MCE-202 Microchip Electrophoresis System for DNA/RNA Analysis

MultiNA
Simplifies Gel Electrophoresis
Quick Setup, Great Results

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MultiNA
**Start Analysis in Just Three Steps** ► Page 4
Extremely simple operation. Once the analysis schedule has been created, simply load the samples and reagents and click the Start button.

**Automated Analysis From 1 to 108 Loaded Samples** ► Page 6
Fast analysis with up to four microchips in parallel.

**Wide Range of Applications** ► Page 8
Widely used for genetic research applications as well as food analysis, genotyping, microbiological analysis, infectious disease analysis, and RNA analysis.

**Consumables and Options** ► Page 10

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Start Analysis in Just Three Steps

Extremely simple operation. Once the analysis schedule has been created, simply load the samples and reagents and click the Start button.

Outstanding Ease of Use

**Step 1**
Register the analysis schedule.
* A single analysis schedule permits analysis using multiple reagent kits.

**Step 2**
Load the samples and reagents.

**Step 3**
Press the Start button.

Automated Analysis

Sample Application → Migration → Separation → Detection → Washing → Analysis

Full automation of all steps from sample application to data analysis.

**Result**
Analysis results screen is displayed.
Solution to Your Frustration with Agarose Gel Electrophoresis

Agarose Gel Electrophoresis

Ease of operation
- Requires a number of different manual steps
  - The sequence of manual operations from gel creation to visualization takes much time and effort.
  - It would be preferable to collect data over lunch hour and overnight.
  - As there are many steps you are tired up with the process.

Data quality could be better
- Only approximate sizes can be recognized when comparing to a ladder pattern.
- Discrepancies from analysis to analysis make comparisons difficult.
- Inadequate separation.
- Difficult to detect small DNA.

Quality of Results

Organisation of results is difficult
- Data (photograph) organization is tedious.
- Hand-written records lead to loss and mistakes.

MultiNA

Easy automated analysis
- No need to cast gels.
- Just load your samples and reagents for automated analysis.
- Automated cleaning after analysis.

Objective analysis of results
- Correction by internal standard markers and ladder standards result in the output of highly reproducible size data.
- High-sensitivity fluorescent dyes achieve order-of-magnitude greater sensitivity than agarose/ethidium bromide systems.
- Good separation and clear detection of DNA below 100 bp.

Convenient data management
- Gel images and waveform data saved as image files.
- Viewer allows parallel display of analysis data from different times and dates.
- Numerical data can be output as a csv file for analysis by Shimadzu AutoFinder (option).
Automated Analysis of Up to 108 Loaded Samples

Reusable microchips and selecting the optimal reagent for each sample achieves excellent analytical performance.

System for Automated Analysis

**Reagents**

Five different reagent kits are available to suit different samples. To make operation visually simple, the reagent holders and software screen display are color-coded to match the reagent kit used.

**Instrument**

* Automated Analysis
  Permits automated analysis using parallel processing of up to four microchips. Data for each sample can be observed after each analysis is complete, with no need to wait for all sample analyses to complete.

* Automated Cleaning Function
  Microchips are rinsed with water after analysis is complete. Automated cleaning can be performed using the optional RA Chip Cleaning Kit according to the microchip condition.

**Microchips**

Extremely fine flow channels and electrode patterns are created in a quartz substrate using MEMS* technology. A special coating allows the microchips to be reused.

* MEMS (Micro Electro Mechanical Systems)
Displaying Analysis Results in the MultiNA Viewer

Analysis results are obtained as electronic data that can be observed using the MultiNA Viewer software.

The comparative view function allows data from analyses performed at different times to be compared and analyzed on the same screen.

Automated Size Calculation

Each reagent kit contains internal standard markers. By mixing the markers with the analysis target (sample and ladder*1) before performing analysis, the mobility of the ladder and sample can be corrected. The software automatically handles mobility correction utilizing markers, the size calibration curve from the ladder peaks, and sample size prediction. The software also allows the registration and setup of your own ladders as well as the commercially available ladders*2.

(*1 A ladder is equivalent to markers used in agarose gel electrophoresis. *2 Conditions, such as size and concentration, determine which ladder should be used.)
Wide Range of Applications

Widely used for genetic research as well as food analysis, genotyping, microbiological analysis, infectious disease analysis, and RNA analysis.

**Application to Food Analysis**

Detection of Allergenic Substances

Application News: No. B23

Japan was the world’s earliest adopter of a labeling system for foods containing allergens. DNA analysis by qualitative PCR can be performed on five (wheat, buckwheat, peanuts, prawn, and crab) of the seven specified raw materials (excluding egg and milk).

**Application to Genotyping**

Identification of Thunnus Using PCR–RFLP Method

Application News: No. B28

The tuna-specific genetic sequence in mitochondrial DNA is amplified using PCR. This amplified DNA is cleaved with a restriction enzyme and the pattern used to identify the tuna species.

* PCR–RFLP: (Polymerase Chain Reaction–Restriction Fragment Polymorphism)

**Application to Multiplex-PCR**

Identification of Rice Varieties

Application News: No. B30

Multiplex-PCR is performed on four sets of samples using a variety identification kit (from Kokken). The rice variety can then be identified by comparing the pattern obtained against patterns for each rice variety.
Restriction enzyme processing

* PCR–RFLP: (Polymerase Chain Reaction–Restriction Fragment Polymorphism) enzyme and the pattern used to identify the tuna species.

The tuna-specific genetic sequence in mitochondrial DNA is amplified using PCR. This amplified DNA is cleaved with a restriction enzyme and the pattern used to identify the tuna species.

Multiplex-PCR is performed on four sets of samples using a variety identification kit (from Kokken). The rice variety can then be identified by comparing the pattern obtained against patterns for each rice variety.

### Applications to Genotype

**Application to Genotyping**

Acquisition of appearance

Agency, Japan)

Inspection Center; Fisheries Research (Food and Agricultural Materials

### Applications to NGS

**NGS Library Quality Control**

A library prepared utilizing the NGS Library Preparation Kit was analyzed, and a postrun was performed with smear analysis software. The quality of the NGS library was confirmed from the analysis results including average size and concentration.

* NGS: Next Generation Sequencer

**Example of RNA Analysis**

Rat Total RNA Analysis

During research using RNA, it is important to continuously monitor the RNA quality to ensure that the RNA used is not affected by degradation by RNase. MultiNA is able to accurately recognize 18S-rRNA and 28S-rRNA based on the calibration curve information acquired from the ladder.
Dedicated Consumables

- **MultiNA Reagent Kits**
  Reagent kits are designed to work optimally for different size ranges and sample types.

  P/N: 292-27910-91 DNA-500 Kit (1000 analyses)
  P/N: 292-27911-91 DNA-1000 Kit (1000 analyses)
  P/N: 292-27912-91 DNA-2500 Kit (1000 analyses)
  P/N: 292-36600-91 DNA-12000 Kit (1000 analyses)
  P/N: 292-27913-91 RNA Kit (1000 analyses)

- **Microchip**
  P/N: 292-36010-41
  Part Name: MICROCHIP, TYPE WE-C
  The microchip is common to all reagent kits.

- **RA Chip Cleaning Kit**
  P/N: 292-35925-91
  Part Name: CHIP CLEANING KIT-RA
  Fluorescent dye and reagent components can be adsorbed onto the wall of the microchip flow channel, thus reducing the separation performance and lowering the number of reuses. Cleaning of the microchip using the CHIP CLEANING KIT-RA eliminates the adsorbed components and improves (or restores) the separation performance of the microchip.

Options —Detection of Specific Size DNA

Shimadzu AutoFinder Optional Software for Detection of Specific Size DNA

P/N: 292-96800-01 Shimadzu AutoFinder

Shimadzu AutoFinder directly imports the MultiNA analysis results in a csv format to detect DNA of specific sizes. It enables the simple and rapid analysis of data accumulated through large numbers of analyses in the course of daily routine work. Normally complex manipulation of data required to evaluate the absence or presence of target bands and the detection of specific size DNA. The Shimadzu AutoFinder is a powerful tool to support your analysis.

- Developed and manufactured by Shimadzu System Development Corporation.

MultiNA Data Import Screen

Detection of Specific Bands

- The detected bands are displayed color-coded.

  - Select the error range and detection sensitivity.
  - Select the color for bands to be detected.
Specifications

Sample rack: Compatible with 96-well PCR plate and 128-strip PCR tube (Shimadzu recommended product).

Microchip: Quartz, 23 mm separation channel length, on-chip electrodes (insert up to four microchips).

Pretreatment: Automatic sample injection, automatic separation buffer replenishing, automatic chip cleaning.

Electrophoresis Voltage: Max. rated voltage: 1.5 kV, max. current: 250 μA.

Analysis Cycle time: Approx. 80 s (using four chips) * DNA standard analysis (DNA-1000/premixed).

Detection Method: LED-excited fluorescence detector (470 nm excitation wavelength) * Class 1 LED product.

Separation Size Range:
- 25 to 500 bp (DNA-500 Kit)
- 100 to 1000 bp (DNA-1000 Kit)
- 500 to 2500 bp (DNA-2500 Kit)
- 1000 to 12000 bp (DNA-12000 Kit)
- Up to 285 rRNA (5.0 knt) (RNA Kit)

Resolution: 5 bp (25 to 100 bp), 5% (100 to 500 bp), 10% (500 to 1000 bp), 20% (1000 to 12000 bp).

Sizing Accuracy:
- ±5 bp (25 to 100 bp), ±5% (100 to 500 bp), ±15% (DNA-1000, DNA-2500, DNA-12000).

Required Sample Volume:
- DNA analysis: Premix mode: 2 to 10 μL (after mixing with marker solution: 6 to 30 μL)
- On-Chip Mixing mode: 5 to 30 μL
- RNA analysis: Premix mode: 3 to 15 μL (after mixing with marker solution: 6 to 30 μL)
- In the Premix mode, the marker solution is mixed with the sample before loading in the instrument.
- In the On-Chip Mixing mode, the sample and marker solution are loaded separately and mixed on the microchip under program control.

Maximum Salt Concentration:
- DNA analysis: 10mM Tris-HCl containing 125 mM KCl or NaCl max.
- RNA analysis: 10mM Tris-HCl, containing 1 mM EDTA max.

Min. Detection Limit:
- DNA analysis: 0.2 ng/μL (at 10mM Tris-HCl buffer, containing 50 mM KCl and 1.5 mM MgCl2)
- RNA analysis: 5 ng/μL (total RNA), 25 ng/μL (mRNA) (at 10 mM Tris-HCl buffer, containing 1mM EDTA).

Quantitation Range:
- DNA analysis: 0.5 to 50 ng/μL (at 10mM Tris-HCl, containing 50 mM KCl and 1.5 mM MgCl2)
- RNA analysis: 25 to 500 ng/μL (total RNA), 25 to 250 ng/μL (mRNA) (10 mM Tris-HCl buffer containing 1 mM EDTA).

Quantitation Accuracy:
- DNA analysis: ±30% (at 10 mM Tris-HCl buffer, containing 50 mM KCl, DNA-500, DNA-1000 and DNA-2500 Kits)
- ±40% (DNA-12000 Kit). Quantitative accuracy is based on verification from 200 bp to 12000 bp.

Quantitation Repeatability:
- RNA analysis: CV 10% or less (CV 20% or less for eukaryotic-origin total RNA at concentrations of 150 ng/μL or more).

External Dimensions:
- W 415 mm x D 545 mm x H 508 mm

Weight: 43 kg.

Power Supply: 100 to 120 V, 220 to 240 (CE Marking) 300 VA max.

Controller and Viewer Software

Controller:
- Creating analysis schedules, real-time control, automatic analysis pretreatment, automatic analysis post-treatment, automatic error processing, analysis log management, analysis performance checks.

Data Processing:
- Batch display/detail display of gel images/pherograms, automatic quantitation and size prediction by size markers, data searching, data import/export, manual editing and re-analysis.
- Changes in average size and concentration with respect to smear samples (during smear analysis).

Reports:
- Multilevel data display, tree display of samples/files, RNA structural comparison, analysis performance check results, analysis log.

Note: The analysis performance specifications above are based on Shimadzu standard analysis conditions and standard samples.

Note: The specifications might not be satisfied depending on the analysis sample and the analysis conditions.

Note: Reagent kits and microchips are not included as part of the MultiNA instrument’s standard accessories.

1 An aluminum sheet (Shimadzu recommended product) can be applied to prevent sample evaporation.

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MCE®-202 MultiNA is not available in the United States.

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