



# SafTest™ System

for Quality Testing of Fats and Oils

Your Eye for Food, Oil, Cosmetics  
and Biodiesel Quality Testing



# Quality Testing and Analysis

Freshness of incoming raw materials is critical to the quality of your end-product. Equally important is freshness and shelf-life determination of your finished goods. MP Biomedicals' benchtop SafTest system offers a quick, accurate, and affordable means of determining the freshness of human foods, pet foods, and cosmetics without having to send your samples out to an external testing lab. SafTest is designed with simplicity and convenience in mind and has proven to be the system of choice for determination of freshness and quality for over 15 years.

The SafTest test methods are an environmentally-friendly solution for analyzing fat and oil degradation to assess the quality and freshness of your product. SafTest can be customized to your workflow, from incoming raw material testing to establishing the shelf-life of your finished product. Fat quality and content are used as key indicators of overall quality, ensuring proper texture, odor, flavor, nutritional value, safety, stability, reliability and consistency.

Key benefits of the SafTest system:

- **Proven** – Reagent kits have been designed for reproducibility, lot-to-lot consistency, scalability, and ease-of-use
- **Speed** – Rapid, on-site results in as little as 20 minutes and no special lab or degree needed
- **Convenience** – Kits are configured and standardized for analysis of 110 samples at a cost of ~ \$4.50 per sample
- **Flexibility** – Customizable platforms for running various types of liquid or solid samples
- **Safety** – Reagents are low hazard and require no toxic chemicals or solvents
- **Quality** – Kits and testing methods in alignment with AOCS test methods

MP Bio's SafTest platforms and kits are designed for analyzing any combination of endpoints including peroxide value, free fatty acids, malonaldehydes, alkenals, percent fat, or total, free and bound glycerin from a variety of products. SafTest is ideal for quality control labs, suppliers and renderers, and manufacturers in the following areas:



**Pet foods**

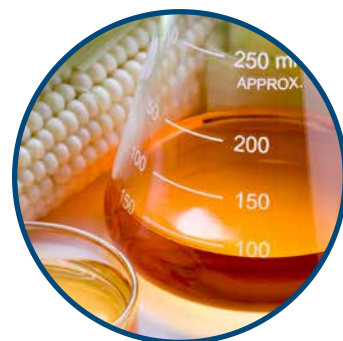


**Human food  
ingredients and  
food products**



**Consumer goods**

- cosmetics
- skin care
- other goods



**Biodiesel**





## SafTest Analyzer

The SafTest system is comprised of an instrument platform, consumables, and kits for evaluating the fat quality and content of various liquid or solid samples. The platform utilizes a simple, easy-to-use photometric analyzer designed specifically for measuring analytes in complex materials. The touch-screen based graphical user interface with pre-programmed protocols makes this instrument simple to learn and easy to operate. Menu-driven software provides flexibility for the user to perform a wide variety of assays.

SafTest analyzer features:

- Pre-programmed touch-screen based protocols
- Reads standard disposable glass 12 mm diameter round tubes – no expensive cuvettes necessary
- Results exported to both onboard printer and USB drive
- Large full color LCD touch screen (800RGB x 480 pixels) for easy navigation and viewing
- Linear and polygonal interpolation for test kit calibration
- Built in memory (64 Mb) for saving and recalling previous calibration curves
- Onboard calculation of concentration or value indexes based on calibration curves
- Absorbance read time less than 2 seconds
- Built in printer

System Specifications	
Absorbance Range	0.000-2.000 AU
Wavelength	550 nm, 570 nm and 690 nm
Optics	Bichromatic
Reproducibility	R coefficient > 0.98; Standard deviation of < 0.005 AU when measured with 20 samples of distilled water
Liquid Crystal Display	320 x 240 STN LCD with Touch Screen
Printer	Onboard
Size	30 cm x 27.2 cm x 12.5 cm
Weight	6.17 lbs (2.8 kg)
Tube Size	12 mm generic round-bottom glass or polystyrene
Read Time	Less than 2 seconds per tube

## SafTest Kits

SafTest test kits provide the reagents and calibrators necessary for analyzing changes in product quality of selected samples. Kits can detect lipid peroxide values, free fatty acids, percent fat, malonaldehyde and alkenal levels for the analysis of freshness and quality of human and pet foods, as well as oils and cosmetics. Additionally, kits are available for the analysis of total (bound and free) glycerin and free fatty acids for analyzing biodiesel quality. Each kit is designed to meet or exceed the precision obtained using the methods specified by AOCS or ASTM.



### Advantages:

- 6 different reagent kits for the analysis of quality in human and pet foods, oils, cosmetics and biodiesel
- Requires only small amount of the sample (10 – 50 µL)
- Results that meet the standards set by AOCS and or ASTM
- Obtain quality data in 20 – 30 minutes as opposed to traditional methods that take 8 hours
- Designed for ease-of-use and convenience
- Each kit contains up to 120 tests and comes pre-packaged with all the reagents, calibrators and controls
- All reagents are non-toxic

Test Kit	Calibration Range	Optimal Working Range*
Peroxide Test Kit	0.00 – 0.20 MEQ/kg	0.05 – 50 MEQ/kg
Free Fatty Acid Test Kit	0.04 – 2.01%	0.1 – 30%
Malonaldehyde Test Kit	0.00 – 0.32 mg/kg	0 – 20 mg/kg
Alkenal Test Kit	8 – 64 nmol/mL	2 – 640 nmol/mL
Percent Fat Test Kit	0.06 – 0.33%	0.04 – 50%
Total Glycerin Test Kit	0.008 – 0.060%	N/A

\*Optimal Working Range is defined as the expected sample value prior to dilution.

For best accuracy and repeatability, all samples should be diluted to fall within the Calibration Range prior to analysis.

Product Name	Pack Size	Cat. No.
Peroxide Test Kit	100 preps	07KTPR2000
Free Fatty Acid Test Kit	100 preps	07KTFA2000
Malonaldehyde Test Kit	100 preps	07KTMA2000
Alkenal Test Kit	100 preps	07KTAK2000
Percent Fat Test Kit	100 preps	07KTPF2000
Total Glycerin Test Kit	100 preps	07KTG2000

## SafTest Platform for Solid Samples

The SafTest Solid Platform is a custom combination of instrumentation and consumables designed specifically for utilization with MP Bio's SafTest Kits. Any combination of SafTest endpoints including peroxide, free fatty acid, malonaldehyde, alkenal, and percent fat can be used with the SafTest Solid Platform.



- Pet Food
- Chips
- Grains
- Nuts
- Dairy Products
- Butters
- Meats
- Almond & Coconut Milk
- Cosmetics
- Skin Care Products & Ingredients

The SafTest Liquid Platform is a custom combination of instrumentation and consumables designed specifically for the testing of liquid samples in conjunction with MP Bio's SafTest Kits. Any combination of SafTest endpoints including peroxide, free fatty acid, malonaldehyde, alkenal, and percent fat can be used with the SafTest Liquid Platform.

## SafTest Platform for Liquid Samples



- Vegetable Oils
- Coconut Oil
- Essential Oils
- Peanut Oil
- Mineral Oil

Product Name	Cat. No.
Solid Sample Instrumentation Platform for Peroxide, Alkenal	07SI2020
Solid Sample Instrumentation Platform for Free Fatty Acid, Malonaldehyde, Percent Fat, Total Glycerin	07SI2000
Solid Sample Consumables Platform for All Kits	07SC2000

Product Name	Cat. No.
Liquid Sample Instrumentation Platform for Peroxide, Alkenal	07LI2020
Liquid Sample Instrumentation Platform for Free Fatty Acid, Malonaldehyde, Percent Fat, Total Glycerin	07LI2000
Liquid Sample Consumables Platform for All Kits	07LC2000

## SafTest Training Services

No matter the method you are currently using, SafTest offers a non-toxic, cost effective and time saving way of testing your samples. With SafTest, you will receive on-site instrument set-up and training. Prior to instrument set-up and training, we will test your samples and provide a detailed report of the full panel of testing results and recommendations for future testing. A custom testing protocol will be created for you, if required.

## SafTest Onsite Testing Services

We also offer sample testing services onsite using the MP Bio SafTest instrument platform. Send us your solid or liquid samples and we'll take care of the rest. Visit [www.mpbio.com/applications/food-quality](http://www.mpbio.com/applications/food-quality) to learn more.

# SafTest Kit Selection Guide

Kit	Component Measured	Samples
Peroxide Test Kit	Lipid Peroxides	Oils, hydrogenated oils, milk, eggs, nuts, grains, fried foods, crackers, chips, seeds. Meals, ground meats, fish, digests, organs, finished products (wet/dry), tallow and greases, cosmetics
Free Fatty Acid Test Kit	Free Fatty Acids	Oils, hydrogenated oils, milk, eggs, nuts, grains, fried foods, crackers, chips, seeds. Meals, ground meats, fish, digests, organs, finished products (wet/dry), tallow and greases, cosmetics
Malonaldehyde Test Kit	Malonaldehydes	Oils, hydrogenated oils, milk, eggs, nuts, grains, fried foods, crackers, chips, seeds. Meals, ground meats, fish, digests, organs, finished products (wet/dry), tallow and greases, cosmetics
Alkenal Test Kit	Alkenals	Oils, hydrogenated oils, milk, eggs, nuts, grains, fried foods, crackers, chips, seeds. Meals, ground meats, fish, digests, organs, finished products (wet/dry), tallow and greases, cosmetics
Percent Fat Test Kit	Triglycerides, Percent Fat	Dairy, cheese, oils, snacks, eggs, cosmetics
Total Glycerin Test Kit	Free, Bound and Total Glycerin	Biodiesel



# Application Guide

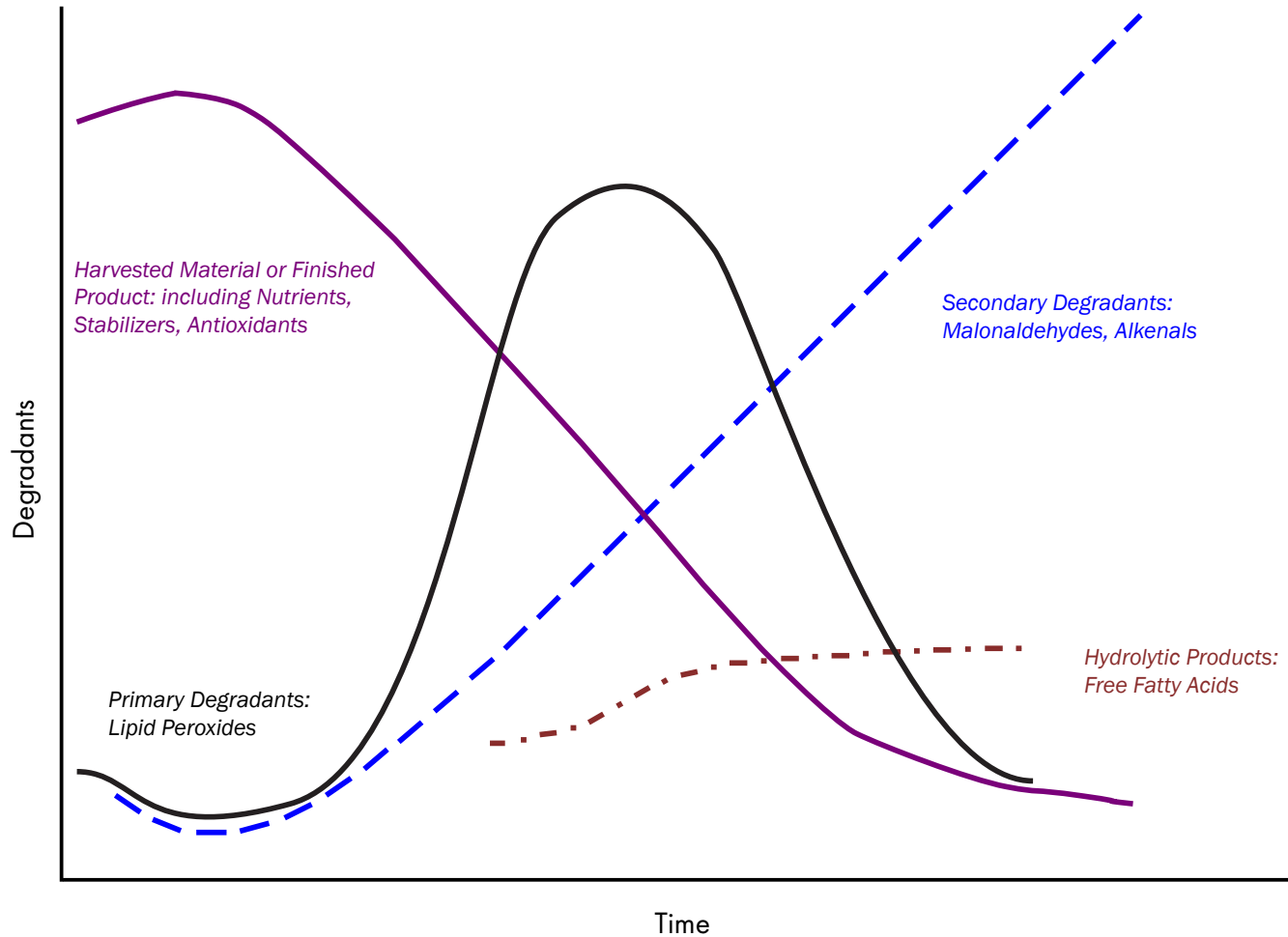
Test Samples	Test Parameters	Limit of Quantification	Min. Sample Size
Pet Food	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals Percent Fat	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg Percent Fat: 0.05 – 90% fat	>1 mL or 4g
Protein and Meat Meals	Peroxide Value Malonaldehyde Alkenals Percent Fat	Peroxide Value: 0.01 – 50 meq/kg Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg Percent Fat: 0.05 – 90% fat	>1 mL or 4g
Egg Whites	Percent Fat	Percent Fat: 0.05 – 90% fat	>1 mL or 4g
Essential Oils and Cosmetics	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg	>1 mL or 4g
Milk, Dairy and Creamer	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg	>1 mL or 4g
Nut, Nut Meals and Seeds	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg	>1 mL or 4g
Oils and fats (tallow), Vegetable Oils (olive, palm, avocado, etc.), Cosmetics	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg	>1 mL or 4g
Frying Oil	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg	>1 mL or 4g
Cookies, Crackers, Candy, Potato Chips, Chocolate and Peanut Butter	Peroxide Value Free Fatty Acids Malonaldehyde Alkenals	Peroxide Value: 0.01 – 50 meq/kg FFA: 0.02 – 20% Oleic acid Malonaldehydes: 0 – 60 mg/kg or 0 – 1,200 µmol/kg Alkenals: 0 – 1,200 µmol/kg	>1 mL or 4g
Feedstock	Free Fatty Acids	FFA: 0.02 – 20% Oleic acid	>1 mL or 4g
Biodiesel	Total Glycerin Bound Glycerin Free Glycerin Acid Number Free Fatty Acids	Total Glycerin: 0.004% – 99.6% glycerin FFA: 0.02 – 20% Oleic acid	>1 mL or 4g



# Lipid Degradation

## Decreasing Nutrients and Increasing Degradants Over Time

SafTest methods are very successful in performing shelf life testing. Finished products can be tested over time, and the following curves are typically produced:



Once the initial shelf-life study is performed, the time required to reach rancidity for any sample can be estimated. The appropriate action can then be taken to prevent unsafe product from reaching the marketplace.





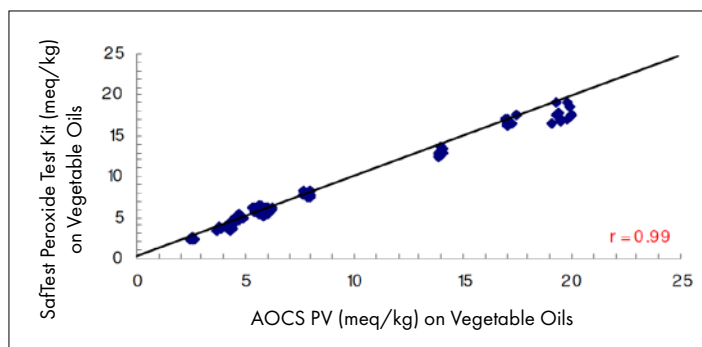
# Peroxide Analysis

MP Bio's Peroxide Test Kit is designed to provide rapid analysis of lipid peroxides in any type of oil or complex sample using microanalytical and membrane separation principles. Lipid peroxides are the primary product of oxidized oils or fats and are an indicator of off-flavors and off-odors (rancidity). The optimal working range, or expected sample value prior to dilution, is 0.05 – 50 MEQ/kg.

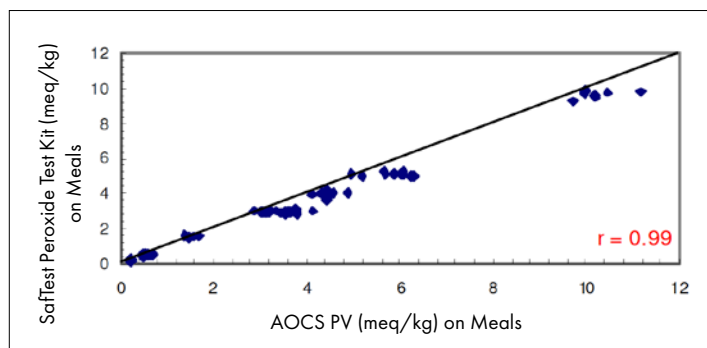
MP Bio's Peroxide Test Kit is in alignment with AOAC and is designed to replace AOCS extraction and titration testing methods. The Peroxide Test Kit offers a fast, easy, non-toxic means of obtaining peroxide values in almost any sample type.

The Peroxide Test Kit quantitates peroxide value (PV) by transferring a free electron to a metal-chromogen complex whose visible spectrum then changes and is read using the SafTest analyzer. The Peroxide Test Kit can be used for testing solubilized dry and wet matrices by extracting lipid fat from the sample matrix using MP Bio's preparation reagent and employing mechanical mixing and warming techniques. This results in significantly shorter sample preparation (15 minutes), allowing for data to be obtained in under 30 minutes. The Peroxide Test Kit contains all reagents, calibrators, and controls required for testing approximately 100 samples.

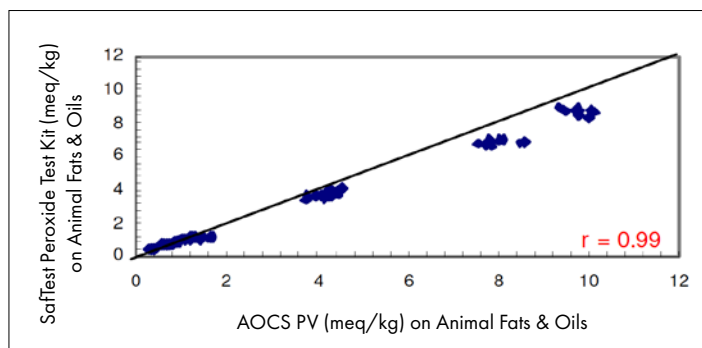
## Vegetable Oils, Seed Oils, Marine Oils, Olive Oils and Pressed Oils



## Meats and Protein Powders



## Animal Fats and Oils



## Sample Preparation

Liquid oils may require heating or dilution; semi-solid, solid oils and solid samples require heating and mechanical disruption; solid samples require membrane separation

## Time Requirement

Sample Preparation: 1 – 20 minutes  
Analysis Time: approximately 10 minutes

## Calibration Range

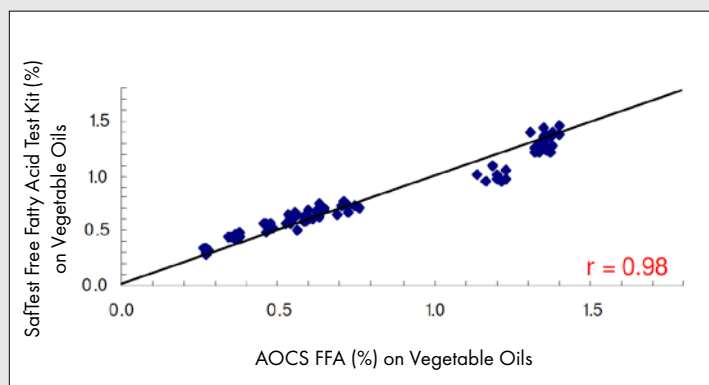
0.00 – 0.20 MEQ/kg

# Free Fatty Acid Analysis

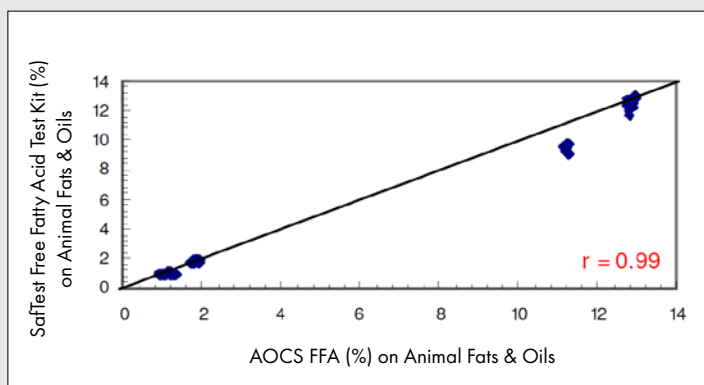
MP Bio's Free Fatty Acid Test Kit is designed to measure free fatty acid content in any raw material or finished product containing oil. Free fatty acids are a key indicator of hydrolytic degradation associated with off flavor and textural changes. The free fatty acid is quantitated as percent oleic acid using an indicator that responds to the acids in the sample matrices. The optimal working range, or expected sample value prior to dilution, is 0.1 – 30% oleic acid.

MP Bio's Free Fatty Acid Test Kit is in alignment with AOAC and is designed to replace AOCS extraction and titration testing methods. The Free Fatty Acid Test Kit offers a fast, easy, non-toxic means of obtaining free fatty acid values in almost any sample type.

**Vegetable Oils, Seed Oils, Marine Oils,  
Olive Oils and Pressed Oils**



**Animal Fats and Oils**



The Free Fatty Acid Test Kit quantitates free fatty acids (FFA) by using a pH sensitive chromogen whose visible spectrum then changes and is read using the SafTest analyzer. The conventional method requires large volumes of organic solvents, large sample aliquots, and involves a lengthy titration process, as well as extraction for some samples which can take up to eighteen hours. MP Bio's proprietary Free Fatty Acid Test can be used for testing solubilized dry and wet matrices by releasing lipid from the sample matrix using a stabilizing reagent (i.e. stabilized isopropanol) and employing mechanical mixing and warming techniques. The significantly shorter sample preparation of 15 to 20 minutes permits data to be obtained in 25 to 30 minutes. MP Bio's Free Fatty Acid Test Kits contain the reagents, calibrators, and controls required for testing approximately 100 samples.

## Sample Preparation

Liquid oils may require heating or dilution; semi-solid, solid oils and solid samples require heating and mechanical disruption; solid samples require membrane separation

## Time Requirement

**Sample Preparation:** 1 – 20 minutes  
**Analysis Time:** approximately 10 minutes

## Calibration Range

0.04 – 2.01% oleic acid

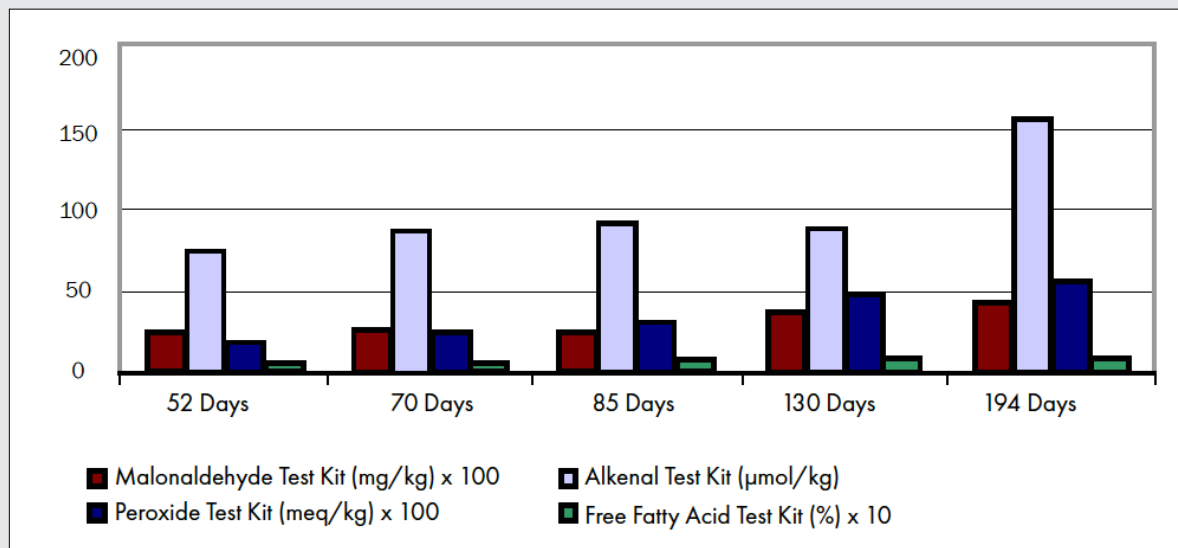


# Malonaldehyde Analysis

MP Bio's Malonaldehyde Test Kit is designed to measure malonaldehyde content in any raw material or finished product containing oil. Malonaldehydes are an indicator of secondary oxidation associated with off-odors and off-flavors (rancidity). The optimal working range, or expected sample value prior to dilution, is 0 – 20 mg/kg.

MP Bio's Malonaldehyde Test Kit is designed to replace TBARS and p-anisidine testing methods. The Malonaldehyde Test Kit offers a fast, easy, non-toxic means of obtaining malonaldehyde values in almost any sample type.

## SafTest Results for Samples Stored at 50°C for 52 to 194 Days



To demonstrate method repeatability, accuracy, and linearity, samples of various types of meals were analyzed using the SafTest's Malonaldehyde Test Kit.

The Malonaldehyde Test Kit quantitates malonaldehyde (MDA) through a condensation reaction where 2 MDA molecules react with a chromogen whose visible spectrum then changes and is read using the SafTest analyzer. MP Bio's proprietary Malonaldehyde Test Kit can be used for testing solubilized dry and wet food matrices by releasing lipid from the sample matrix using a stabilizing reagent (i.e. stabilized isopropanol) and employing mechanical mixing and warming techniques. The short sample preparation time of 15 to 20 minutes permits data to be obtained in 25 to 30 minutes. MP Bio's Malonaldehyde Test Kit contains all reagents, calibrators, and controls required for testing approximately 100 samples.

### Sample Preparation

Liquid oils may require heating or dilution; semi-solid, solid oils and solid samples require heating and mechanical disruption; solid samples require membrane separation

### Time Requirement

Sample Preparation: 1 – 20 minutes  
Analysis Time: approximately 10 minutes

### Calibration Range

0.00 – 0.32 mg/kg

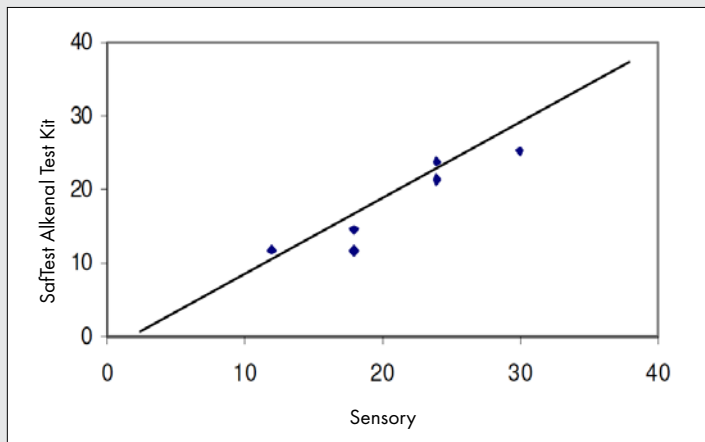


# Alkenal Analysis

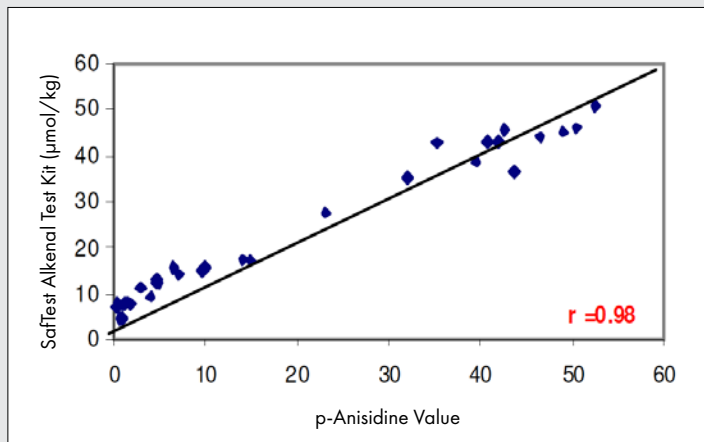
MP Bio's Alkenal Test Kit is designed to provide rapid analysis of the alkenal content in any raw material or finished product containing oil. Alkenals are products of secondary oxidation arising from the degradation of lipid peroxides. The presence of alkenals contributes to off-flavors and off-odors (rancidity). The optimal working range, or expected sample value prior to dilution, is 2 – 640 nmol/mL.

MP Bio's Alkenal Test Kit is designed to replace the p-anisidine testing method. The Alkenal Test Kit offers a fast, easy, non-toxic means of obtaining alkenal values in almost any sample type.

**Correlation of Alkenal Test Kit Results and Sensory Results**



**Correlation of Alkenal Test Kit Results and p-Anisidine for Oil Samples**



The Alkenal Test Kit is designed to provide rapid analysis of the alkenal content of oils, tallows, greases, feed, and protein meals using micro-analytical and membrane separation principles. The Alkenal Test Kit quantitates alkenals through a condensation reaction with a chromagen whose visible spectrum then changes and is read using the SafTest analyzer. MP Bio's proprietary Alkenal Test Kit can be used for testing solubilized dry and wet food matrices by releasing lipid from the sample matrix using a stabilizing reagent (i.e. stabilized isopropanol) and employing mechanical mixing and warming techniques. The significantly shorter sample preparation of 15 to 20 minutes permits data to be obtained in 25 to 30 minutes. MP Bio's Alkenal Test Kit contains all reagents, calibrators, and controls required for testing approximately 100 samples.

## Sample Preparation

Liquid oils may require heating or dilution; semi-solid, solid oils and solid samples require heating and mechanical disruption; solid samples require membrane separation

## Time Requirement

**Sample Preparation:** 1 – 20 minutes  
**Analysis Time:** approximately 10 minutes

## Calibration Range

8 – 64 nmol/mL

# Percent Fat Analysis



MP Bio's Percent Fat Test Kit is designed to measure fat content in any raw material or finished product containing oil. The optimal working range, or expected sample value prior to dilution, is 0.04 – 50% fat.

MP Bio's Percent Fat Test Kit is in alignment with AOAC and replaces other tedious methods such as the butt-tube, Soxhlets, Mojonnier and Babcock (dairy products), and acid-hydrolysis. Depending on conditions of digestion and extraction processes employed, these methods determine triglyceride values as well as other lipid component values. Furthermore, conventional methods typically require the use of large volumes of toxic and flammable solvents, large sample aliquots, and extraction procedures taking up to 18 hours.

## Nuts, Nut Butter, Nut Flours and Dairy

Method	Mean % Fat	Variance SD	SEM	N
AOCS	45.1611	15.3221	3.6115	18
SafTest Percent Fat Test Kit	51.8912	14.7384	2.5656	33

Fifty-six samples of various types of protein meals were extracted and analyzed using SafTest.

When comparing MP Bio Percent Fat Test Kit to traditional AOCS test methods, MP Bio Percent Fat Test Kit was found to be more precise and had less variation.

MP Bio's proprietary Percent Fat Test Kit is an easy-to-use method capable of measuring fat content ranging from 0.04 – 50%. The method has been designed specifically to measure and quantitate total triglycerides. MP Bio's Percent Fat Test Kit is intended for testing solubilized dry and wet food matrices by extracting lipid fat using a stabilizing reagent (i.e. stabilized isopropanol) and employing mechanical mixing and warming techniques. The Percent Fat Test Kit contains all reagents, calibrators, and controls required for testing approximately 100 samples.

### Sample Preparation

Liquid oils may require heating or dilution; semi-solid, solid oils and solid samples require heating and mechanical disruption; solid samples require membrane separation

### Time Requirement

**Sample Preparation:** 1 – 20 minutes  
**Analysis Time:** approximately 10 minutes

### Calibration Range

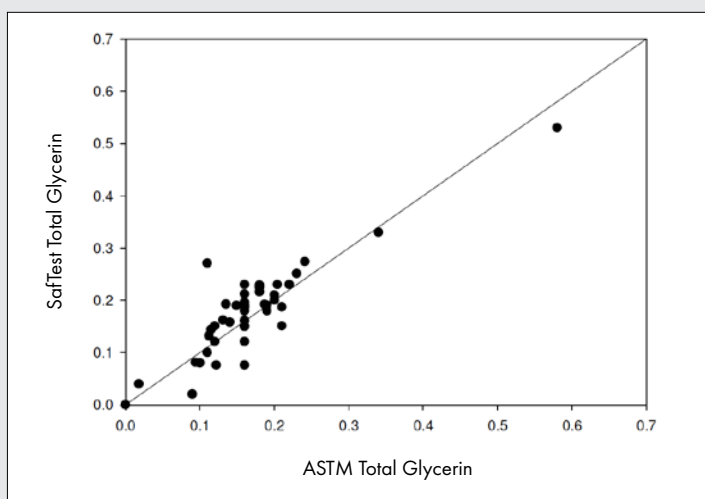
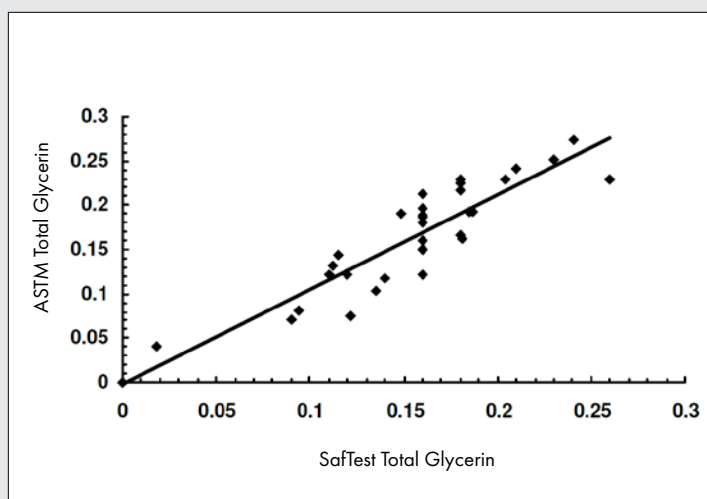
0.06 – 0.33%

# Biodiesel Analysis

The MP Bio SafTest platform can be customized to run all or any combination of the SafTest endpoints such as free fatty acids and total, free and bound glycerin, useful for analyzing biodiesel quality. Biodiesel is a replacement for petroleum-based diesel fuel that can be used in most diesel engines. Biodiesel can be made from plant oils such as soybean, canola, cottonseed, and others or from animal fats such as beef, chicken tallow or pork lard.

Glycerin in biodiesel is an indicator of poor quality. High levels of glycerin in biodiesel can result in clogged fuel filters and damaged injectors. In a 2007 study, the MP Bio SafTest method was compared to the ASTM method for total glycerin testing. From the study we achieved excellent correlation with an  $r$  value of 0.97.

## ASTM Total Glycerin vs SafTest Total Glycerin NREL Results



Alleman, T. et al. Rapid Test Methods for Biodiesel Analysis.  
American Oil Chemists Society. 2007



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[www.mpbio.com](http://www.mpbio.com), [www.mgp.cz](http://www.mgp.cz)

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ES 7X Cleaning Solution, Environment-Safe	1 gal	097667193



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tel. +420 577 212 140  
e-mail: [mgp@mgp.cz](mailto:mgp@mgp.cz)

**MGP spol. s r.o.**  
Šustekova 2  
Bratislava 851 04  
Slovensko  
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