Exercise V

Bacterial Cultural Characteristics or Morphology

When a single bacterial cell is deposited on a solid or in a liquid medium, it begins to divide. One cell produces two, two produce four, four produce eight, and so on. Eventually, a colony appears where the original organism was. When grown on a variety of media, microorganisms will exhibit visible physical differences in appearance in their isolated colonies and their growth. These differences are called cultural characteristics or morphology. Cultural characteristics or morphology may be used as an aid in identifying and classifying some organisms.

These physical characteristics are often specific for the type of bacteria making the colony and can be used as a means of recognition. The appearance of colonial growth on agar media can be very distinctive for individual species. Some microorganisms have characteristic growth patterns but they aid in the identification of species only if they are distinctive. Although some bacteria grow in distinctive patterns, others look alike. Colonial morphology, however, is influenced by the media and other growth conditions. The colonial morphology of the same bacteria may vary on different media or under different conditions.

Cultural characteristics or morphology are determined by culturing microorganisms in nutrient broth and on nutrient agar plates and slants. After incubation, the characteristics are observed.

After incubation, in a nutrient broth, bacteria may exhibit a particular form of growth. In a liquid media, some bacteria grow diffusely causing a uniform clouding of the media (turbidity), whereas others look granular. Layering of growth or accumulation of cells at the top (pellicle), center, or bottom (sediment) of the broth tells something about the microorganism’s oxygen requirements. Sometimes bacterial aggregations are formed and the bacterial growth appears as small puff balls floating in the broth (flocculent). Observation of such factors also helps in recognizing types of bacteria.

The basic categories of bacterial colony appearance, forms and characteristics on solid media include: colony form (shape), margin (edge), elevation, pigmentation (color), texture, and pattern of growth. Colony shape may be described as circular, irregular, or punctiform (tiny). The margin may be entire (smooth with no irregularities), undulate (wavy), lobate (lobed), filamentous, or rhizoid (branched like roots). Colony elevations include flat, raised, convex, pulvinate (very convex), and umbonate (raised in the center). Colony texture may be moist, mucoid, or dry. Pigment production may be influenced by environmental factors such as temperature and nutrient supply. Colony color may be combined with optical properties such as opaque, translucent, shiny, or dull.
Terms Used for Growth in Nutrient Broth

1. Uniform fine turbidity – finely dispersed growth throughout (cloudy)
2. Flocculent – flaxy aggregates dispersed throughout
3. Pellicle – thick, padlike growth on the surface
4. Sediment – concentration of growth at the bottom of the broth culture may be granular, flaxy, or flocculent
5. Ring formation – a ring of growth on the surface

Terms Used for Growth on Nutrient Slants

1. Abundance of growth - the amount of growth is designated as none, slight, moderate, or large
2. Pigmentation – chromogenic bacteria may produce intracellular pigments that are responsible for the color of the colonies on the agar surface. Other bacteria produce extracellular soluble pigments that are excreted into the medium and that also produce a color. Most microorganisms are nonchromogenic and will appear cream, white, or gray.
3. Optical characteristics - these characteristics are based on the amount of light transmitted through the growth: opaque (no light transmitted), translucent (partial transmission), or transparent (full transmission).
4. Form – the appearance of the single line streak of growth on the agar slant.
   a. filiform – continuous, threadlike growth with smooth edges
   b. echinulate – continuous threadlike growth with irregular edges
   c. beaded – nonconfluent to semi-confluent colonies
   d. effuse – thin, spreading growth
   e. arborescent – treelike growth
   f. rhizoid – rootlike growth

Terms Used for Growth on Nutrient Agar Plates

1. Size – pinpoint, small, moderate, large
2. Pigmentation – color of colony
3. Optical properties
   a. opaque
   b. translucent (clear)
   c. shiny
   d. dull
4. Form – the shape of the colony
   a. circular – unbroken, peripheral edge
   b. irregular – indented, peripheral edge
   c. rhizoid – root-like, spreading growth
   d. punctiform - tiny
   e. filamentous
   f. spindle

5. Margin – the appearance of the outer edge of the colony
   a. entire – sharply defined, even, smooth
   b. lobate – marked indentation (lobed)
   c. undulate – wavy indentation
   d. serrate or erose – tooth-like appearance
   e. curled
   f. rhizoid – root-like
   g. filamentous – threadlike, spreading edge

6. Elevation – the degree to which the colony growth is raised
   a. flat – elevation not discernable
   b. raised – slightly elevated
   c. convex – dome-shaped
   d. umbonate – raised, with elevated convex center region
   e. pulvinate – very convex

Procedure 1:

1. Obtain the nutrient broth tubes inoculated during the previous lab period from the incubator.
2. Obtain the nutrient agar slants inoculated during the previous lab period from the incubator.
3. Obtain the nutrient agar plates inoculated during the previous lab period from the incubator.
4. Identify the growth patterns on the nutrient agar plates and slants, and in the nutrient broth tubes.
Procedure 2:

1. Identify the growth patterns of an outside air sample on the nutrient agar plate demonstration.
2. Identify the growth patterns of an inside air sample on the nutrient agar plate demonstration.

Clean-up Procedure

Dispose of the used nutrient broth tubes, nutrient agar slants and plates in the waste bin.
Nutrient Agar Slants

Filiform  Echinulate  Beaded  Effuse  Arborescent

Cultural Characteristics of Bacteria

Colonies on Nutrient Agar Plates

Punctiform  Spindle  Circular
Rhizoid  Irregular  Filamentous

Form
Nutrient Broths

Nutrient Agar Slants