

## Quality Control Microorganisms for Dry Rehydratable Film

### What Products are Recommended for QC of Dry Rehydratable Film? ---

Microbiologics recommends Epower™ and Epower CRM™ for quality control (QC) testing of dry rehydratable films such as Petrifilm™. Since the lyophilized microorganisms are available in a wide variety of concentrations, laboratories do not have to spend precious time preparing enumerated microorganism suspensions for tests such as aerobic plate counts.

### Is QC of Dry Rehydratable Film Necessary? ---

Yes. Microorganism controls are used for:

- Routine QC of each batch of food samples tested on dry rehydratable film used for detection and enumeration of indicator microorganisms. If a control gives an erroneous result, the laboratory is alerted that something has gone wrong with the test.
- Testing new shipments of rehydratable film to ensure the media did not deteriorate during shipping.
- Verifying the laboratory can successfully detect target microorganisms when using a dry rehydratable film for the first time.
- Evaluating the competency of analysts who perform tests using dry rehydratable film.
- Verifying a target microorganism can be recovered from a food matrix similar but not the same as the matrices evaluated by the manufacturer.

### USDA Guidelines and ISO 17025 Standards ---

- **United States Department of Agriculture (USDA) Guidelines:**  
USDA Laboratory Guidebook, MLG 3.02, *Qualitative Analysis of Bacteria in Foods as Sanitary Indicators* states, “Positive and sterility controls and an air plate for environmental monitoring will be used with each set of sanitary indicator tests.” Examples of sanitary indicator tests are aerobic plate counts and tests for *E. coli*. Many of the tests described in MLG Chapter 3.02 use dry rehydratable film.
- **ISO 17025 requirements:**  
ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*, 7.7.1, states, “The laboratory shall have a procedure for monitoring the validity of results. The resulting data shall be recorded in such a way that trends are detectable and, where practicable, statistical techniques shall be applied to review the results. This monitoring shall be planned and reviewed and shall include, where appropriate, but not limited to: a) use of reference materials or quality materials...”

### Characteristics of Epower and Epower CRM ---

Epower and Epower CRM are:

- Ready-to-use
- Traceable to authentic reference cultures
- Easily manipulated to deliver a wide variety of concentrations
- Easily combined with other Epower pellets to create a mixed microorganism population

In addition, Epower CRM is:

- Only one passage from reference culture (Epower is three passages or fewer from reference culture)
- Certified Reference Material which means it is ideal for labs following ISO 17025 standards. ISO

17025 5.6.3.2 states, “Reference materials shall, where possible, be traceable to SI units of measurements, or to Certified Reference Materials.” The certified value for the microorganism preparation and the expanded uncertainty is listed on the certificate of analysis.

## Suggestions for Quality Control Microorganisms

Tables 1-5 below provide examples of controls that can be used for several types of dry rehydratable film. The tables also suggest dilutions for each microorganism. The suggestions are based on an inoculum of 1.0 ml. A few tips for diluting pellets are:

- A positive Epower E3 control, diluted 1:100 in phosphate buffer pH 7.2, will recover 10-100 CFU when 1.0 ml is inoculated onto nonselective dry rehydratable film. A positive Epower E4 control must be diluted 1:1000 in order to recover 10-100 CFU on nonselective dry rehydratable film.

Product	CFU/pellet	Diluent	Inoculum	Media	Recovery
E3	1,000 – 9,999	100 ml	1.0 ml	Nonselective Dry Rehydratable Film	10-100 CFU
E4	10,000 – 99,999	1000 ml	1.0 ml	Nonselective Dry Rehydratable Film	10-100 CFU

- For higher recovery of the positive control, use a smaller dilution. For example, dilute 1:50 instead of 1:100.
- Recovery of Epower and Epower CRM microorganisms will be less on selective media than on nonselective media. (For example, the same suspension of *E. coli* may recover only half as many colonies on rehydratable film selective for *E. coli* as on nonselective rehydratable film used for aerobic counts.)

## Additional Tips

- Variability of hydrating fluid, sampling, different colony counting techniques, incubation and the use of selective media will produce colony counts different from the stated mean on the certificate of analysis.
- If a laboratory needs to determine the exact number of CFU per inoculum, the laboratory should inoculate a non-selective agar or film in addition to a selective dry rehydratable film. The count on the nonselective media is comparable to the number of CFU in the inoculum.
- A food matrix can affect both the recovery and appearance of colonies on rehydratable film. A laboratory can verify it can recover a microorganism from a food matrix by testing dry rehydratable film in parallel with two different samples. One sample should contain the food matrix and one sample should not.

**Table 1. Quality Control for Dry Rehydratable Film Used for Aerobic Plate Counts**

Microorganism	Microbiologics Product Line	Microbiologics Catalog Number	CFU Per Pellet	Dilution	Expected Result
<i>Staphylococcus aureus</i> subsp. <i>aureus</i>	Epower Epower CRM	0360E3 0360E3-CRM	1,000-9,999 CFU	1:100	Growth
	Epower Epower CRM	0360E4 0360E4-CRM	10,000-99,999 CFU	1:1000	Growth
<i>Lactobacillus fermentum</i>	Epower Epower CRM	0813E3 0813E3-CRM	1,000-9,999 CFU	1:100	Growth
<i>Escherichia coli</i>	Epower Epower CRM	0791E3 0791E3-CRM	1,000-9,999 CFU	1:100	Growth
	Epower Epower CRM	0791E4 0791E4-CRM	10,000-99,999 CFU	1:1,000	Growth
<b>Sterile Diluent Blank</b>	N/A	N/A	N/A	N/A	No Growth

**Table 2. Quality Control for Dry Rehydratable Film Used for Detection and Enumeration of *E. coli* and Coliforms**

Microorganism	Microbiologics Product Line	Microbiologics Catalog Number	CFU Per Pellet	Dilution	Expected Result
<i>Escherichia coli</i>	Epower Epower CRM	0791E3 0791E3-CRM	1,000-9,999 CFU	1:50	Growth
	Epower Epower CRM	0791E4 0791E4-CRM	10,000-99,999 CFU	1:500	Growth
<i>Klebsiella aerogenes</i>	Epower Epower CRM	0306E3 0306E3-CRM	1,000-9,999 CFU	1:50	Growth
<i>Staphylococcus aureus</i> subsp. <i>aureus</i>	Epower Epower CRM	0360E3 0360E3-CRM	1,000-9,999 CFU	1:10	No Growth
	Epower Epower CRM	0360E4 0360E4-CRM	10,000-99,999 CFU	1:100	No Growth
<b>Sterile Diluent Blank</b>	N/A	N/A	N/A	N/A	No Growth

**Table 3. Quality Control for Dry Rehydratable Film used for Detection and Enumeration of Enterobacteriaceae**

Microorganism	Microbiologics Product Line	Microbiologics Catalog Number	CFU Per Pellet	Dilution	Expected Result
<i>Escherichia coli</i>	Epower Epower CRM	0791E3 0791E3-CRM	1,000-9,999 CFU	1:50	Growth
	Epower Epower CRM	0791E4 0791E4-CRM	10,000-99,999 CFU	1:500	Growth
<i>Klebsiella aerogenes</i>	Epower Epower CRM	0306E3 0306E3-CRM	1,000-9,999 CFU	1:50	Growth
<i>Staphylococcus aureus</i> subsp. <i>aureus</i>	Epower Epower CRM	0360E3 0360E3-CRM	1,000-9,999 CFU	1:10	No Growth
	Epower Epower CRM	0360E4 0360E4-CRM	10,000-99,999 CFU	1:100	No Growth
<b>Sterile Diluent Blank</b>	N/A	N/A	N/A	N/A	No Growth

**Table 4. Quality Control for Dry Rehydratable Film for Detection and Enumeration of *S. aureus***

Microorganism	Microbiologics Product Line	Microbiologics Catalog Number	CFU Per Pellet	Dilution	Expected Result
<i>Staphylococcus aureus</i> subsp. <i>aureus</i>	Epower Epower CRM	0485E3 0485E3-CRM	1,000-9,999 CFU	1:50	Growth
<i>Staphylococcus aureus</i> subsp. <i>aureus</i>	Epower Epower CRM	0360E3 0360E3-CRM	1,000-9,999 CFU	1:50	Growth
	Epower Epower CRM	0360E4 0360E4-CRM	10,000-99,999 CFU	1:500	Growth
<i>Escherichia coli</i>	Epower Epower CRM	0791E3 0791E3-CRM	1,000-9,999 CFU	1:10	No Growth
	Epower Epower CRM	0791E4 0791E4-CRM	10,000-99,999 CFU	1:100	No Growth
<b>Sterile Diluent Blank</b>	N/A	N/A	N/A	N/A	No Growth

**Table 5. Quality Control for Dry Rehydratable Film Used for Detection and Enumeration of Yeast and Mold**

Microorganism	Microbiologics Product Line	Microbiologics Catalog Number	CFU Per Pellet	Dilution	Expected Result
<i>Penicillium venetum</i>	Epower Epower CRM	0794E3 0794E3-CRM	1,000-9,999 CFU	1:100	Growth
<i>Saccharomyces kudriavzevii</i>	Epower Epower CRM	0698E3 0698E3-CRM	1,000-9,999 CFU	1:100	Growth
<i>Zygomycetes. rouxii</i>	Epower	0803E3	1,000-9,999 CFU	1:100	Growth
		0803E4	10,000-99,999 CFU	1:100	Growth
<i>Staphylococcus aureus</i> subsp. <i>aureus</i>	Epower Epower CRM	0360E3 0360E3-CRM	1,000-9,999 CFU	1:10	No Growth
	Epower Epower CRM	0360E4 0360E4-CRM	10,000-99,999 CFU	1:100	No Growth
<b>Sterile Diluent Blank</b>	N/A	N/A	N/A	N/A	No Growth

## References

ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. 2017.

USDA Microbiology Laboratory Guidebook, *Quantitative Analysis of Bacteria in Foods as Sanitary Indicators*. 2015.