McFarland Latex Standards

REF PL.2350 REF PL.2300 REF PL.2301 REF PL.2302 REF PL.2303 REF PL.2304 REF PL.2320

INSTRUCTIONS FOR USE

INTENDED USE
The McFarland Latex Standards are for use as part of a quality control program for adjusting densities of bacterial suspensions that are used for identification and susceptibility testing.

SUMMARY AND EXPLANATION
The McFarland Latex Standard tubes contain polystyrene particles suspended in an aqueous solution that is adjusted to an acceptable transmittance range using a spectrophotometer at a wavelength of 600 nm and a densitometer. A bacterial suspension, once adjusted to the same turbidity of a McFarland Latex Standard, produces expected bacterial plate counts and can be used in a variety of identification or susceptibility kits and methods.[1]

The McFarland Latex Standards are used for adjusting densities of bacterial suspensions. Each standard is made from different concentrations of polystyrene particles mixed in an aqueous solution. The original McFarland Standards were made from the combination of barium chloride and sulfuric acid that resulted in a precipitate.[2] Problems were encountered with this technique which included instability, storage, and reproducibility of the resulting suspension.[3] These problems have been overcome by using polystyrene particles in an aqueous solution, resulting in the McFarland Latex Standards used today.[4] For additional information on McFarland Latex Standards, refer to the Clinical and Laboratory Standards Institute (CLSI) and the European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines.

MATERIALS PROVIDED
Each McFarland Latex Standard is packaged with a Wickerham Card. Tube size is 16x100 mm and contains 10 ml of standard with 0.095% sodium azide as a preservative. McFarland Latex Standards are supplied ready to use.

Cat. No	Description
PL.2300	McFarland Latex Standard 0.5
PL.2301	McFarland Latex Standard 1.0
PL.2302	McFarland Latex Standard 2.0
PL.2303	McFarland Latex Standard 3.0
PL.2304	McFarland Latex Standard 4.0
PL.2320	McFarland Latex Standard Blank (0.0)
PL.2350	McFarland Latex Standard Set*

*Contains one of each 0.5, 1.0, 2.0, 3.0 and 4.0 standards and a Wickerham Card.

STABILITY AND STORAGE
Store at 15-30ºC. **Do not freeze or overheat.** Product stored under these conditions will be stable until the expiry date shown on the product label.

WARNINGS AND PRECAUTIONS
- Do not use after the expiration date shown on the product label.
- For Laboratory Use only.
- The procedures, storage conditions, precautions, and limitations specified in these directions must be followed to obtain valid test results.
- Tubes with similar diameters should be used in comparing bacterial suspensions to the McFarland Latex Standards.
- Do not use tubes if volume or color has changed or show microbial contamination or any other signs of deterioration.
- Do not vortex.

TEST PROCEDURE

1. Prior to use, gently invert the McFarland Latex Standard tube several times to assure uniformity of the suspension.
2. Adjust the turbidity of the bacterial suspension to that of a known McFarland Latex Standard.
3. Using adequate light, compare the turbidity of the bacterial suspension to the McFarland Latex Standards against the black bars printed on the Wickerham Card.[5]

QUALITY CONTROL

Each lot of McFarland Latex Standard is tested using a densitometer and a spectrophotometer. OD_{600nm} is used as the primary acceptance criterion, while McFarland Unit (MFU), measured using a densitometer, is used as a reference. Both OD_{600nm} and MFU results passed the quality control range of acceptability as follows.

McFarland Latex Standards	Absorbance Range in Densitometer		Absorbance at OD_{600nm} in Spectrophotometer			Approximate Cell Density (x 10^8/ml)
	Lowest	Highest	Target OD_{600nm}	Lower Limit	Upper Limit	
0.5	0.45	0.55	0.0856	0.0787	0.0925	1.5
1.0	0.90	1.10	0.2292	0.2232	0.2352	3.0
2.0	1.80	2.20	0.3984	0.3785	0.4183	6.0
3.0	2.70	3.30	0.5754	0.5466	0.6041	9.0
4.0	3.60	4.40	0.7446	0.7074	0.7819	12.0

INTERPRETATION OF RESULTS

Bacterial suspension is standardized when distortion of black bars on Wickerham Card is equivalent to that of the McFarland Latex Standard.

LIMITATIONS OF THE PROCEDURE

- Colored broth media may not provide the proper contrast with McFarland Latex Standards. Incorrect results may occur.
- Bacterial suspensions of older cultures may not compare to expected bacterial counts.
- These standards have been adjusted by a spectrophotometer. Use of any other instrumentation may not give reliable results.

AVAILABILITY

Cat. No	Description
PL.2325	Wickerham Card (Pkg. of 10)

REFERENCES

1. Tille P. M. *Bailey & Scott's Diagnostic Microbiology*, *Fifteenth Edition*. St. Louis, Missouri: Elsevier, 2021.
2. McFarland, J. The Nephelometer: An Instrument for estimating the number of bacteria in suspensions used for calculating the opsonic index and for vaccines. *Journal of the American Medical Association*. (JAMA) 1907; 14:1176-1178.
3. Washington, J.A., Warren, E. Karlson, A. G. Stability of barium sulfate turbidity standards. Applied Microbiology. 1972; 24:1013.
4. Zapata, A. & Ramirez-Arcos, S. A Comparative study of McFarland turbidity standards and the Densimat photometer to determine bacterial cell density. *Current Microbiology.* 2015; Jun:70(6):907-9.
5. Wickerham, L. J. Taxonomy of Yeasts. In Technical bulleting no 1029, U.S. Department of Agriculture, Washington, D.C. 1951.

SYMBOLS GLOSSARY

	Manufacturer
	Use-by date
	Lot number
	Catalogue number
	Temperature limit
	Consult electronic instructions for use

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