

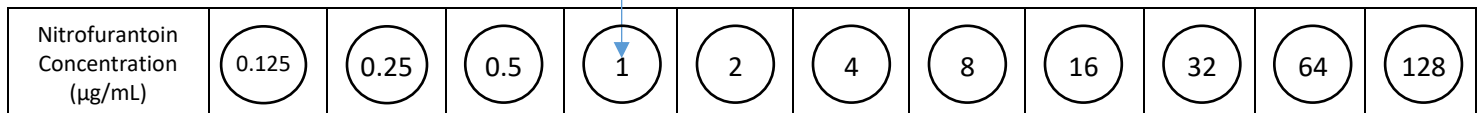


Minimum Inhibitory Concentration – From Lab to Chart

The KASIC education pearl “What is a Minimum Inhibitory Concentration” reviews the basic concept of an MIC. Below is an example visual representation of how MIC values are determined, interpreted with breakpoints, and reported. Please note that most microbiology laboratories use a commercially available automated susceptibility testing platform that performs an abbreviated or similar version of the below process.

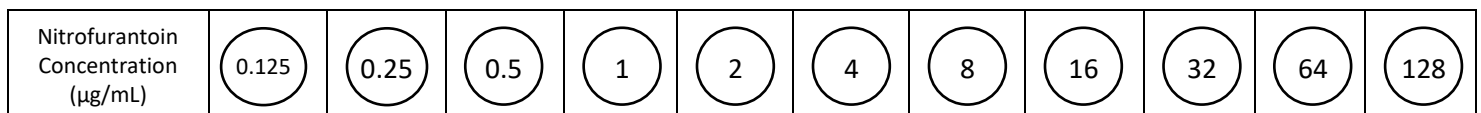
1. Set up

Wells with varying concentrations of drug (serial halvings and doublings from 1 µg/mL) are inoculated with a set amount of bacteria



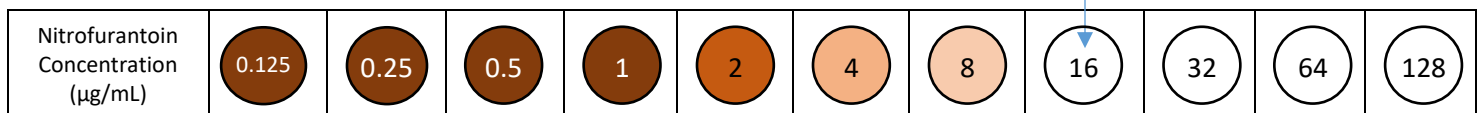
2. Incubate

Wells are incubated for ~24 hours



3. Read

With increasing antibiotic concentrations, bacterial growth decreases. Lowest concentration with **no** visible growth = MIC. The MIC here is 16 µg/mL



Example: Clinical and Laboratory Standards Institute Breakpoints for Enterobacterales (e.g. *E. coli*) for nitrofurantoin

Drug	Susceptible	Intermediate	Resistant
Nitrofurantoin	≤ 32 µg/mL	64 µg/mL	≥ 128 µg/mL

4a. Interpret with breakpoints – Susceptible *E. coli*

Nitrofurantoin Concentration (µg/mL)	0.125	0.25	0.5	1	2	4	8	16	32	64	128
Interpretation								S			

MIC of ≤ 32 µg/mL is considered **susceptible** per Clinical and Laboratory Standards Institute breakpoints for nitrofurantoin


4b. Interpret with breakpoints – Intermediate *E. coli* (different *E. coli* from 4a)

Nitrofurantoin Concentration (µg/mL)	0.125	0.25	0.5	1	2	4	8	16	32	64	128
Interpretation										I	

MIC of = 64 µg/mL is considered **intermediate** per Clinical and Laboratory Standards Institute breakpoints for nitrofurantoin

4c. Interpret with breakpoints – Resistant *E. coli* (different *E. coli* from 4a and 4b)

Nitrofurantoin Concentration (µg/mL)	0.125	0.25	0.5	1	2	4	8	16	32	64	128
Interpretation											R

 = Bacterial growth

S = Susceptible
I = Intermediate
R = Resistant

MIC of ≥ 128 µg/mL is considered **resistant** per Clinical and Laboratory Standards Institute breakpoints for nitrofurantoin

5. Lab report for 4a *E. coli*

Urine culture: <i>E. coli</i>		
Drug	MIC (µg/mL)	Interpretation
Amoxicillin/clavulanate	$\leq 8/4$	Susceptible
Ampicillin	> 16	Resistant
Ampicillin/sulbactam	$8/4$	Susceptible
Cefazolin	≤ 2	Susceptible
Ciprofloxacin	≤ 1	Susceptible
Gentamicin	4	Susceptible
Nitrofurantoin	≤ 32	Susceptible
Trimethoprim/sulfamethoxazole	$\leq 2/38$	Susceptible

References:

- Patel R. The clinician and the microbiology laboratory: test ordering, specimen collection, and result interpretation. In: Bennett JE, Dolin R, Blaser MJ, ed. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 9th ed. Philadelphia, PA: Elsevier; 2020:194-210.
- Clinical and Laboratory Standards Institute (CLSI). Accessed September 16, 2022. <https://clsi.org>.