

TORTORA • FUNKE • CASE

Microbiology

AN INTRODUCTION

EIGHTH EDITION

Kuliah 04: Perhitungan Jumlah Bakteri

PowerPoint® Lecture Slide Presentation prepared by Christine L. Case

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Pendahuluan

- Perhitungan diperlukan untuk mengetahui jumlah bakteri atau mikroorganisme yang akan digunakan dalam proses produksi sehingga memprekcil kegagalan proses.
- Perhitungan dapat dilakukan dengan beberapa cara

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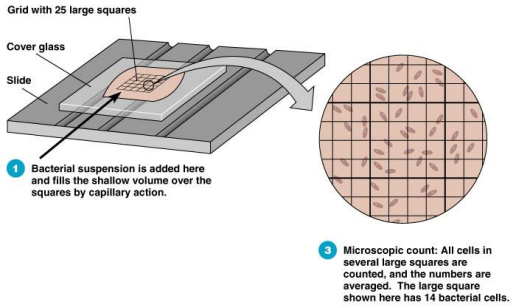
| Generation Number | Number of Cells | Log ₁₀ of Number of Cells |
|-------------------------|-----------------|--------------------------------------|
| 0 | 1 | 0 |
| 5 (2 ⁵) = | 32 | 1.51 |
| 10 (2 ¹⁰) = | 1,024 | 3.01 |
| 15 (2 ¹⁵) = | 32,768 | 4.52 |
| 16 (2 ¹⁶) = | 65,536 | 4.82 |
| 17 (2 ¹⁷) = | 131,072 | 5.12 |
| 18 (2 ¹⁸) = | 262,144 | 5.42 |
| 19 (2 ¹⁹) = | 524,288 | 5.72 |
| 20 (2 ²⁰) = | 1,048,576 | 6.02 |

(b)

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Figure 6.12b

Pengukuran langsung pertumbuhan mikrobia



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Figure 6.19

Pengukuran langsung pertumbuhan mikrobia

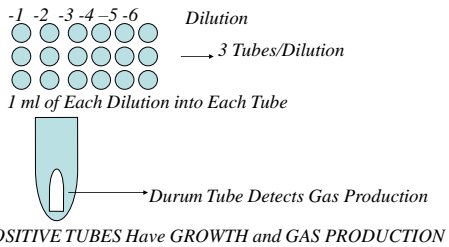
- Hitung langsung dengan Mikroskop

$$\text{Number of bacteria/ml} = \frac{\text{number of cells counted}}{\text{volume of area counted}}$$

$$\frac{14}{8 \times 10^{-7}} = 17,500,000$$

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Most Probable Number (MPN)



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Figure 1: Three-tube design for MPN (unincubated).

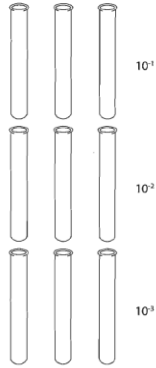
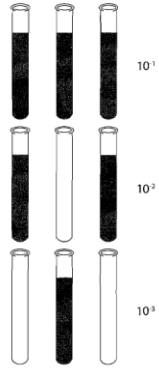


Figure 2: Three-tube design for MPN (incubated).



MPN - Continued

- Recording Results
 - 1 -2 -3 -4 -5 -6
 - 3 3 2 1 0 0 - # of (+) Tubes
- Objective is to "DILUTE OUT" the organism
- Select Most Dilute Sample with All Positive and Take Next Two
 - 3,2,1 – Our Combination
- Determine MPN Using MPN Table

MPN

- Calculations
 - If 3, 2,1 Then Result is: 150/ml or g
 - This is IF we used the the -1, -2, -3 Dilution
 - WE used the -2,-3,-4 Dilutions so we must multiply by 10
 - OUR RESULT
 - 1500 cfu/g or ml
 - 1.5 x 10³ cfu/g or ml

MPN

- If none of the tubes have 3 positive, take most dilute with a positive and take next two ABOVE it
- Examples
 - 1 -2 -3 -4 -5 -6
 - a. 3 3 3 3 1 1
 - b. 2 2 1 0 0 0
 - c. 3 3 2 1 1 0 ?????

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MPN

- For C, use 3 2 2
 - There is a tube that has a positive result “below” the -4 tube (most dilute tube used in the result)
- If a tube that is more dilute than the tubes in the 3 tube combination has a positive result then combine that number with the last tube of the 3 tube combination!!

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MPN

| Example | Sample quantities (g or ml) ¹ | | | | | Reported positive values | MPN estimate/ g or ml |
|---------|--|------------|------------|------------|------------|--------------------------|--------------------------|
| | 10 | 1 | 0.1 | 0.01 | 0.001 | | |
| a | 3/3 ² | <u>3/3</u> | <u>2/3</u> | <u>0/3</u> | 0/3 | 3-2-0 | 9.3 |
| b | 3/3 | 3/3 | <u>3/3</u> | <u>2/3</u> | <u>0/3</u> | 3-2-0 | 93. |
| c | 0/3 | <u>0/3</u> | <u>1/3</u> | <u>0/3</u> | 0/3 | 0-1-0 | 0.31 |
| d | 3/3 | <u>3/3</u> | <u>2/3</u> | <u>1/3</u> | 1/3 | 3-2-2 | 21. |
| e | 3/3 | 3/3 | <u>3/3</u> | <u>3/3</u> | <u>3/3</u> | 3-3-3 | >1100 |

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Pendugaan Jumlah Bakteri dengan Metode Tidak Langsung

- Aktivitas metabolik
- Berat kering

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