

Short series of biochemical tests

We identify intestinal bacteria (within the **Enterobacteriaceae** family) on the basis of the biochemical properties of individual genera. We use a short series of biochemical reactions for this. It is a series of test tubes in which various biochemical tests are performed. The summary of results is always characteristic of a certain genus. Tests include: fermentation of glucose, H₂S formation, urease formation, Simmons citrate, and indole formation.

Glucose fermentation + gas formation

- Glucose solution with bromothymol blue + gas
- **Principle:** the reaction uses pH changes during fermentation of sugars + the gas is in the test tube upside down, if the bacteria produce gas, they accumulate in it and form a bubble.
- **Result:**
 - *Positive with bubble* - yellow (glucose fermentation) + bubble
 - *positive without bubble* - yellow (glucose fermentation)
 - *negative* - green-blue (no fermentation).

H₂S formation

- H₂S medium (ferric ammonium citrate indicator)
- **Principle:** lead sulfide elimination causes medium blackening.
- **Result:**
 - *positive* - blackening
 - *negative* - red, yellow

Urease formation

- Medium with urea
- **Principle:** urease produced by bacteria breaks down urea in the medium, which leads to an increase in pH and the medium turns pink.
- **Result:**
 - *positive:* medium color change
 - *negative:* green, yellow

Simmons citrate

- medium with sodium citrate and bromothymol blue as an indicator
- **Principle:** bacteria use sodium citrate as a carbon source, ammonia is released, this leads to the increase in the pH of the environment and bluing of the medium
- **Result:**
 - *positive:* medium bluing
 - *negative:* green, yellow

Indole formation

- Hottinger broth (contains tryptophan) + Ehrlich (paradimethylaminobenzaldehyde) or Kovács reagent
- **Principle:** tryptophan is degraded by some bacteria, producing indole (indole-positive bacteria), the presence of which can be demonstrated by the addition of an agent.
- **Result:**
 - *positive:* red ring on the surface
 - *negative:* yellow ring

Resolution of the most important bacteria ^[1]

	Distinguishing the most important bacteria						
	glucose	lactose	sucrose	mannitol	urea	hydrogen sulfide	indole
Escherichia Coli	+g	+	+, -	+	-	-	+
Citrobacter freundii	+g	+, -	-, +	+	-	+	-
Klebsiella pneumoniae	+g	+	+	+	+	-	-
Enterobacter aerogenes	+g	+	+	+	-	-	-
Proteus mirabilis	+g	-	r	-	+	+	-
Proteus vulgaris	+g	-	+	-	+	+	+
Morganella morganii	+g, +	-	-	-	+	-	+
Providentia rettgeri	+g, +	-	r	+, -	+	-	+
Salmonella typhi	+	-	-	+	-	+	-
other salmonellas	+g	-	-	+	-	+	-
Shigella	+	-	-	+, -	-	-	+, -
Serratia	+g	-	+	+	r	-	-
Yersenia enterocolica	+	-	+	+	+	-	-

- fermentation with gas formation: +g
- fermentation without gas formation: +
- negative reactions: -
- differing results: r

References

Related Articles

- Bacitracin test
- CAMP test
- E-test
- Catalase test
- Optochin test
- Plasma coagulase test

Citations

1. {{#switch: book |book = *Incomplete publication citation*. COOPER, Marek, Andrej SOUČEK and Faith FRANKOVÁ, et al. *Medical Microbiology : Bacteriology, virology, parasitology*. Prague : Marvil, 1996. 558 s. pp. 262. 978-80-7262-438-6. |collection = *Incomplete citation of contribution in proceedings*. COOPER, Marek, Andrej SOUČEK and Faith FRANKOVÁ, et al. *Medical Microbiology : Bacteriology, virology, parasitology*. Prague : Marvil, 1996. 558 s. pp. 262. {{#if: 8023802976 |978-80-7262-438-6}} |article = *Incomplete article citation*. COOPER, Marek, Andrej SOUČEK and Faith FRANKOVÁ, et al. 1996, year 1996, pp. 262, |web = *Incomplete site citation*. COOPER, Marek, Andrej SOUČEK and Faith FRANKOVÁ, et al. Marvil, ©1996. |cd = *Incomplete carrier citation*. COOPER, Marek, Andrej SOUČEK and Faith FRANKOVÁ, et al. Marvil, ©1996. |db = *Incomplete database citation*. Marvil, ©1996. |corporate_literature = COOPER, Marek, Andrej SOUČEK and Faith FRANKOVÁ, et al. *Medical Microbiology : Bacteriology, virology, parasitology*. Prague : Marvil, 1996. 558 s. 978-80-7262-438-6}} , s. 262.

Literature

- BEDNÁŘ, M, V FRAŇKOVÁ a J SCHINDLER, et al. *Lékařská mikrobiologie - bakteriologie, virologie, parazitologie*. 1. vydání. Praha : Marvil, 1996. 558 s. ISBN 80-238-0297-6.
- ŠMÍROVÁ, Václava. *Úvod do lékařské mikrobiologie*. - edition. -.
- *-Praktika 2. LF* [online]. [cit. 2011-12-16]. <<http://www.lf2.cuni.cz/info2lf/ustavy/ulm/praktika.htm>>.