Pressure Cycling Technology Sample Preparation System (PCT SPS)

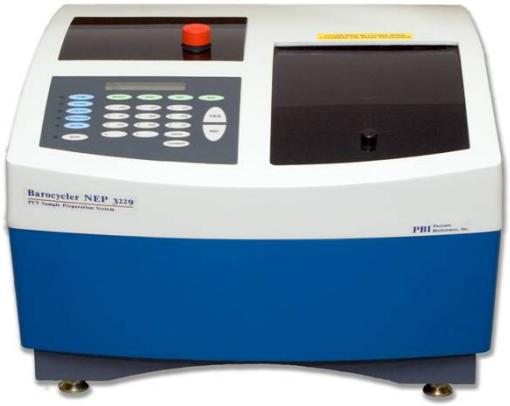
…the Power of PCT

Pressure Cycling Technology (PCT) uses rapid cycles of hydrostatic pressure between ambient and ultra high levels to control biomolecular interactions, allowing for a high degree of safety, speed, reproducibility, and convenience. This unique, patented technology offers the potential for broad applications in a number of established and emerging fields, including genomics, proteomics, pathogen inactivation, drug discovery and development, protein purification, and immunodiagnostics.

…the PCT Sample Preparation System

Sample preparation is a significant bottleneck to discoveries in genomic and proteomic research. To address this problem, the PCT Sample Preparation System (PCT SPS) was developed, which allows for the safe, rapid, and reproducible extraction of DNA, RNA, proteins, and small molecules from a wide variety of cells and tissues, particularly those considered “hard-to-lyse”. The PCT SPS uses a small, semi-automated bench top instrument (Barocycler NEP3229), together with single-use sample processing containers (PULSE Tubes).

…the Barocycler NEP3229



…PULSE Tubes (PT)

The Barocycler NEP3229 is an affordable, high pressure laboratory instrument designed to fit on a bench top, inside a biological safety cabinet, or on the shelf of a cold room. The Barocycler NEP3229 is capable of processing up to three samples simultaneously using specially designed, single-use containers called PULSE Tubes. The Barocycler NEP3229 has an external chiller hook-up, automatic fill and dispense valves, and an integrated micro-processor with an easy-to-use keypad. The new bench top Barocycler NEP3229 fills an important and growing need in genomics, proteomics, and metabolomics for the rapid, robust, versatile, reproducible, and quantitative extraction of nucleic acids, proteins, and small molecules from a wide variety of organisms including, viruses, bacteria, plant and animal cells and tissues.

PULSE (Pressure Used to Lyse Samples for Extraction) Tubes (PT) transmit the power of PCT from the Barocycler instrument to the sample. For bio-molecule extraction, the specimen (such as tissue) is placed on the Lysis Disk, the PT is placed in the pressure chamber of the Barocycler, pressure chamber fluid is added, and pressurization begins. As pressure increases, the Ram pushes the specimen from the Sample Chamber through the Lysis Disk and into the Fluid Retention Chamber. When pressure is released, the sample (now partially homogenized) is pulled back through the Lysis Disk by the receding Ram. The combination of physical passage through the Lysis Disk, rapid pressure changes, and other biophysical mechanisms breaks up the cellular structures of the specimen to quickly and efficiently release nucleic acids, proteins, and small molecules.

Specifications of the PCT SPS*

Barocycler NEP3229			
Maximum Pressure	44 kpsi, 300 MPa	Protocol Settings	Pressure Holding Time (up or down) protocol number
Working Pressure Range	5 to 35 kpsi	Temp. Control	4.0 to 40.0 ± 2.0 °C
Minimum Pressure	1 kpsi	Number of Chambers	1
Recommended Pressure Range	10 to 35 kpsi	Number of PULSE Tubes per Chamber	3
Ramp Time (up)	~3 kpsi/sec	Dimensions	Top Unit: 19.0 × 17.5 × 27.5 in. Bottom Unit: 28.2 × 18.0 × 21.5 in.
Ramp Time (down)	< 0.3 sec	Weights	Top Unit: 157 lbs Bottom Unit: 207 lbs
Power Requirement	120 VAC, 20 Amps, 60 Hz	Laboratory Environment	15 to 35 °C, < 85% Humidity
PULSE Tube FT500			
Dimensions	13 mm diameter × 51 mm long	Compatible solvent	Solvent that is compatible with polypropylene and silicon rubber
Material	Tube, cap, ram: Polypropylene O-ring Seal: silicon rubber	Operational Temperature	4 to 37 °C
Sample Size**	Solid: 50 – 500 mg Liquid: 1.2 – 1.5 mL	Storage Temperature	- 70 to 35 °C

* Specifications may be changed without prior notification
** The combined volume of solid sample and lysis buffer needs to be 1.2 – 1.5 mL

Features & Benefits of the PCT SPS

- **Safe** — PULSE Tubes offer a closed system to reduce sample handling and minimize exposure to pathogens/toxins
- **Fast** — Nucleic acids, proteins, and small molecules are released from a wide variety of cells and tissues in minutes
- **Powerful** — Up to 35,000 PSI (235 MPa, 2.35 kbar) can be used to lyse samples and release excellent quality and quantity of bio-molecules
- **Efficient** — Up to three samples can be extracted simultaneously, and in minutes
- **Versatile** — Animal, plant, and microbial samples can be processed; either standard or user defined protocols can be used
- **Reproducible** — Computer controlled protocols mean consistent extraction each time, every time

Third-Party Publications and Presentations

Geiser, H.A., Hanneman, A., Rosa, J.C., & Reinhold, V.N. (2002), “HTP Proteome-Glycome Analysis in Caenorhabditis elegans”, Poster Presentation at the Annual Conference of The Society for Glycobiology, Boston, MA

Fischer, S.H., Silcott, V., Tao, F., Rampal, J.B., Lawrence, N.P., & Manak, M.M. (2002), “Pressure Cycling Technology and Release of Nucleic Acid from Mycobacterium tuberculosis for Quantification”, Poster Presentation at LabAutomation, Palm Springs, CA

Harrington, S., McCouch, S., Tao, F., Lawrence, N., Schumacher, R.T. (2004), “Use of Pressure Cycling Technology (PCT) for the Release of DNA from Plants”, Poster presentation at the Plant, Animal and Microbes Genomics (PAG) Conference, San Diego, CA

Hinerfeld, D., Tam, S. & Smejkal, G. (2005), “Application of Pressure Cycling Technology to the Proteomic Analysis of Rat Liver”, Poster Presentation at the Proteome Society Meeting, Cambridge, MA

Guthrie, J., Gray, D., Greene, L., and Harris, R. (2005), “Biomarker Profiles of Echinacea Species Using Pressure Cycling Technology and MALDI-TOF Mass Spectrometry”, Poster Presentation at the Kansas City Area Life Sciences Institute (KCALSI) Research Day, Kansas City, MO

Witzmann, F., Ringham, H., Smejkal, G., and Behnke, J. (2006), “Application of Pressure Cycling Technology in Proteomics: Increased Yield of High Molecular Weight Proteins in Mouse Liver Lysates”, Poster Presentation at ABRF 2006, Long Beach, CA

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