

3M *Micro Messenger*

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3M Helps Consumers Monitor Storage of Refrigerated Foods

In an effort to provide consumers with an additional measure of food quality, 3M has developed an innovative way to monitor the temperature conditions of refrigerated food products before and after they are purchased.

The 3M™ MonitorMark™ Time Temperature Label is a visual indicator that lets consumers see if a package of refrigerated food has been stored for the proper time and at proper temperatures. The MonitorMark labels were introduced on packages of Cub Foods ground beef at Cub Foods supermarkets in the Minneapolis and St. Paul areas.

“Monitoring the temperature exposure of food is very important because temperature impacts the shelf life of the product,” according to Rich Matner,

Market Development Manager, 3M Microbiology. “For example, a product that lasts for four days at 40°F may only last for four hours when exposed to 120°F—which is how hot a car trunk can be in the summer.”

The MonitorMark label is temperature sensitive, changing color from off-white to black over time and darkening more rapidly at higher temperatures. “We conducted extensive market research and focus groups throughout the United States. 3M developed the label in response to consumers’ concerns about the temperature storage of meat and dairy products,” says Matner. “Manufacturers were also looking for a cost-effective label that could be easily applied to the products.”



The label is applied to the package during food manufacturing and monitors the temperature from the food processor to the food retail store to the consumer’s home. Since the permanent color change of the MonitorMark label is tailored to a specific food product, consumers will know right away whether the product has been shipped and stored for the proper time and temperatures.

For more information about 3M MonitorMark time temperature labels, send an e-mail to microbiology@mmm.com or call the 3M Customer Helpline at **1-800-228-3957**.

Threshold Indicators Provide History of Temperature Exposure

To provide food processors with a cost-effective means of monitoring critical temperature control and exposure throughout the distribution process, 3M introduced 3M™ MonitorMark™ Threshold Indicators.

These small indicators provide processors with an easy, inexpensive way to tell if perishable food products have been exposed to temperatures that may cause premature breakdown. The indicators are lightweight and adhere securely on secondary shipper boxes ready for storage or transit. In addition, they can be used to monitor raw material inventories.



“Using MonitorMark threshold indicators will help food processors

and suppliers further

Importance of Controlling Temperature of Refrigerated Foods



By: Theodore P. Labuza, Ph.D.

Department of Food Science and Nutrition, University of MN, St. Paul

Refrigeration (cold storage) is a common food preservation practice for thermally sensitive products. Refrigerated foods such as meat, poultry, fish, dairy products, fruits and vegetables need to be maintained and stored at refrigeration temperatures (40°F or less) to ensure quality. If proper refrigeration temperature is not maintained throughout the entire distribution, from producer to consumer, quality and safety of the product can be sacrificed. This may

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3M Microbiology continues to establish 3M™ Petrifilm™ Plates as a global standard. It is now available in over 45 countries. In the Asia Pacific region Petrifilm plates are sold in thirteen countries.

Country	Contact	Company	Telephone Number	Fax Number
Australia	Geoff Ravenscroft	3M Australia Pty. Ltd.	61-3-9265-4368	61-3-9265-4411
China 	Jerry Sun	3M China Ltd.	86-21-62753535 x2124	86-21-62752343
Hong Kong	Dickson Chin	3M Hong Kong Ltd.	852-28061111	852-28071308
India 	Uday Mulya	Birla 3M Ltd.	91-22-6426753	91-22-6404809
Indonesia	Okky Rosmawati	PT 3M Indonesia	62-21-88346059	62-21-8834-6108
Japan	Takatoshi Moriyama	3M Health Care Ltd.	81-3-3709-8289	81-3-3709-8754
South Korea	S.P. Kim	3M Korea Ltd.	82-2-3771-4176	82-2-786-2825
Malaysia	Kevin Cheong	3M Malaysia Sdn Bhd	603-706-2888	603-706-2897
New Zealand	Jenny Ash	3M New Zealand Ltd.	64-9-443-9093	64-9-443-7885
Philippines	Ryll Larr Alvarez	3M Philippines	63-2-813-3781	63-2-814-5873
Singapore	Catherine Sum	3M Singapore Pte Ltd.	65-450-8820	65-455-2130
Taiwan	Tony Yu	3M Taiwan Ltd.	886-2-27049011	886-2-27060355
Thailand	Pongtep Jaruckjanyanam	3M Thailand Ltd.	66-2-260-8577	66-2-261-7535

Sterilization Monitors Now Available from 3M Microbiology

3M Microbiology now offers sterilization assurance products for the food and beverage industry. The products provide quality assurance personnel with a simple and efficient method for accurately monitoring the steam sterilization process. In addition, the products can help QA labs document the results as part of a good HACCP plan.

3M Sterilization Assurance Products available to the food and beverage industry include:

- n 3M™ Attest™ Biological Indicator. The purple indicator introduces live, highly resistant, non-pathogenic spores (*Bacillus stearothermophilus*) into the sterilization cycle to detect the actual killing of the spores during the cycle. Interpreting results is easy—purple indicates a successful sterilization process and yellow indicates a failure.
- n 3M™ Comply™ Chemical Integrator. Assess your autoclave performance with the Comply chemical integrator. It indicates if conditions—time, temperature and steam quality—for sterilization have been met. The results are easy to interpret. Just look for the color bar in the “Reject” or “Accept” window.
- n Attest Monitoring Starter Kit. Everything you need to begin effective monitoring of your sterilization is included in this

kit. Sterilization monitoring equipment and supplies are packaged with a training video and print materials that demonstrate basic sterilization principles. A handy wall chart provides staff with a quick reference.

- n Attest Incubator. A compact incubator that allows quick, on-site monitoring.
- n Attest Record Keeping System. The log book can help you keep track of sterilization for Quality Assurance documentation.

3M has been a worldwide leader in sterilization assurance products, helping health care professionals meet their industry’s stringent standards. When food processors purchase these products, 3M provides an easy-to-follow program, customer service and technical support. For more information, contact the 3M Customer Helpline at **1-800-288-3957**.

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Importance of Controlling Temperature of Refrigerated Foods

lead to a food poisoning incident or the consumer getting a poor product—and no longer buying that brand or shopping at the store from which they bought it. A recent survey (*Super Market News*, 1996) showed that consumers gave freshness the top priority in purchasing refrigerated foods. In addition, a survey (*Progressive Grocer*, 1997) indicated that improper controls cause an estimated loss of 1.2% to 1.5% of foods at the grocer level, amounting to a loss of close to \$2 billion, while a USDA-ARS study in 1997 indicated another 25% loss (and waste) in the home and at food service.

Most refrigeration units operate with limit switches (i.e., the refrigeration unit during cooling will cool to a low set temperature and then shut off). During the subsequent time, the internal temperature of the cabinet rises as heat penetrates into the chamber, especially if the door is opened. Once an upper set temperature limit is reached, the compressor turns on automatically and the unit cools down again. The range of temperature between the upper and lower limits will have a significant effect on shelf life and safety, since spoilage is an exponential function of temperature. Thus the mean temperature of the cycle is not the actual mean

temperature, it is generally 3°F to 5°F above the average. Most commercial units are preset at the factory. Therefore it is hard to change the limit switches, plus most operators feel this practice is more economical. A 5°F decrease in temperature costs about 10% more in energy to operate. In addition to this problem, the sensor may not indicate the true cooling temperature of the unit, depending on where it is located.

In order to save hand labor, many units have a defrost cycle which can subject food to an even higher average temperature. Finally, food in many open display cases may be stored above the chill line so that the product is exposed to higher temperatures than the unit indicates. In a 1989 study by Audits International, it was found that deli cabinets in supermarkets ranged from 34°F to 71°F (47°F average) and home refrigerators had an average of about 43°F. Given all these problems, careful monitoring and control of refrigeration units is critical to safety and quality.

Importance of Temperature Monitoring to Quality and the Shelf Life Date

Consumers are concerned with food quality (freshness and spoilage). We refrigerate food to preserve the freshness and maintain the quality, essentially by slowing microbial growth, especially of food poisoning organisms. Most scientific and government organizations recommend that a temperature of 40°F or lower should be maintained during distribution in the refrigerator. However foods can still spoil, as is evidenced by development of off-odors, off-color or slime. The basics of food safety are to maintain proper temperatures during handling, cooking and storing of the food. Although microorganisms do not grow well at low temperatures, they can grow at typical refrigeration temperatures of 41°F to 50°F. All can grow more rapidly between 41°F and 140°F (doubling in numbers in as little as 8 to 20 minutes).

Consumers also understand that the longer food is left out of the refrigerator the less it lasts. On a basic level, this is a time-temperature relationship. Microorganisms that spoil food grow exponentially faster at higher temperatures, somewhere

between a two-to three-fold increase in rate for a 10°F increase in temperature.

Currently, consumers rely on the shelf life date stamped on the package label in their purchases (sorting for the youngest date) and in holding practices at home. Most companies have a “use by” date, a “best if used by” date, a “freeze by” date (on poultry) or a date that says to use within “x” days of date stamped. About 30 states require such dating, mostly on refrigerated products. These dates give consumers a way to manage their purchases and storage at home in order to ensure the freshness and quality of the food. However, even the most appropriate open date on a food package may be inaccurate—if it is based on the average distribution time for packages and assumes constant conditions. The date does not take into consideration the temperature conditions that an individual product was exposed to throughout the entire distribution chain. This includes the cycling of the unit, defrost, exposure during transfer between refrigeration units, (especially when brought home in the car), and the home refrigeration conditions. Recent reports suggest that temperature control is not being done well, so there can be significant spoilage before the stamped date is reached. The temperature abuse is integrative and cumulative—each step in the distribution chain is critical. A quality product like milk, exposed to one hour abuse at 50°F, will lose about four times more quality than one hour exposure at 35°F. Many refrigerated foods have similar or greater temperature sensitivities because of the high temperature sensitivity for the growth of microbes. One major fresh refrigerated orange juice manufacturer found that 70% of consumer complaints were related to temperature abuse in the control chain.

Temperature Monitoring Systems

There are two major types of temperature monitoring units that can be used to ensure food quality and potentially, safety. One type uses either a mechanical recorder or a computerized recorder/data logger to record the time-temperature history measured at the tip of a probe. These devices measure some point in a distribution container or in a display unit, but they do not measure the

temperature at the surface of the food. The data can be downloaded into graphic form to see points of abuse. However, unless a computer program is written to analyze the data from a quality loss standpoint, the graphs cannot tell anything about quality loss since the area under the temperature-time curve (degree-days) is not a meaningful measure. Obviously these devices have a benefit if the company has a temperature control program. The above mentioned fresh orange juice company was able to eliminate almost 50% of consumer complaints by installing such devices in all transport vehicles and establishing a temperature control program, including accountability and warehouse stock rotation.

Unfortunately, the other 50% of complaints were not controllable since they occurred in the supermarket and in transport to the home and home storage. The second major type of device is a chemical time-temperature integrator that essentially integrates the exponential behavior of the exposure. It must be designed to have the same

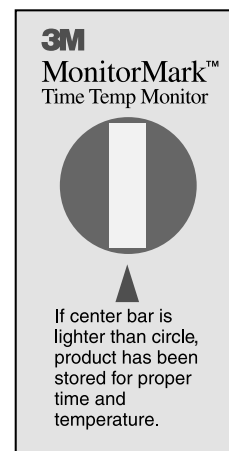


Figure A

temperature sensitivity of the food it is monitoring and is placed (essentially a tape label) on the package surface so that each package has a monitor system. It could be designed to show some easily recognizable color change (e.g., when an initially lighter area reaches the same color as the outer area surrounding it—see figure A). Of course, since we would not recognize how fast the color is changing, this must be complemented with some type of open date code. This latter technology has important benefits to the consumer as well as to the food industry and eventually will follow the other types of temperature monitoring methods.

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AOAC® Official MethodSM 998.08

Confirmed 24-Hour *Escherichia coli* Counts in Poultry, Meat and Seafood Dry Rehydratable Film Method

3M™ Petrifilm™ E. coli/Coliform Count Plate

3M received AOAC® Official MethodSM approval for 3M™ Petrifilm™ E. coli/Coliform Count Plates at 24 hours for the determination of confirmed *Escherichia coli* in poultry, meats and seafood. An analysis of the precollaborative study data substantiates that the Petrifilm E. coli/Coliform Count plate can confidently be read after 24 hours of incubation for meat, poultry and seafood.

3M™ Electronic Pipettor Frequently Asked Questions and Answers

Q Should the 3M Electronic Pipettor be sent in once a year for a “check-up” or for calibration?

A The EP does not require service every year if it passes the calibration check. For instructions on running a calibration check refer to your manual or the Electronic Pipettor “Calibration Check” technical sheet (see below for Fax-On-Demand information).

Q How often should I clean my Electronic Pipettor?

A The exterior of the pipettor should be wiped with a soft cloth and mild detergent every day. At least monthly you should remove the red tip ejector collar and clean the tip cone. Whenever you suspect liquid has rolled up into the pipettor, decontaminate both the tip cone and the piston with pure ethanol. It’s a good idea to conduct this decontamination procedure at least quarterly.

Q How often should the filter on the 1mL pipettor be replaced?

A Replace the filter when it comes into contact with the sample, if it looks discolored, or if you get low volumes during your calibration check. Many customers find it works well to replace the 1mL filter weekly.

Q What types of alcohol can be used for cleaning?

A Use alcohol with less than 10% water.

Q Should I replace the battery after one year of use?

A It is not necessary to replace the battery until it loses the ability to recharge. The EP shuts off before the battery power is too low to allow it to perform accurately. We estimate that the battery will last around a year. However, heavier use will make earlier replacement necessary.

Q Is it important that I use 3M grease on the piston following the decontamination procedure?

A Yes. The 3M grease will minimize problems with scratching the piston that can occur with other types of grease. This will help you maintain your pipettor’s accuracy.

Q Why does 3M suggest I keep the pipettor in the recharging stand whenever it’s not in use?

A Keeping the pipettor in the stand keeps the unit upright and reduces the chance of sample rolling back up into the tip cone. Storage in the stand also maximizes the battery charge and can help reduce the risk of dropping the pipettor off the bench.

Q What does it mean if I see “Er 1” in the screen?

A This can indicate the battery needs recharging or a mechanical error has occurred.

Q What should I do if I see “Er 1” in the screen?

A Place the switched “ON” pipettor in the recharging stand. Check the display after a few minutes. You will see one of these symbols in the display:

- 1) <E—Fully recharge the unit for 10 hours. Resume normal use.
- 2) Er 1—Press the E button and “<E” should appear in the display. Then press the Start button twice. Resume normal use.

If the pipettor repeatedly displays “Er 1,” there is a mechanical error—like a plugged, dirty filter, a dirty piston, or a piston needing grease. You can call the 3M Service Center for further troubleshooting. (In the U.S. call 1-800-292-6298.)

Use our Fax-On-Demand system to request literature for the 3M Electronic Pipettor. Call 1-800-328-6553 and select option 1.

Use the following Document I.D. Numbers:
1201 General Information Flyer
1202 Instruction and Maintenance Technical Sheet
1203 Calibration Check Technical Sheet



Microbiology Products

3M Center, Building 275-5W-05
St. Paul, MN 55144-1000
USA
1 800 228-3957
microbiology@3M.com

3M Canada Inc.

Post Office Box 5757
London, Ontario N6A 4T1
Canada
1 800 364-3577

3M Europe

Laboratoires 3M Santé
Boulevard de l’Oise
F-95029 Cergy-Pontoise Cedex
France
33 1 30 31 85 71

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