes, or viruses

Table 06 References

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