

Electroporation
optimization

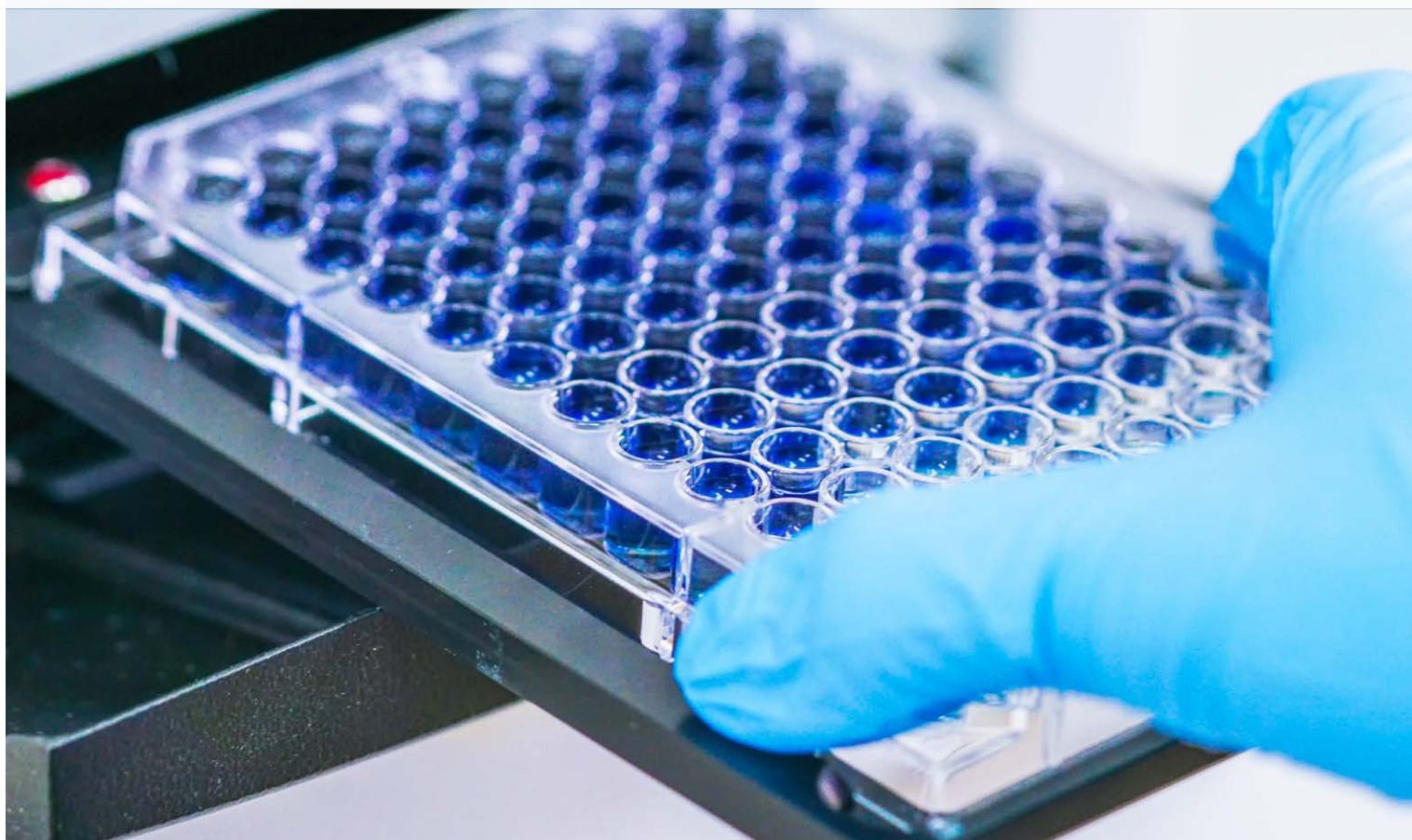
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Automated extraction of DNA
from various food samples

Pages 27-29

FOCUS: EQUIPMENT & INSTRUMENTS

VOLUME 1 ISSUE 2



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ALLEVI 2 3D BIOPRINTER, TWO EXTRUDER SYSTEM, ALLEVI



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- Two extruder system
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Allevi 2 is the bioprinter for researchers, by researchers. It is the most versatile bioprinter on the market, trusted by leading researchers worldwide, and is easy enough for everyone in the lab to use.

| Description | Dimensions | Cat. No. |
|----------------------|-------------------------------|-----------|
| 3D Bioprinter Device | 30.5x30.5x30.5 cm (12x12x12") | 76292-706 |

This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region.



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| Description | Size | Cat. No. |
|---|----------|-----------|
| MycoAlert™ Plus Mycoplasma Detection Kits | 10 Tests | 75860-358 |

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VWR® -86°C ULTRA-LOW TEMPERATURE FREEZERS WITH NATURAL REFRIGERANTS

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- Long warm up time
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Designed to keep your samples safe. Limit environmental impact and lower HVAC costs. User friendly and quiet.

| Description | Electrical | Capacity | Volume | Exterior Dimensions | Interior Dimensions | Plug Type | Amps/Breaker | Weight | Cat. No. |
|---|--------------|--------------|------------------------|---------------------|---------------------|-----------|--------------|----------|-----------|
| VWR® Ultra-Low Freezers, 300-Box Capacity | 115 V, 60 Hz | 300 box (2") | 14.9 cu.ft. (Interior) | 27Wx38.4Dx 78"H | 17.8Wx28.3D x51.2"H | NEMA | 5-20 12.6/20 | 712 lbs. | 76307-942 |
| VWR® Ultra-Low Freezers, 400-Box Capacity | 115 V, 60 Hz | 400 box (2") | 19.4 cu.ft. (Interior) | 32.3Wx38.4Dx 78"H | 23.1Wx28.3D x51.2"H | NEMA | 13/20 | 687 lbs. | 76307-948 |
| VWR® Ultra-Low Freezers, 500-Box Capacity | 115 V, 60 Hz | 500 box (2") | 24.1 cu.ft. (Interior) | 37.9Wx38.4Dx 78"H | 28.8Wx28.3D x51.2"H | NEMA | 5-20 12.5/20 | 734 lbs. | 76307-936 |
| VWR® Ultra-Low Freezers, 600-Box Capacity | 115 V, 60 Hz | 600 box (2") | 28.8 cu.ft. (Interior) | 43.5Wx38.4Dx 78"H | 34.4Wx28.3D x51.2"H | NEMA | 5-20 12.7/20 | 820 lbs. | 76307-954 |



Dense storage in space saving Undercounter/ Stackable ULT Freezer

STIRLING ULTRACOLD SU105UE: IDEAL FOR RESEARCH LABS AND CLINICAL TRIALS

- Store more samples in a surprisingly compact space
- Secure individual storage for researchers or teams
- Lightweight, maneuverable and convenient
- No compressors to fail with Stirling engine technology
- Stable operation from -20°C to -86°C
- Plugs into any outlet worldwide

The SU105UE model gives you the freedom and control to organize your samples in a way that works best for your research. Placing 105s in a stack offers a unique level of convenience and space savings, with the flexibility to use the same freezer model at dissimilar temperature ranges. With the widest temperature range in the industry, the SU105UE is the perfect solution for warming up samples and biologics in stages.



| Description | Exterior Dimensions | Temperature Range | Cat. No. |
|---|---------------------------------------|--|-----------|
| ULT Stirling Undercounter Ultra-Low Temperature Freezer | 864H x 711D x 686W mm (34 x 28 x 27") | -86°C to -20°C @ 32°C (90°F) ambient, adjustable to 1°C increments | 75845-818 |

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VWR® SERIES GENERAL-PURPOSE REFRIGERATORS AND FREEZERS

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Refrigerators:

- Tight 2 to 10°C cabinet temperature range (5°C factory setpoint)
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The VWR® series general-purpose laboratory refrigerators are designed with user needs in mind. These are built with a focus on performance, security, and quality features. All units feature temperature, power failure, and door ajar alarms. They are certified, with whisper-quiet refrigeration systems. They use green, natural refrigerants, and have height-adjustable casters for easy mobility and leveling. These units all feature a digital controller, adaptive defrost, and produce a low heat output.



| Electrical | Volume | Exterior Dimensions | No. of Shelves | Shipping Weight | Cat. No. |
|--|--------------------|-----------------------------------|----------------|-------------------|-----------|
| VWR® Series Refrigerator Painted Exterior Glass Doors | | | | | |
| 115 V, 60 Hz | 651 l (23 cu.ft.) | 2057Hx705Wx813D mm (81x27.75x32") | 4 | 178 kg (392 lbs.) | 76314-252 |
| 115 V, 60 Hz | 1387 l (49 cu.ft.) | 2057Hx1339Wx813D mm (81x52.7x32") | 8 | 271 kg (597 lbs.) | 76314-260 |
| 115 V, 60 Hz | 2038 l (72 cu.ft.) | 2057Hx1924Wx813D mm (81x75.7x32") | 12 | 332 kg (733 lbs.) | 76314-268 |

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VWR® VACUUM FILTRATION SYSTEMS, STANDARD LINE



SYSTEMS FOR VACUUM FILTRATION OF AQUEOUS SOLUTIONS INCLUDING CELL CULTURE MEDIA, BUFFERS, OR OTHER BIOLOGICAL FLUIDS

- Polypropylene funnel and collection reservoir
- Each individual unit is lot numbered for traceability
- Solution can be stored in the collection reservoir until needed
- Top filter and bottom collector bottle have engraved graduation
- Designed hose connector can fit multiple hose diameters

PES Membrane: low protein binding and low extractables.

| Description | Capacity | Membrane Diameter | Pore Size | Quantity | Cat. No. |
|--------------------------|----------|-------------------|-----------|----------|-----------|
| PES Membrane | | | | | |
| Complete Filtration Unit | 150 mL | 50 mm | 0.20 µm | Cs. 12 | 10040-460 |
| PVDF Membrane | | | | | |
| Complete Filtration Unit | 150 mL | 50 mm | 0.22 µm | Cs. 12 | 76010-374 |
| Nylon Membrane | | | | | |
| Complete Filtration Unit | 150 mL | 50 mm | 0.22 µm | Cs. 12 | 76010-378 |



VWR® BENCHTOP GENERAL PURPOSE CENTRIFUGES



THIS COMPACT BENCHTOP UNIT OFFERS LABORATORIES A TRUE WORKFLOW BENEFIT

- Offers a unique fast-cool function
- General-purpose use
- Mid-sized tabletop centrifuge is compatible with most laboratory workflows

Available with temperature control, the refrigerated unit offers a unique fast-cool function that will lower the unit to +4°C in 10-15 minutes saving you valuable time spinning delicate samples.

| Description | Capacity | Speed | RCF | Rotor | Cat. No. |
|--|--------------|----------|---------|--------------------------------|-----------|
| Refrigerated Centrifuges | | | | | |
| Refrigerated Centrifuge, Cell Culture Bundle | 8 x 15/50 mL | 4500 rpm | 3,260 g | 4-Place Universal and Adapters | 10830-764 |
| Ambient Centrifuges | | | | | |
| Centrifuge, Cell Culture Bundle | 8 x 15/50 mL | 4500 rpm | 3,260 g | 4-Place Universal and Adapters | 10830-762 |



VWR® AIR JACKETED CO₂ INCUBATORS



ENHANCED SAFETY FEATURES INCLUDE HEPA FILTRATION AND HIGH HEAT STERILIZATION

- Removable water pan and four shelves included
- In-chamber HEPA filtration airflow designed to protect samples from airborne contaminants during routine access
- Dual stack configurations include two incubator units, mobile support stand, and stacking kit to maximize lab space
- Three-year parts and labor warranty

HEPA filtration safeguards your cultures from airborne contaminants, which is a primary source of contamination.

| Description | Volume | Cat. No. |
|---|--------|-----------|
| CO ₂ Incubator Air Jacket TC | 6.5 CF | 10810-902 |



Quality, cleanability, and ease of setup

REACH-IN CO₂ INCUBATORS, NOW WITH H₂O₂ STERILIZATION

Caron's large reach-ins offer the culture quality, cleanability, and ease of setup & use you've come to expect from small stackable CO₂ units, only in a full-sized chamber.

- Culture quality – IR CO₂ sensor, highly uniform ducted airflow & smart control alerts
- Clean conditions – available two-hour dry H₂O₂ sterilization cycle, tool-free three-minute interior removal, opt. controlled humidification system
- Facility-friendly – easy-use large color touchscreen, standard power plugs & low power usage, 25 cu.ft. units roll through doorways.



| Volume, L (cu. ft.) | Electrical | Cat. No. |
|---------------------|---------------------|-----------|
| 708 (25) | 115V, 60Hz, 16A | 10158-720 |
| 708 (25) | 208-230V, 60Hz, 10A | 10158-842 |
| 934 (33) | 115V, 60Hz, 16A | 10158-846 |
| 934 (33) | 208-230V, 60Hz, 10A | 10158-734 |

solutions for reliability

VWR® MULTISTAGE GAS REGULATORS WITH STAINLESS STEEL DIAPHRAGMS



DESIGNED FOR GAS CHROMATOGRAPHY APPLICATIONS

- Solderless construction for easy maintenance
- Solid forged brass body contains two regulators
- First stage reduces full cylinder pressure to 90%
- Sintered inlet filter removes particulates, tank scale, and rust from gas stream

VWR® Multistage Gas Regulators feature safe, accurate, and sensitive delivery of reduced pressure.



| Gas | Gas | Delivery Pressure Gauge | Delivery Range | Flow Capacity Standard | Inlet CGA | Cat. No. |
|----------------|----------------|-------------------------|----------------|------------------------|-----------|-----------|
| Carbon Dioxide | Carbon Dioxide | — | 1-50 psi | — | 320 | 55850-414 |

VWR® SG-900 SEMIAUTOMATIC SWITCHOVER MANIFOLDS FOR NONCORROSIVE GASES



DESIGNED TO PREVENT THE DEPLETION OF GAS DURING TESTING AND TO ELIMINATE THE DOWNTIME REQUIRED TO CHANGE EMPTY CYLINDERS

- Easy to refill cylinders without interrupting work
- Chrome-plated brass construction
- Reverse flow check valves

The manifold will automatically switch gas supply from the primary cylinder to a reserve cylinder when the primary supply is depleted.



| Gas | Gas | Delivery Pressure Gauge | Inlet CGA | Cat. No. |
|----------------|----------------|-------------------------|-----------|-----------|
| Carbon Dioxide | Carbon Dioxide | 0-50 psi | 320 | 82023-736 |



A reputation built on reliability

DRUMMOND SCIENTIFIC'S PIPET CONTROLLERS

- Original patent holder of the "pipet-aid" controller
- Offer a full service technical support department that can repair any Drummond pipette controller
- One-year parts/labor warranty with additional six months when registering product
- Ergonomic design of the XL greatly reduces arm strain fatigue when working under a hood
- Ergonomic design of the XP2 and lightweight with ability to change speeds to aspirate/dispense
- The XP unit with gravity drain features a dispense button, that when rotated to "G," will not activate the pump, allowing liquid to simply drain by gravity



Since 1948, Drummond has continued to serve and develop new products to meet the needs of laboratories, research organizations and education facilities throughout the US and around the world. We not only produce pipette-controllers, but manufacture a wide range of microdispensers, microinjectors, micropipettes and innovative liquid handling tools. We hold the original patent for the pipette-aid. For more information contact your local VWR representative.

| Description | Size (Or Another Secondary Description) | Unit (Each, Pack, or Case) | Cat. No. |
|---------------------------------------|---|----------------------------|-----------|
| Portable Pipet-Aid XP Controller | | Each | 53498-105 |
| Portable Pipet-Aid with Gravity Drain | | Each | 53440-188 |
| Portable Pipet-Aid XP2 | | Each | 89166-464 |
| Portable Pipet-Aid XL | | Each | 53439-990 |

Free 2nd Purification Pack with purchase of an ELGA LabWater system!



Contact your VWR sales representative for your free water test kit!

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ELGA specializes in delivering water purification systems for research, science, and clinical environments. Our comprehensive range of pure and ultrapure water (Type I, II, III) purification systems offer several features and benefits, including either a few liters or up to thousands of liters of water per day. The PURELAB® Chorus systems are reliable water purification units that are constructed from the highest quality components to ensure optimal purity. All systems come with the option of validation. The Chorus units feature:

- Real-time TOC monitoring
- PURESURE® technology to ensure accurate results with uninterrupted workflow
- Full recirculation for the highest microbial purity

Purchase any qualifying ELGA LabWater system between January 1 and December 31, 2019 by visiting vwr.com, calling 1 800 932 5000, or contacting your VWR Sales Representative. Customer must purchase 1st purification pack with order to receive the 2nd free through online redemption. Cannot be combined with other offered promotions. One redemption per system only.

To redeem, have your VWR invoice, VWR purchase order, or VWR packaging slip available and visit vwr.com/promotions and search for **Promo Code 5188**. Fill out the form online before January 15, 2020.



| Description | Cat. No. | Free 2nd Purification Pk. |
|-----------------|---|--|
| PURELAB Chorus | 10034-540, 10034-542, 10034-544, 10034-546, 10034-548, 76048-804, 76048-806, 76048-808, 76048-810, 76048-796, 76048-798 | 10035-894, 10035-890, 76048-854, 76048-852 |
| PURELAB Classic | 89204-072, 89204-076, 89204-080, 89204-084 | 89204-376 |
| PURELAB Flex | 89204-088, 89204-092, 89221-838, 89221-840, 89221-842, 89221-844 | 89204-392, 89204-404 |



**REDISHIP PURIFIER® LOGIC®+ CLASS II A2
BIOSAFETY CABINETS, LABCONCO®**



SHIP WITHIN 48 HOURS

Using the same ECM blower technology as the Purifier Logic®, the Logic+ uses the Constant Airflow Profile™ (CAP) to maintain a precise volume of air as the filters load. In addition, the cabinet will continuously display the HEPA filter life remaining and cabinet status. These features combine to provide unparalleled safety.

| Description | Electrical | Sash Opening | Cat. No. |
|--|--------------------|--------------|-----------|
| 4' REDISHIP Purifier Logic+ A2 Biosafety Cabinet with Base Stand | 115 V, 60 Hz, 15 A | 10" | 76317-622 |



AVANTI™ J-15 SERIES BENCHTOP CENTRIFUGES, BECKMAN COULTER®



**DESIGNED TO PROTECT YOUR SAMPLE AND INCREASE WORKFLOW
TIME EFFICIENCIES**

- Ultra harmonic technology
- Workflow optimization
- Sample protection
- Time efficiency
- Multi-dimension imbalance tolerance

The Avanti™ J-15 series of benchtop centrifuges is part of a new family of life science equipment that provides the exceptional performance you expect from Beckman Coulter.

| Description | Electrical | Includes | Cat. No. |
|---|--------------|--|-----------------|
| Avanti J-15R, Refrigerated, Benchtop Centrifuge Swinging Bucket Package | 120 V, 60 Hz | Includes benchtop centrifuge and BioCertified JS-4.750 (4 x 750 mL) swinging bucket rotor. (Rotor is BioCertified when used with bucket covers or aerosolve canisters.) Adapters, tubes/bottles, bucket covers and aerosolve canisters are NOT included and can be ordered separately. | BKC19397 |
| Avanti J-15R, Refrigerated, Benchtop Centrifuge BioSafe Package | 120 V, 60 Hz | Includes benchtop centrifuge and BioCertified S-4.750 (4 x 750 mL) swinging bucket rotor, BioCertified aerosolve canisters (qty 4), 15 mL conical BioSafe aerosolve canister tube racks (qty 4) and 50 mL conical BioSafe aerosolve canister tube racks (qty 4). (Rotor is BioCertified when used with aerosolve canisters.) Tubes/bottles are NOT included and can be ordered separately. | BKC19409 |



CORNING®, CELL COUNTER



**THE FIRST AUTOMATED CELL COUNTER THAT UTILIZES ONLINE IMAGE
PROCESSING WITH A CLOUD-BASED MACHINE LEARNING ALGORITHM**

- Provides fast and accurate results with no consumable costs
- Fits into the palm of a hand

The Corning® Cell Counter can perform a single cell count in less than three seconds, which is much faster than any non-cloud based cell counting system. Utilizing a sophisticated Deep Neural Network for cell detection allows for optimal accuracy. When trypan blue is added the system can also detect cell viability. This system utilizes a reusable counting chamber which is included, or a customer supplied hemocytometer.

| Description | Cat. No. |
|-----------------------|-----------|
| Corning® Cell Counter | 76200-994 |



UV5 EXCELLENCE UV/VIS SPECTROPHOTOMETERS, METTLER TOLEDO®
FASTTRACK™ TECHNOLOGY ALLOWS FOR SPEEDY MEASUREMENTS OF THE ENTIRE SPECTRUM ALL WITHIN A COMPACT FOOTPRINT



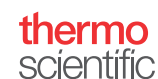
- Unique system design with excellent optical performance
- Xenon Flash Lamp combined with CCD array detector
- Open sample area for efficient cuvette handling
- Robust design with no moving parts

UV/VIS Excellence instruments include One Click, an easy and intuitive way to run tasks right from the terminal.

| Model | Overall Dimensions | Resolution | Cat. No. |
|---|---|--------------------------|-----------|
| UV5 Excellence UV/VIS Spectrophotometer | 20.8W x 25.5D x 25.4H cm (8.19 x 10.04 x 9.98") | >1.5 (Toluene in Hexane) | 10811-200 |
| UV5Bio Excellence UV/VIS Spectrophotometer | 20.8W x 25.5D x 25.4H cm (8.19 x 10.04 x 9.98") | >1.5 (Toluene in Hexane) | 10811-202 |
| UV5Nano Excellence UV/VIS Spectrophotometer | 20.8W x 25.5D x 21.7H cm (8.19 x 10.04 x 8.54") | >1.7 (Toluene in Hexane) | 10811-204 |



What value do you put on trust?



REDUCING RISK TO SAFEGUARD YOUR SAMPLES

- There are numerous factors that can pose potential risk to your samples during cold storage. Although small, the tube that you use should never be overlooked
- For 40 years researchers have trusted the Thermo Scientific™ Nalgene™ and Nunc™ portfolio for safe sample storage. Each tube is engineered to mitigate risk and maintain sample integrity

Our cryogenic storage tubes and accessories are designed as a system to protect and organize your valuable, irreplaceable samples.

Thermo Scientific Nalgene® Externally Threaded and Thermo Scientific Nunc® Internally Threaded Cryogenic Vials

| Description | Unit (Each, Pack, or Case) | Size (Or Another Secondary Description) | Cat. No. |
|--|----------------------------|---|-----------|
| 1.2 mL Nalgene® Cryogenic Vials, External Thread with Screw Cap | Case of 500 | 25/Bag | 66008-706 |
| 1.2 mL Nalgene® Cryogenic Vials, External Thread with Screw Cap | Case of 1,000 | Bulk | 66008-751 |
| 2 mL Nalgene® Cryogenic Vials, External Thread with Screw Cap | Case of 500 | 25/Bag | 66008-728 |
| 2 mL Nalgene® Cryogenic Vials, External Thread with Screw Cap | Case of 1,000 | Bulk | 66008-754 |
| 5 mL Nalgene® Cryogenic Vials, External Thread with Screw Cap | Case of 250/Pack of 10 | 10/Bag | 66008-732 |
| 1 mL Nunc® Skirted Self-Standing Vials, Conical Bottom, Internally Threaded | Case of 2000 | 500/Pack | 66021-992 |
| 1.8mL Nunc® Skirted Self-Standing Vials, Round Bottom, Internally Threaded | Case of 1800 | 450/Pack | 66021-987 |
| 1 mL Nunc® Starfoot Self-Standing Vials, Conical Bottom, Internally Threaded | Case of 2000 | 500/Pack | 66021-993 |
| 1.8mL Nunc® Starfoot Self-Standing Vials Round Bottom, Internally Threaded | Case of 1800 | 450/Pack | 66021-986 |
| 3.6mL Nunc® Starfoot Self-Standing Vials, Round Bottom, Internally Threaded | Case of 1600 | 400/Pack | 66021-989 |
| 4.5mL Nunc® Starfoot Self-Standing Vials, Round Bottom, Internally Threaded | Case of 1200 | 300/Pack | 66021-991 |



SAPPHIRE BIOMOLECULAR IMAGER, AZURE BIOSYSTEMS

THE NEXT GENERATION LAB IMAGING PLATFORM

- With most imaging systems a decision between application flexibility and image quality has to be made
- Next generation laser scanning system which offers the best of both worlds
- Unparalleled flexibility with excellent sensitivity and image quality
- Capture software will deliver high quality quantifiable data

Up to four solid state lasers (488, 520, 658 and 784 nm) offering ultimate excitation sensitivity. Photon multiplier tube (PMT) for fluorescence and phosphor imaging, avalanche photodiodes (APD) for near-infrared imaging and a CCD sensor for chemiluminescent and visible imaging. Ultra-wide dynamic range for imaging and quantifying low and high abundance samples simultaneously. Image resolution down to 10 microns for high-quality image analysis.

| Description | Cat. No. |
|------------------------------------|-----------|
| Sapphire Biomolecular Imager - NIR | 76317-604 |



INGENIO® EZPORATOR® ELECTROPORATION SYSTEM, MIRUS BIO

PROVIDES A COST-EFFECTIVE, ROBUST AND OPEN TRANSFECTION SYSTEM FOR MANY HARD-TO-TRANSFECT CELL TYPES

- Performance: deliver any nucleic acid to hard-to-transfect, stem and primary cells
- Simplicity: use a single, universal electroporation solution across all cell types
- Flexibility: easily optimize electroporation parameters for each cell type



Electroporation is the method of choice for many hard-to-transfect cell types, and the Ingenio® EZporator® Electroporation System is a cost-effective, straightforward, open system that is perfect for any lab seeking performance without breaking the bank.

| Description | Cat. No. |
|--|-----------|
| Ingenio® EZporator® Electroporation System | 76304-532 |
| This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region. | |

Electroporation optimization: A user's guide

For more information, visit vwr.com/mirusbio

By Anthony Lauer and Laura Juckem, Mirus Bio LLC, Madison, Wisconsin USA

ABSTRACT

Electroporation is an effective physical method for delivery of various types and sizes of molecules to cells in culture. It is a fast and relatively easy way to re-engineer cells to contain exogenous nucleic acids or small molecules. Electroporation conditions, including strength of the pulse and buffer composition, can have profound effects on the delivery efficiency and cellular viability post-electroporation, thereby influencing the total number of cells available for experimentation.

INTRODUCTION

Electroporation is the application of an electric field pulse that result in changes in the cellular membrane, promoting the uptake of exogenous macromolecules including DNA, RNA and proteins. Plasmid DNA is commonly electroporated into mammalian cells to overexpress a gene of interest. Cell and molecular biologists commonly utilize electroporation methods due to its low cost, ease-of-use and high efficiency delivery of various types of cargo. The mechanism of electroporation of mammalian cells is poorly understood; however, the most recognized theory suggests that the rapid administration of an electrical pulse creates transient leaky structures or pores in the cellular membrane that allow entry of the nucleic acid or other macromolecules into the cell interior. The DNA, RNA or protein do not require modification or complexing with lipids or polymers which can be beneficial for therapeutic applications. The key experimental factors for mammalian electroporation experiments include: nucleic acid and cell concentration, pulse strength, and buffer composition. Each cell type has specific experimental conditions that will allow for high efficiency electroporation of the macromolecule of interest with minimal cytotoxicity.

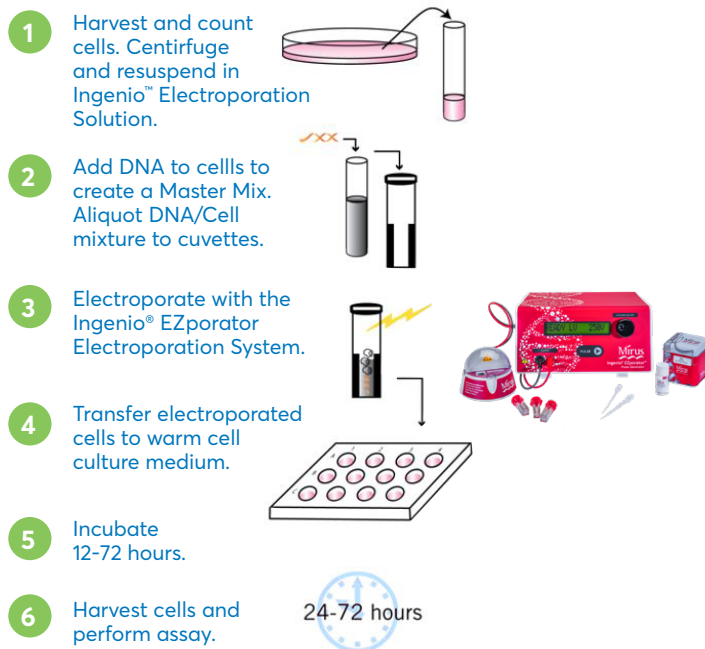


FIGURE 1: Overview of electroporation workflow

Electroporation devices can solicit three types of electrical wave forms including: exponential decay, square wave and time constant. Exponential decay pulses can be optimized by varying the voltage and capacitance settings to achieve a wide pulse gradient. Square wave pulses are characterized by the voltage, time of the pulse, duration between pulses, and the total number of pulses. Time constant pulses specify a single sustained voltage for a designated time. Exponential and square wave are the most common pulses utilized for mammalian electroporation studies.



Specifically, an exponential decay pulse releases the charge from a capacitor set to a specific maximum voltage (V_{max}), which then decays exponentially, typically over milliseconds. The delivered pulse is characterized by the field strength (kV/cm) and the time constant (T) which is the time elapsed before the voltage reaches $1/3 V_{max}$. The time constant is influenced by both the set capacitance and resistance of the system.

MAMMALIAN CELL ELECTROPORATION PROTOCOL

The process of electroporating mammalian cells is straightforward (Figure 1). For all conventional electroporators, the cells are harvested from the tissue culture plate, counted and resuspended at a high density in the electroporation buffer. The recommended cell density depends on the size of the cells, 1×10^7 cells per ml for smaller cells such as immune cells, 5×10^6 cells/ml for larger cells such as HeLa. The plasmid DNA, or other macromolecule to be delivered to the cells, is added to the cell mixture and transferred to the electroporation cuvette. This contains the electrodes that will conduct the pulse generated from the electroporation device. The cells are then electroporated at a designated voltage and capacitance. Post-electroporation the cells are transferred to a tissue culture plate containing warm complete growth medium. The incubation and harvest time will vary depending on the nature of the experiment. Typically, cells are harvested 24-72 hours post-electroporation and assayed for gene expression or gene regulation.

Pulse Strength

A key parameter to achieve successful permeabilization of the cell membrane is the Field Strength (E) that is applied to the cell. Field strength is calculated using the initial peak voltage that is applied during an exponential decay pulse divided by the gap size of the cuvette (kV/cm). Mammalian cells are less tolerant of high voltage settings than prokaryotes, so a lower field strength must be applied to maintain cell viability. Typically starting voltages range from 80-160 V for a 0.2 cm cuvette or 200 – 300 V for a 0.4 cm cuvette.

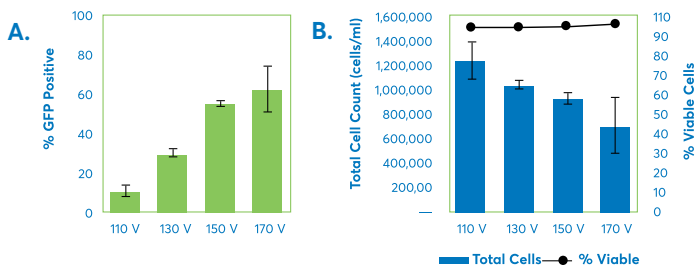


FIGURE 2: Pulse strength affects electroporation efficiency and total cell count. Jurkat E6-1 cells were electroporated with an EGFP reporter plasmid at varying voltages using the Ingenio® Electroporation Solution (Mirus Bio) and the Ingenio® EZporator® Electroporation System (Mirus Bio). GFP efficiency (A) or cell count and viability (B) using propidium iodide was determined by flow cytometry at 48 hours post-electroporation.

Titration of the pulse strength was performed in Jurkat E6-1 cells using 0.2 cm cuvettes and the Ingenio® Electroporation Solution with the Ingenio® EZporator Electroporation System (Figure 2A). Three parameters were assessed including: (1) the effectiveness of the gene delivery (% GFP positive cells), (2) number of viable cells, and (3) total cell count. The goal in a voltage titration experiment is to determine the voltage conditions that maximizes these three parameters to achieve high transgene expression and many healthy cells.

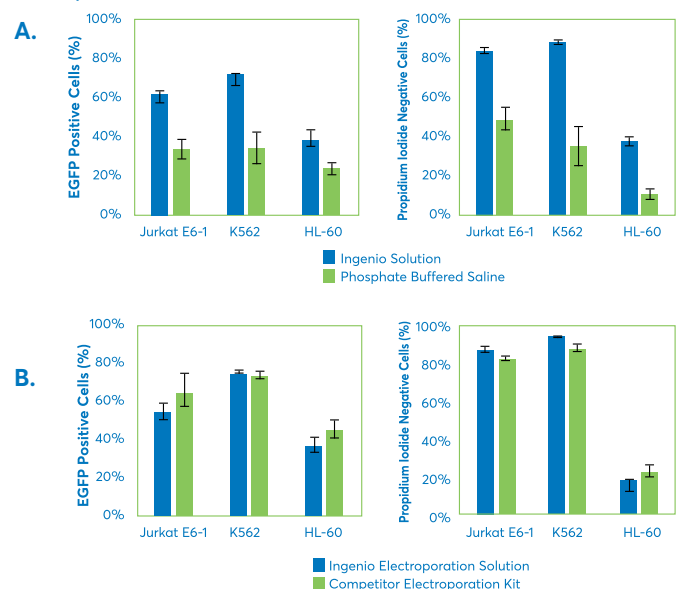


FIGURE 3: Buffer composition influences electroporation efficiency and cell viability. Cells were electroporated in parallel with an EGFP reporter plasmid using either (A) Ingenio® Electroporation Solution or Phosphate Buffered Saline (PBS) on the Gene Pulser Xcell™ Eukaryotic System (Biorad) or (B) Ingenio® Electroporation Solution or competitor electroporation kit using Amaxa® Nucleofector® II Device (Lonza). GFP efficiency and cell viability using propidium iodide was determined by flow cytometry at 24 hours post-electroporation.

Electroporation Buffer

The composition of the buffer utilized during the electroporation process is critical to achieving high efficiency and low toxicity results. Phosphate buffer saline (PBS) or cell culture medium is frequently used as an electroporation buffer; however, these can have detrimental effects on plasmid DNA delivery efficiency and cell viability (Figure 3A). We observed a lower number of GFP positive cells, and lower cell viability measured by propidium iodide exclusion, when Jurkat E6-1, K562 or HL-60 cells were electroporated in a PBS solution compared to the Ingenio® Electroporation Solution (Mirus). Another commonly used solution is the Nucleofector® Solution V (Lonza) in combination with the Amaxa® Nucleofector IIb Device. Similar plasmid DNA efficiencies and cell viabilities were observed between the Ingenio® Electroporation Solution or the Nucleofector® Solution V in Jurkat E6-1, K562 or HL-60 cell types when electroporated using the same program on the Amaxa® Nucleofector® IIb Device (Figure 3B).

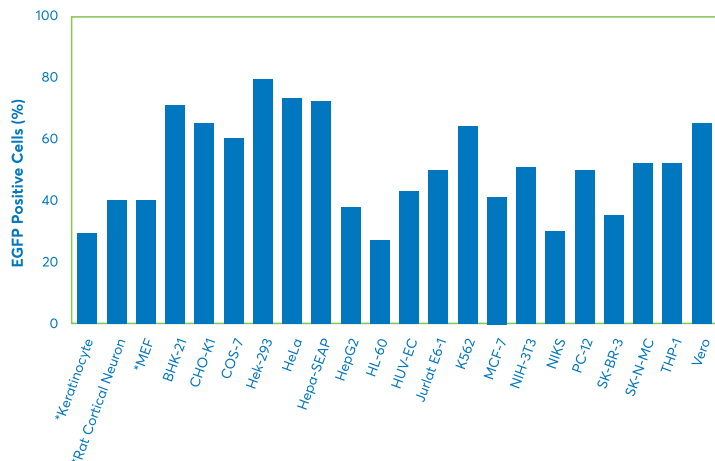


FIGURE 4: Efficient plasmid DNA delivery to a wide variety of cell types. Ingenio® Electroporation Kits were used to transfected indicated cell types using the Amaxa® Nucleofector® IIb Device (Lonza). Cells were assayed at 24 hours by flow cytometry and bars represent the percentage of live cell population expressing GFP. The cell types with an asterisk are primary cells.

Cell Type Specificity

The maximum transfection efficiency that can be obtained for different cell types is based on factors including their size and membrane composition, so field strength must be selected for each cell accordingly. Optimization of electroporation conditions involves the manipulation of pulse parameters such as: voltage, capacitance and resistance. Application of the optimal field strength allows for the most effective electropermeabilization of the membrane, and thereby delivery of nucleic acid and/or protein. Figure 4 demonstrates representative electroporation efficiencies using optimized pulses to deliver plasmid DNA in twenty-two common cell types including primary keratinocytes, rat cortical neurons and mouse embryonic fibroblasts (MEF).

DELIVERY OF DIFFERENT MACROMOLECULES

While plasmid DNA is the most common macromolecule, the same electroporation conditions can also be utilized to deliver macromolecules of other sizes.

siRNA

RNA interference (RNAi) is mediated by small (21-23 base pair) double stranded RNA molecules that interact with cellular proteins and mRNA in the cytoplasm. A luciferase system can be utilized to determine the quantitative levels of RNAi knockdown of an exogenous gene.

Three cell lines (CHO-K1, Jurkat E6-1 or HeLa) were co-electroporated with plasmid DNA encoding GL3 luciferase and either a non-targeting siRNA control or a GL3 targeting siRNA using the Ingenio® Electroporation Solution. Luciferase expression was measured 24 hours post-electroporation and knockdown was

calculated by normalizing expression levels to the non-targeting control (Figure 5A). Greater than 80% knockdown of luciferase was observed in all three cell lines.

CRISPR-Cas9

Genome editing using CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) involves the delivery of an endonuclease, Cas9, and a gRNA specific to the genomic DNA site for cleavage. Electroporation can effectively deliver Cas9 and gRNA in various forms, including ribonucleoprotein (RNP) complex comprised of an intact Cas9 protein and a synthetic gRNA.

Electroporation of an RNP complex was performed to target the WT1 Associated Protein (WTAP) locus in K562 or Jurkat E6-1 cells using the Ingenio® Electroporation Solution (Figure 6B). Triplicate 0.2cm cuvettes demonstrate high cleavage at the WTAP locus in both immune cell lines; CRISPR cleavage efficiencies range from 28–58%.

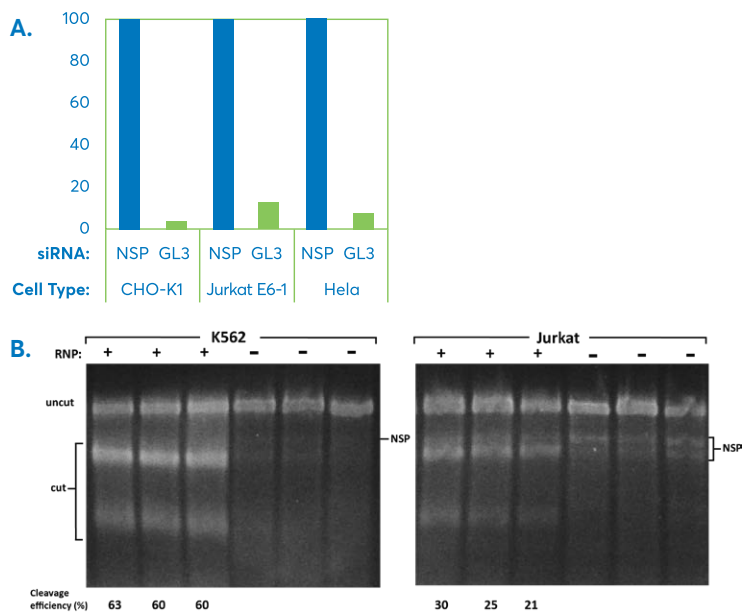


FIGURE 5: Electroporation Can Effectively Deliver siRNA and CRISPR RNP Complexes. (A) siRNA and plasmid DNA were co-electroporated with the indicated cell lines with the Ingenio® electroporation solution in 0.2 cm cuvettes using either the Gene Pulser Xcell™ Eukaryotic System (Bio-Rad). Plasmid encoding Firefly luciferase (10µg/ml) was co-electroporated with 250nM of either non-targeting control siRNA or GL3 siRNA into Jurkat E6-1, HeLa or CHO-K1 cells. Twenty-four hours post electroporation, cells were harvested and assayed for luciferase activity. Data was normalized to the non-targeting control siRNA. (B) CRISPR ribonucleoprotein (RNP) complexes targeting WTAP, composed of 750 nM Cas9 protein (NEB) and 1500 nM pre-complexed two-part gRNA (IDT), was electroporated into K562 and Jurkat E6-1 cells using the Ingenio® Electroporation Solution (Mirus Bio) and a Gene Pulser Xcell™ Eukaryotic System (Bio-Rad). Exponential pulse conditions of 150V and 950 µF for K562 or Jurkat E6-1 cells were applied to triplicate 0.2 cm cuvettes, 100 µl volume, 10 x 106 cells/ml +/- RNP complex. A T7E1 mismatch assay was used to measure cleavage efficiency at 48 hours post-transfection. Densitometry was used to quantitate the cleavage efficiency.

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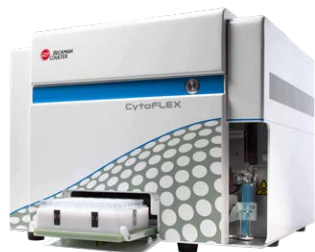
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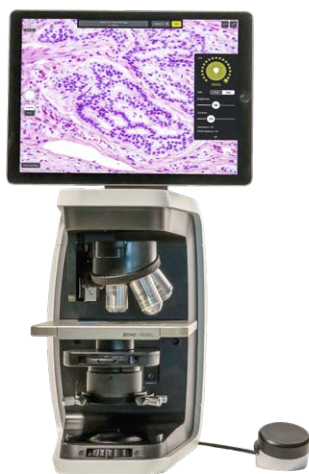
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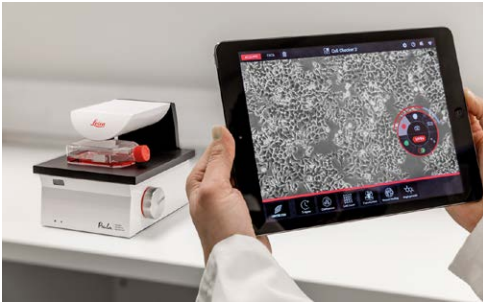


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- Tube rockers provide smooth, gentle mixing
- Available with a variety of speed settings

The mini tube rockers hold 8 tubes, 120 mm long while the XL model holds up to 18 tubes, also 120 mm long. Each model is equipped with a fixed tilt angle of 35 degrees and mixes your samples simultaneously via a 110-240V power pack. The variable speed models are adjustable in 1 rpm increments from 5-25 rpm while the fixed speed model is fixed at 18 rpms.

| Description | Capacity | Speed | Cat. No. |
|---------------------------------------|----------------------------|----------|-----------|
| VWR® Mini Tube Rocker, Fixed Speed | 8 Tubes, 120 mm in length | 18 rpm | 10159-756 |
| VWR® Mini Tube Rocker, Variable Speed | 8 Tubes, 120 mm in length | 5-25 rpm | 10159-752 |
| VWR® Tube Rocker, XL, Variable Speed | 18 Tubes, 120 mm in length | 5-25 rpm | 10159-754 |


UVP CHEMSTUDIO PLUS IMAGING SYSTEMS, ANALYTIK JENA
THE UVP CHEMSTUDIO SYSTEMS OFFER TWO DIFFERENT CAMERA OPTIONS AND AN UPGRADABLE PLATFORM FOR NIR IMAGING

- Take images of the highest quality with deep cooling, efficient photon-to-signal conversion and high performance cameras
- Wide aperture lens optics, capture more light in low-light applications (signals come faster and are stronger; this guarantees extremely fast image capture)
- Available as either a PC-operated unit or as a stand-alone instrument with an integrated color touchscreen
- Overhead white, green, red and blue LEDs come as standard in the series
- Includes Ethidium Bromide emission filter in an easy-to-access filter wheel with up to five positions

The UVP ChemStudio systems were built with flexibility in mind, providing RGB detection as standard. These chemiluminescent imaging systems offer high-resolution and sensitive imaging of gels, western blots, colorimetry, fluorescent westerns, NIR, colony plates, plants, IR dyes, and a wide range of fluorescent dyes.

| Description | Electrical | Darkroom Configuration | Camera | Cat. No. |
|-------------------------|------------|------------------------|--|------------------|
| 115 V Units | | | | |
| UVP ChemStudio PLUS 615 | 115 V | Slide2Hide Door | 3.2 MP 615 Camera, Automated 25 mm f/0.95 lens | 76307-478 |
| 230 V Units | | | | |
| UVP ChemStudio PLUS 615 | 230 V | Slide2Hide Door | 3.2 MP 615 Camera, Automated 25 mm f/0.95 lens | 76307-480 |

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At VWR, part of Avantor, we meet your lab's needs by offering a comprehensive line of glassware products including disposable glassware, reusable glassware, and bottles. We provide Class A and Class B products manufactured according to ASTM methods, so no matter how simple or complex your task may be, we are calibrated to contain and deliver!

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PB19042-NA

VWR® PCR WORKSTATION

REPRESENTS AN IDEAL ENVIRONMENT FOR PCR SAMPLE PREPARATION AND OTHER SENSITIVE PROTOCOLS

- Large working area for stress-free working
- Can accommodate benchtop equipment
- Additional inactivation of aerosol-bound contaminants by shielded UV air recirculator during operation
- Contaminant prevention with antimicrobial work surface made of stainless steel
- Function indicator for UV air recirculator tube
- Displays operating time of UV tubes

This workstation allows the combination of several working steps without change of location or interruption of workflow, thereby also minimising the risk of cross-contamination.



| Description | Cat. No. |
|-----------------|-----------|
| PCR Workstation | 10783-132 |



MONARCH™ PLASMID MINIPREP KIT AND COMPONENTS, NEW ENGLAND BIOLABS®



A RAPID AND RELIABLE METHOD FOR THE PURIFICATION OF HIGH QUALITY PLASMID DNA

- Elute in as little as 30 µl
- Eliminate buffer retention and salt carryover with optimized column design
- Save time with fast, user-friendly protocols
- Easily label columns using tab and frosted surfaces
- Monitor completion of certain steps and easily identify buffers with colored buffer system

This method employs standard cell resuspension, alkaline lysis, and neutralization steps, with the additional benefit of color indicators at certain steps to easily monitor completion. Unique wash buffers ensure salts, proteins, RNA and other cellular components are removed, allowing low-volume elution of concentrated, highly pure DNA. Protocols are fast and user friendly, saving you valuable time.

| Description | Size | Cat. No. |
|------------------------------|-----------|------------|
| Kits | | |
| Monarch Plasmid Miniprep Kit | 50 Preps | 102971-698 |
| Monarch Plasmid Miniprep Kit | 250 Preps | 102971-696 |

DIRECT-ZOL™ RNA KITS, ZYMO RESEARCH

RNA FROM TRIZOL® IN SEVEN MINUTES



- Direct-zol™ RNA (any sample: blood, cells, tissue, etc)
- Easy handling: no phase separation or precipitation steps
- NGS-ready: ultra-pure RNA without phenol carryover, no DNA contamination (DNase I included)
- Non-biased: complete RNA recovery without miRNA loss

The Direct-zol™ RNA kits provide a streamlined method for the purification of up to 100 µg (per prep) of high-quality RNA directly from samples in TRI Reagent® or similar. Total RNA, including small RNAs (17 to 200 nt), is effectively isolated from a variety of sample sources (cells, tissues, serum, plasma, blood, biological liquids, etc.).

| Description | Format | No. of Preparations | Sample Size | Elution Volume | Cat. No. |
|------------------------------|-------------|---------------------|--------------------------|----------------|-----------|
| Direct-zol™ RNA Miniprep Kit | Spin Column | 50 Preps | ≤5×10 ⁶ Cells | ≥25 µl | 76020-642 |

This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region.





Q qPCR INSTRUMENT, QUANTABIO

A FASTER, SMALLER, BETTER WAY TO qPCR

- Ultra-fast data acquisition - 35 cycles in 25 minutes
- Unrivaled performance - detect two fold expression level differences
- Portable & compact - 4.5 lbs - transport without ever calibrating
- Scalable & wireless - connect up to 10 instruments (48 samples/instrument)

Q uses a patented magnetic induction technology to rapidly heat samples coupled with fan forced air for cooling to acquire data in only 25 minutes.

| Description | Size | Cat. No. |
|-----------------------------|--------------|-----------|
| Q 2-channel qPCR Instrument | 1 instrument | 76175-392 |
| Q 4-channel qPCR Instrument | 1 instrument | 76175-394 |



ARIAMX REALTIME PCR SYSTEM, AGILENT TECHNOLOGIES



Agilent Technologies

FULLY INTEGRATED QUANTITATIVE PCR AMPLIFICATION, DETECTION, AND DATA ANALYSIS SYSTEM

- Gene expression analysis
- New genotyping/HRM capability
- mRNA quantification
- NGS quantification: library preparation, result validation

The system design combines a state-of-the-art thermal cycler, an advanced optical system with an LED excitation source, and complete data analysis software.

| Description | Details | Cat. No. |
|-----------------------------|--|-----------|
| Base Instrument | | |
| AriaMx Real-Time PCR System | Base instrument does not include any optical cartridges. Purchase of at least one optical cartridge is required for a functional instrument. | 76193-704 |



qTOWER³ REAL-TIME PCR (qPCR) SYSTEMS, ANALYTIK JENA

analytikjena
An Endress+Hauser Company

AN OPEN PLATFORM qPCR SYSTEM, BOTH WITH REGARD TO PLASTICWARE FORMATS AS WELL AS KITS/MASTERMIXES

- System is operable via built-in touch screen or external computer
- Corrosion resistance and high temperature homogeneity
- Absolutely no periodic calibration or maintenance for the life of the system

The qTOWER3 Real-Time PCR system from Analytik Jena is an open platform qPCR system, both with regard to plasticware formats (standard 96 well SBS plates, 0.2 ml tubes or 8-well strips) as well as kits/mastermixes

| Description | Cat. No. |
|---|-----------|
| qTOWER ³ Real-Time PCR (qPCR) System | 10861-540 |

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- Optimize your budget and maximize your equipment investment

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Automated extraction of DNA from various food samples

Dr. Eileen Brandenburger, Product Manager Diagnostics
 Dr. Jana Felbel, Product Manager Nucleic Acid Extraction
 Dr. David Hertfelder, Application Specialist

INTRODUCTION

Quality food and its impact on health is becoming more important to costumers. This aspect together with food scandals of the recent past push the food industry to make their products more transparent. One important issue is the origin of raw materials. This point touches topics like the use of materials derived from genetically modified organisms as well as the use of the correct materials indicated on the list of ingredients. An effective method to investigate the origin of materials and genetic background of ingredients in processed food are technologies based on Polymerase Chain Reaction (PCR), as these methods are very sensitive. In order to use PCR-based technologies for the analysis of food, a certain amount and quality of DNA is required. Some sample materials (e.g. plant samples, processed food) contain significant levels of inhibitors, which inhibit PCR-based downstream applications and therefore interfere with analysis.

In the experiments described below, DNA was extracted from northern shrimp, hazelnut and two different kinds of cheese. DNA was extracted using innuPREP DNA kit-IPC16 and innuPREP food DNA kit-IPC16. Extraction was performed with InnuPure® C16/C16 touch. After homogenization (optional) and lysis, lysed samples were transferred in the reagent plastics of the kits. Reagent plastics of the kits are pre-filled with all required buffers and magnetic particles for DNA extraction.

The reagent plastics were loaded in the InnuPure® C16/C16 touch followed by fully automated extraction. Following extraction, DNA quality was analyzed using gel electrophoresis, spectrophotometry and quantitative real-time PCR (qRT-PCR) for species analysis.

The high pre-processing state of the kits (pre-filled, sealed buffer reservoirs) and automated purification reduces the hands-on time of the customer to a minimum. Besides the benefit of reduced time consumption, pre-processing also reduces the risk of human errors and loss of valuable samples. Analysis of extracted DNA by agarose gel electrophoresis, spectrophotometry and qRT-PCR analysis shows that DNA extracted with devices and kits from Analytik Jena can be readily used for relevant downstream applications.



MATERIALS AND METHODS

Frozen northern shrimps (50 mg) were homogenized in 200 µl H₂O for 15 seconds using SpeedMill PLUS and Lysis tubes P (Analytik Jena). Homogenates were mixed with 200 µl lysis Solution CBV and 20 µl Proteinase K and incubated at 50°C shaking with 600 rpm for 60 min. 400 µl of the lysate were transferred to the reagent plastic of the innuPREP DNA kit- IPC16 followed by extraction with InnuPure® C16.

100 mg and 200 mg ground hazelnut was resuspended in 800 µl lysis solution CBV and 20 µl Proteinase K. The samples were lysed for 60 min at 65°C. After lysis, 400 µl supernatant were used for extraction with the innuPREP food DNA kit- IPC16 and InnuPure® C16.

DNA was extracted from two varieties of commercially available cheese. Cheeses were declared to be derived from goat and cow milk, respectively. Extraction was performed in quadruplicates using InnuPure® C16 touch and innuPREP food DNA kit- IPC16. 200 mg of cheese were used for each replicate. Elution volume was set to 100 µl. Following extraction, extracts were analyzed by photometry using ScanDrop® 250 and qRT-PCR. For qRT-PCR qTOWER3 and innuDETECT cheese assay were used. The analysis was performed with endpoint method provided by qPCRsoft.

Samples and Reagents

- innuPREP DNA kit-IPC16
- innuPREP food DNA kit-IPC16
- Lysis tubes P
- innuDETECT cheese assay
- Commercially available kit for hazel analysis

Instrumentation

- InnuPure® C16
- InnuPure® C16 touch
- SpeedMill PLUS
- BioShake iQ
- ScanDrop® 250
- Standard equipment for agarose gel electrophoresis and gel documentation
- qTOWER3 G

RESULTS AND DISCUSSION

After extraction of DNA from frozen shrimp samples, DNA quality and integrity was assessed by spectrophotometrical analysis with ScanDrop® 250 and agarose gel electrophoresis.

| Sample number | A260/A280 | c [ng/μl] | cmean±SD [ng/μl] |
|---------------|-----------|-----------|------------------|
| 1 | 2.32 | 23.64 | 22.1±1.8 |
| 2 | 1.96 | 21.26 | |
| 3 | 2.25 | 23.51 | |
| 4 | 1.87 | 19.94 | |

Table 1: Spectrophotometrical analysis of DNA extracted from shrimp samples.

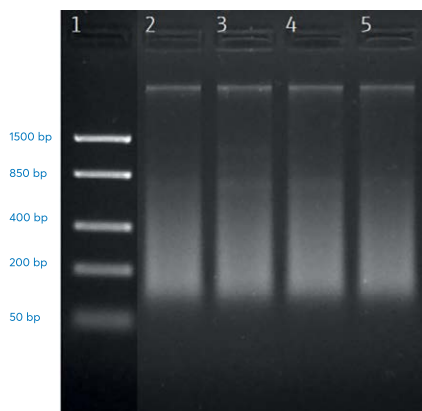


FIGURE 1: Agarose gel electrophoresis of DNA extracted from frozen shrimp samples. Lane 1: DNA ladder; lanes 2–5: Samples 1–4.

The innuPREP DNA kit-IPC16 in combination with the InnuPure® C16 enables the automated DNA extraction from shrimps with minimal hands-on time. As a result of extraction, pure DNA with A260/A280 ratios ranging from 1.87 to 2.32 is obtained. Mean yields of 22.1 ng/μl are sufficient for PCR-based downstream applications. Agarose gel analysis shows that a part of the DNA is degraded which appears as a smear

in lanes 2–5 of Figure 1. DNA degradation is a natural process which starts shortly after the death of the animals and stops with

freezing. Besides degraded DNA, quite some high molecular weight DNA is visible as a distinct band with a size larger than 1500 bp.

After DNA extraction from 100 mg and 200 mg ground hazelnut with the innuPREP food DNA kit-IPC16, extracts were used for qRT-PCR-based detection of hazelnut DNA. In order to detect inhibitory effects of substances contained in the extracted DNA, aliquots of the extract were diluted 1:10 followed by amplification of 1 μl undiluted and 1:10 diluted extract.

Figures 2 and 3 show that DNA extraction from both, 100 mg and 200 mg ground hazelnut, is possible and yields DNA which can readily be used for qRT-PCR. Sample materials with high contents

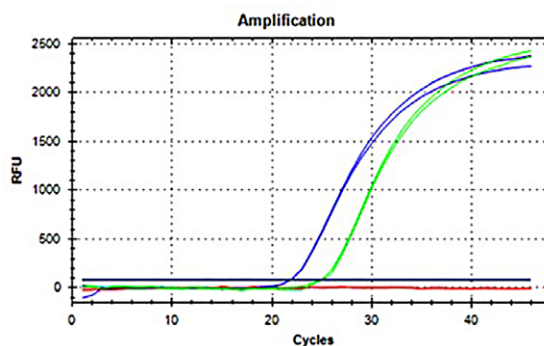


FIGURE 2: DNA extracted from 100 mg ground hazelnut, amplified and detected with qRT-PCR in duplicates (blue curves undiluted, green curves 1:10 dilution).

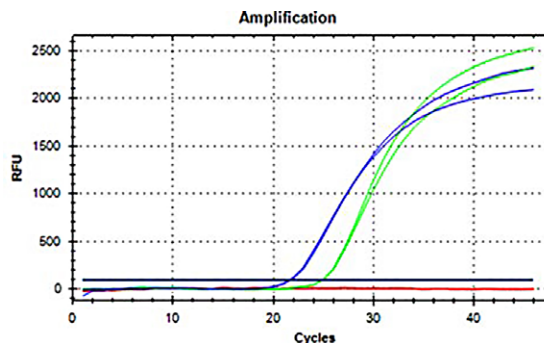


FIGURE 3: DNA extracted from 200 mg ground hazelnut, amplified and detected with qRT-PCR in duplicates (blue curves undiluted, green curves 1:10 dilution).

of lipids are often challenging with respect to extraction as well as to contamination of the extracted DNA with PCR inhibitors. For the extraction of DNA from hazelnut, PCR inhibition can be excluded as ten-fold dilution of the sample. It results in a shift of the ct value of around 3.3 cycles which is the case for extracts from 100 mg and 200 mg, respectively. DNA was extracted from 200 mg cheese as described above. Following extraction, extracts were analyzed by photometry using ScanDrop® 250 and qRT-PCR. qTOWER3 and innuDETECT cheese assay were used for qRT-PCR. Analysis was performed with endpoint method provided by qPCRsoft.

CONCLUSION

In summary, the results show that combination of InnuPure® C16 touch and DNA extraction kits for this device can be used for DNA extraction from a multitude of samples related to food industry. DNA extracted with this system has optimum quality. Most important, DNA extracted with InnuPure C16® touch and the relevant kits can readily be used for qRT-PCR.

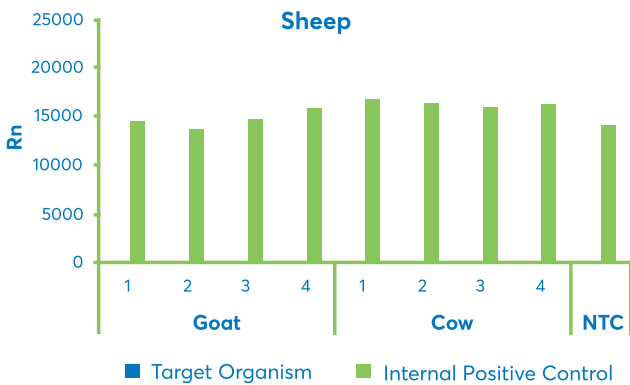


FIGURE 4: Detection of sheep-specific target gene.

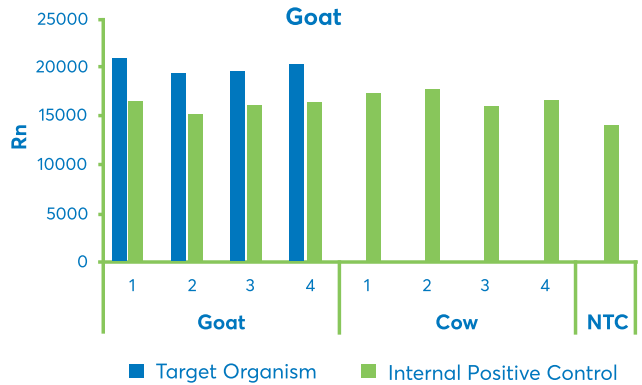


FIGURE 5: Detection of goat-specific target gene.

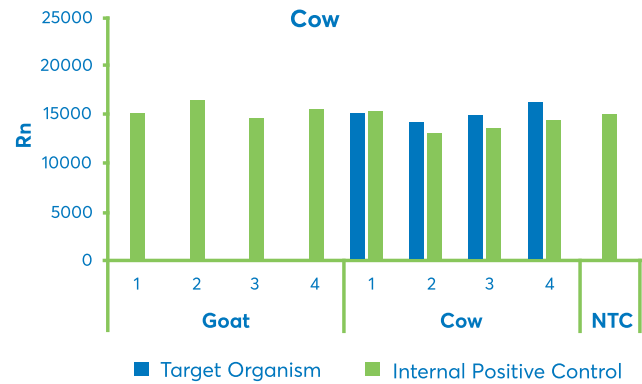


FIGURE 6: Detection of cow-specific target gene.

| Cheese type | Replicate | A260/A280 | c [ng/μl] |
|-------------|-----------|-----------|-----------|
| Goat | 1 | 2.03 | 9.86 |
| | 2 | 2.02 | 11.07 |
| | 3 | 2.01 | 12.56 |
| | 4 | 2.01 | 12.59 |
| Goat | 1 | 2.07 | 16.3 |
| | 2 | 1.96 | 12.78 |
| | 3 | 2.03 | 12.38 |
| Cow | 4 | 2.01 | 9.84 |

Table 2: Photometric analysis of nucleic acid extracted from cheese samples.

Bead Ruptor Elite Bead Mill Homogenizer

- Homogenize any sample in seconds
- Ideal for DNA/RNA extraction, tissue homogenization, enzyme isolation, protein purification, food safety testing and drug extraction
- Process up to 24 samples per cycle
- Process samples from 25 µL to 50 mL
- Wide selection of beads and tubes for ultimate versatility



| Description | Cat. No. |
|--|-----------|
| Bead Ruptor Elite | 76000-746 |
| Choose a Tube Carriage (not included) | |
| 1.5 mL Tube Carriage Kit | 10032-524 |
| 2 mL Tube Carriage Kit | 10032-380 |
| 7 mL Tube Carriage Kit | 10809-030 |
| 30 mL Tube Carriage Kit | 10032-384 |

solutions for every day use



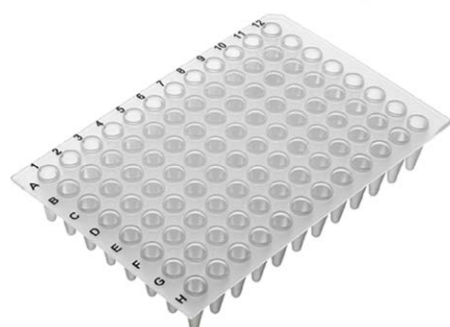
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POLYPROPYLENE PCR PLATES ARE COMPATIBLE WITH MOST THERMAL CYCLERS AND ARE IDEAL FOR HIGH-THROUGHPUT SCREENING THERMOCYCLER APPLICATIONS

- Smooth, thin, uniform well walls ensure accurate thermal transfer
- Wells are slightly raised to accommodate sealing mats, films, and foil
- Printed alphanumeric labeling simplifies plate and sample identification (raised well plates do not feature printed alphanumeric labels)
- All plates are autoclavable and certified free of RNase, DNase, and human DNA (lot-by-lot certificates available)

Plates have a working capacity of 200µL per well. They are thin, flexible, and easy to cut. The raised well plates have extra-high wells that can be sealed with strip caps (see **20170-004** and **53509-306** series). Low profile plates feature smaller wells with the same 200µL capacity as other 96-well plates. The half-skirted plates are easy to insert and extract. Skirted plates provide reduced plate distortion during high-throughput screening and sit flat for greater stability.

| Working Well Volume | No. of Wells | Color | Cat. No. |
|---------------------|--------------|----------|-----------|
| Flat Plates | | | |
| 200 µl | 96 | Assorted | 82006-648 |





BIOMEK® 4000 AUTOMATED WORKSTATION, BECKMAN COULTER
A COMPACT, NONSTERILE, SEMI-AUTOMATED LIQUID HANDLER

- Ideal for low-throughput workflows
- 12 deck positions
- Flexible pipetting with interchangeable pipetting tools and gripper
- Fits in laminar flow hood
- Optional enclosure to protect samples from airborne particles

The workstation features liquid-level sensing, windows 7 operating system, and a 22" display control screen. Execute accurate intra-well pipetting, efficient wash, and bulk dispense tool. Supports labware from tubes to 384-well microplates.

| Description | Volume Range | Cat. No. |
|---|--------------|-----------|
| Laboratory Automated Workstation, 100/240 V | 1-1000 µL | 10809-032 |

solutions for every day use



VWR® CRYOPRO® FIBERBOARD STORAGE BOXES AND DIVIDERS

BOXES AND DIVIDERS ARE CONSTRUCTED OF DURABLE FIBERBOARD WITH A PROTECTIVE, MOISTURE-REPELLANT COATING

- Durable fiberboard construction with a protective, moisture-repellant coating
- Available with or without slots or dividers

Liquid nitrogen (LN₂) freezer boxes feature slots for safe LN₂ drainage and reduced LN₂ consumption. Mechanical freezer boxes do not feature slots and cannot be used with LN₂. Boxes with dividers feature a lid printed with a numbered grid for superior inventory control. Boxes without dividers can accommodate dividers (sold separately) for 16 to 100 cells. Fiberboard dividers can fit in any 13.2Wx13.2Lcm (5¹/₅x5¹/₅") LN₂ cryogenic or mechanical freezer box.



| Description | Cell Dimensions | L x W x H | No. of Cells | Cat. No. |
|---|-----------------|---|--------------|-----------|
| Liquid Nitrogen Cryogenic Freezer Boxes with Drain Slots | | | | |
| 2" Cryogenic box with drain slots and grids, 100 cell divider | 1.3 cm (0.5") | 13.2 x 13.2 x 5.1 cm (5 ¹ / ₅ x 5 ¹ / ₅ x 2") | 100 | 82007-158 |

FOCUS: EQUIPMENT & INSTRUMENTS

VOLUME 1 ISSUE 2

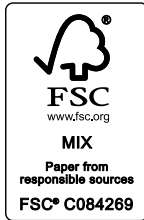


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