

## Genus Identification of Unknown Bacterial Cultures

**TABLE 1 Cultural and Biochemical Characteristics of Unknown Organisms**

ORGANISM	GRAM STAIN	AGAR SLANT CULTURAL CHARACTERISTICS	LITMUS MILK REACTION	FERMENTATION															
				LACTOSE	DEXTRROSE	SUCROSE	H <sub>2</sub> S PRODUCTION	NO <sub>3</sub> REDUCTION	INDOLE PRODUCTION	MR REACTION	VP REACTION	CITRATE USE	UREASE ACTIVITY	CATALASE ACTIVITY	OXIDASE ACTIVITY	GELATIN LIQUEFACTION	STARCH HYDROLYSIS	LIPID HYDROLYSIS	
<i>Escherichia coli</i>	Rod -	White, moist, glistening growth	Acid, curd ±, gas ±, reduction ±	AG	AG	A±	-	+	+	+	-	-	-	+	-	-	-	-	
<i>Enterobacter aerogenes</i>	Rod -	Abundant, thick, white, glistening growth	Acid	AG	AG	AG±	-	+	-	-	+	+	-	+	-	-	-	-	
<i>Klebsiella pneumoniae</i>	Rod -	Slimy, white, somewhat translucent, raised growth	Acid, gas, curd ±	AG	AG	AG	-	+	-	±	±	+	+	+	-	-	-	-	
<i>Shigella dysenteriae</i>	Rod -	Thin, even, grayish growth	Alkaline	-	A	A±	-	+	±	+	-	-	-	+	-	-	-	-	
<i>Salmonella typhimurium</i>	Rod -	Thin, even, grayish growth	Alkaline	-	AG±	A±	+	+	-	+	-	+	-	+	-	-	-	-	
<i>Proteus vulgaris</i>	Rod -	Thin, blue-gray, spreading growth	Alkaline	-	AG	AG±	+	+	+	+	-	±	+	+	-	+	-	-	
<i>Pseudomonas aeruginosa</i>	Rod -	Abundant, thin, white growth, with medium turning green	Rapid peptonization	-	-	-	-	+	-	-	-	+	-	+	+	+	Rapid	-	+
<i>Alcaligenes faecalis</i>	Rod* -	Thin, white, spreading, viscous growth	Alkaline	-	-	-	-	-	-	-	-	±	-	+	+	-	-	-	
<i>Staphylococcus aureus</i>	Cocci +	Abundant, opaque, golden growth	Acid reduction ±	A	A	A	-	+	-	+	±	-	-	+	-	+	-	+	
<i>Lactococcus lactis</i>	Cocci +	Thin, even growth	Acid, rapid reduction with curd	A	A	A	-	-	-	+	-	-	-	-	-	-	-	-	
<i>Micrococcus luteus</i>	Cocci +	Soft, smooth, yellow growth	Alkaline	-	-	-	-	±	-	-	-	-	+	+	-	+	Slow	-	
<i>Corynebacterium xerosis</i>	Rod +	Grayish, granular, limited growth	Alkaline	-	A±	A±	-	+	-	-	-	-	-	+	-	-	-	-	
<i>Bacillus cereus</i>	Rod +	Abundant, opaque, white waxy growth	Peptonization	-	A	A	-	+	-	-	±	-	-	+	-	+	Rapid	+	±

Note: AG = Acid and gas; ± = Variable reaction; Rod\* = Coccobacillus

# Genus Identification of Unknown Bacterial Cultures

## LEARNING OBJECTIVE

Once you have completed this experiment, you should be able to

1. Use previously studied staining, cultural characteristics, and biochemical procedures for independent genus identification of an unknown bacterial culture.

## Principle

Identification of unknown bacterial cultures is one of the major responsibilities of the microbiologist. Samples of blood, tissue, food, water, and cosmetics are examined daily in laboratories throughout the world for the presence of contaminants. In addition, industrial organizations are constantly screening materials to isolate new antibiotic-producing organisms or organisms that will increase the yield of marketable products such as vitamins, solvents, and enzymes. Once isolated, these unknown organisms must be identified and classified.

The science of classification is called **taxonomy** and deals with the separation of living organisms into interrelated groups. *Bergey's Manual* has been the official, internationally accepted reference for bacterial classification since 1923. The current edition, *Bergey's Manual of Systematic Bacteriology*, arranges related bacteria into 33 groups called sections rather than into the classical taxonomic groupings of phylum, class, order, and family. The interrelationship of the organisms in each section is based on characteristics such as morphology, staining reactions, nutrition, cultural characteristics, physiology, cellular chemistry, and biochemical test results for specific metabolic end products.

At this point you have developed sufficient knowledge of staining methods, isolation techniques, microbial nutrition, biochemical activities, and characteristics of microorganisms to be able to work independently in attempting to identify

the genus of an unknown culture. Characteristics of the major organisms that have been used in experiments thus far are given in Table 1. You are to use this table for the identification of the unknown cultures. The observations and results obtained following the experimental procedures are the basis of this identification. *However, you should note that your biochemical results may not be identical to those shown in Table 1; they may vary because of variations in bacterial strains (subgroups of a species).* Therefore, it becomes imperative to recall the specific biochemical tests that differentiate among the different genera of the test organisms.

The rationale for the performance of this exercise later in the semester is twofold. First, you will have acquired expanded knowledge of microbial activities and will be more proficient in laboratory skills. Second, and more important, you will be more cognizant of and more critical in your approach to species identification using dichotomous keys supplemented with *Bergey's Manual*.

## CLINICAL APPLICATION

### Application of Learned Assays to Identify an Unknown Bacterial Pathogen

The role of the clinical laboratory in a hospital is to quickly and efficiently identify the causative agent of a patient's infection. This will entail choosing the correct assays and performing them in the correct order to logically identify the genus and species of the agent.