Solid-phase extraction solution for bioanalysis of therapeutic oligonucleotides

- Biotage® Oligo SPE

Biotage® Oligo SPE is a solid-phase extraction (SPE) solution specifically developed for efficient extraction of oligonucleotide-based therapeutics from biological samples, including plasma, serum, urine and tissue homogenates. Using mixed-mode weak anion exchange (WAX) chemistry, Biotage® Oligo SPE effectively removes interfering proteins, salts, sugars, lipids and DNA fragments. Its tailored sorbent design delivers clean extracts and consistently high recoveries across a variety of oligonucleotide structures and chemistries.

Key benefits:

- **Enhanced sensitivity**
  Accurately quantify a wide range of therapeutic oligonucleotides, even at low concentrations.
- **High recovery**
  High recoveries from a variety of biological fluids and tissue samples.
- **Clean extracts for reliable LC-MS/MS**
  By effectively eliminating matrix interferences, Biotage® Oligo SPE deliver clean extracts for consistent, high-sensitivity LC-MS/MS analysis.
- **Reliable automation**
  Supports robust, high-throughput workflow with seamless integration into automated systems.
- **Guided method development**
  Expert-developed protocols streamline method development and optimization, minimizing oligonucleotide degradation and maximizing analyte recovery from protein binding.

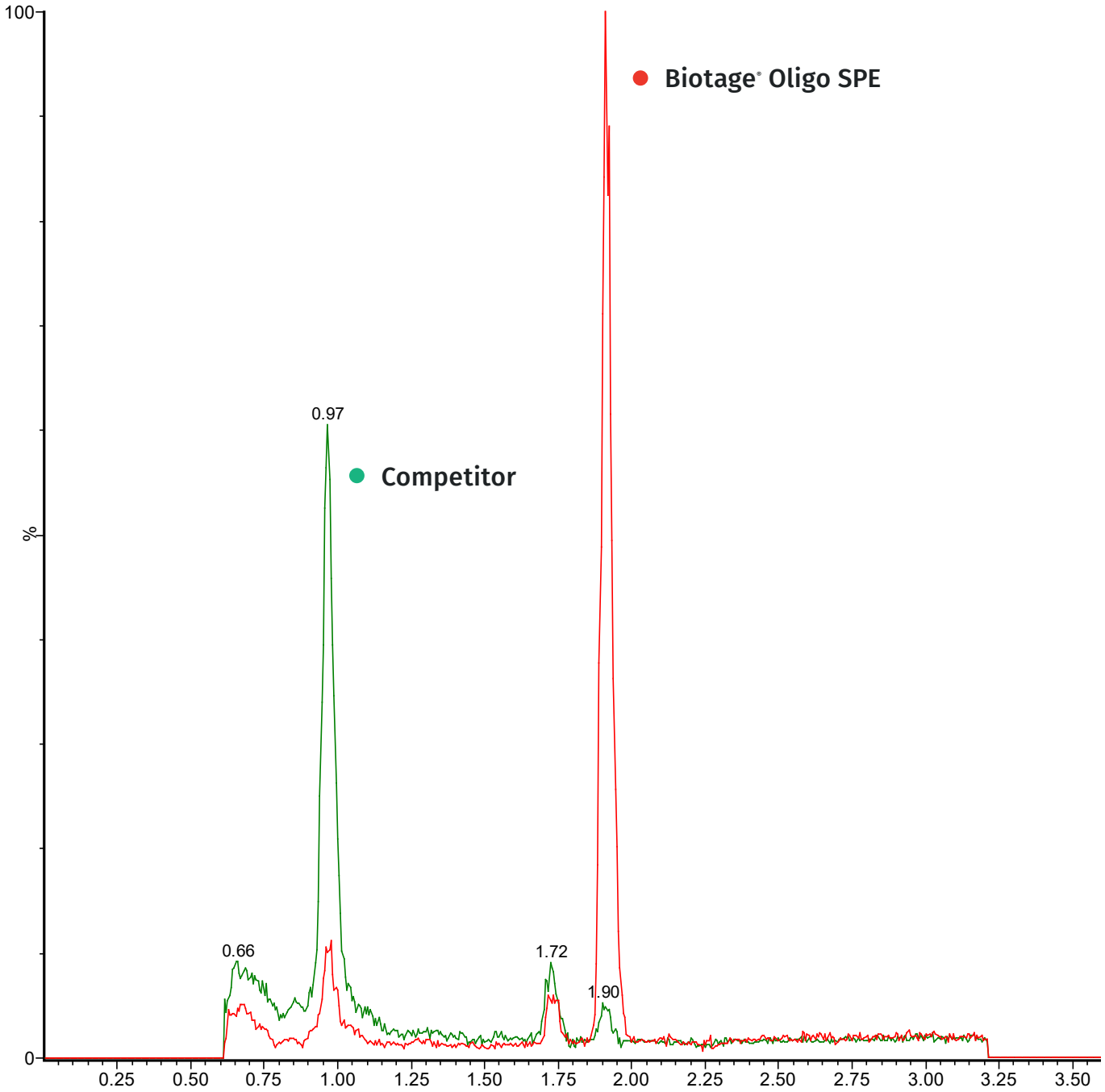

Figure 1. Approximately 13.5 x increase in sensitivity (based on s/n) using the Biotage® Oligo SPE 30 mg plate with the Biotage method, compared to a competitor's 25 mg plate and recommended protocol. Matrix: plasma. Analyte: Formiversen, spiked at 0.5 pmol/µL.

Method development

Advances in therapeutic oligonucleotide development have introduced a wide range of target analytes for bioanalytical extraction, making it challenging for bioanalytical laboratories to achieve consistently high recoveries. To address this, Biotage expert scientists have developed comprehensive method optimization guidelines, based on practical experience. These resources help users tailor extraction protocols to the specific characteristics of their oligonucleotide targets, ensuring reliable and reproducible results, **Figure 2.**

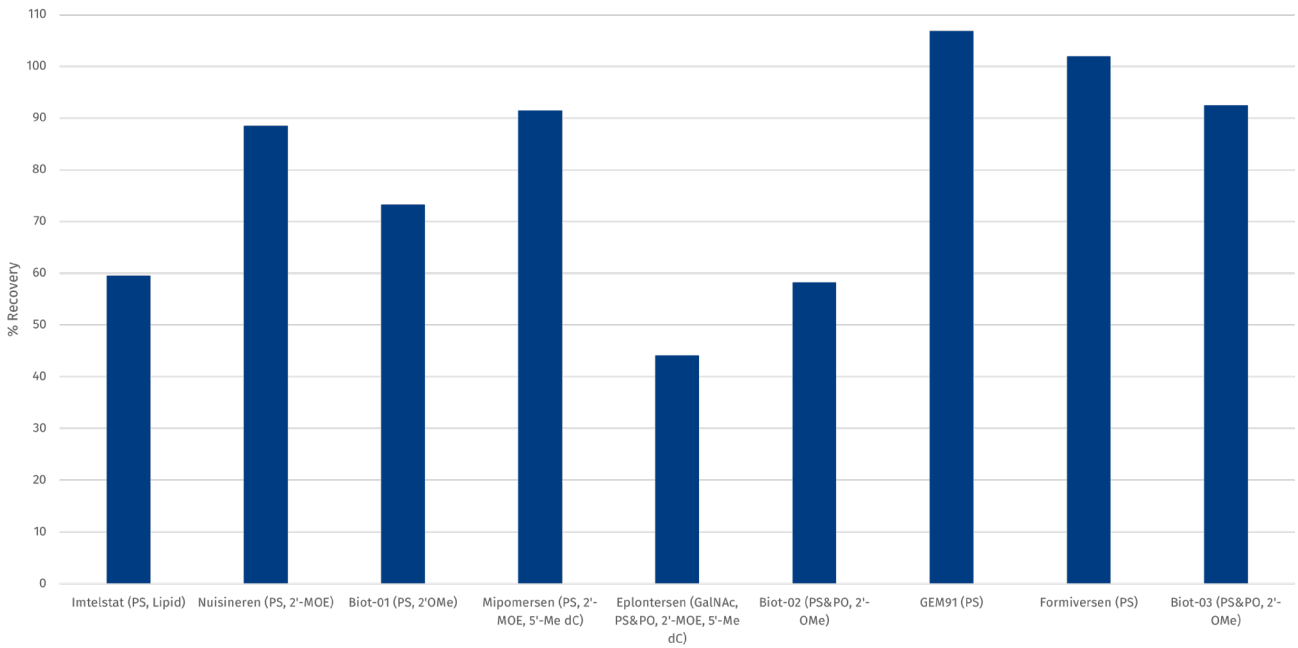

Figure 2. High, reproducible recoveries of a diverse range of therapeutic oligonucleotides using Biotage® Oligo SPE and an optimized extraction methodology.

Workflow integration for high throughput

For high throughput bioanalytical environments, the Biotage® Oligo SPE toolbox provides a comprehensive, reproducible, end-to-end sample preparation workflow. This workflow consists of biological sample pre-treatment, solid-phase extraction, clean-up, and optional evaporation prior to LC-MS/MS analysis.

Designed to meet the demands of the bioanalytical laboratories, this solution ensures consistent performance and high-quality results across a wide range of sample types and oligonucleotide chemistries.

The Biotage® Oligo SPE system supports both manual and automated processing formats, including seamless integration with the Biotage® Extrahera sample preparation systems. The complete workflow is illustrated in **Figure 3**, outlining the key stages and highlighting the modular and scalable nature of the Biotage® Oligo SPE solution.

Both manual positive pressure and automated systems, such as the Biotage® Extrahera Classic, can process up to 96 samples in as little as 250 minutes, from tissue sample to LC/MS-MS ready sample.

Sample concentration prior to analysis is another critical step in the workflow. Some oligonucleotides, particularly those with hydrophobic modifications, are prone to loss during this step. Using TurboVap® evaporators under recommended conditions helps preserve analyte integrity and maintain high recovery across a wide range of oligonucleotides, ensuring consistent and reliable results.

Figure 3. Biotage® Oligo SPE end-to-end workflow for bioanalytical sample preparation, with the integration of pre-treatment, extraction, clean-up, and evaporation steps.

Application

Biotage® Oligo SPE is designed to support a wide range of therapeutic oligonucleotide structures and modifications, making it an ideal tool for bioanalytical laboratories handling diverse analyte profiles.

Therapeutic oligonucleotides that can be efficiently extracted using Biotage® Oligo SPE products include:

Type	ASO, SiRNA
Sequence length	Generally 10-40 bases
Backbone	Negatively charged, e.g. phosphodiester, phosphorothioate
Modifications	Sugar: e.g. 2'-O-Methyl (2'-OMe), 2'-O-methoxyethyl (2'-MOE), Base: 5'-Me dC
Conjugates	GalNac, lipid, peptide
Biological matrix	Plasma, serum, urine, lung, heart, liver

Ordering information

Biotage® Oligo SPE products

Product number	Description	Quantity
654-0002-LVP	Biotage® Oligo SPE 2 mg µ elution plate	1/pk
654-0010-PX01	Biotage® Oligo SPE 10 mg plate	1/pk
654-0030-PX01	Biotage® Oligo SPE 30 mg plate	1/pk
654-0080-PX01	Biotage® Oligo SPE 80 mg plate	1/pk
654-0001-AXG	Biotage® Oligo SPE 10 mg/1 mL (Tabless)	100/pk
654-0003-AXG	Biotage® Oligo SPE 30 mg/1 mL (Tabless)	100/pk
654-0008-AXG	Biotage® Oligo SPE 80 mg/1 mL (Tabless)	100/pk
654-0008-BXG	Biotage® Oligo SPE 80 mg/3 mL (Tabless)	50/pk

SPE accessories

Product number	Description	Quantity
121-5203	Collection Plate, 2 mL, square	50/pk
121-5204	Pierceable sealing cap	50/pk

Sample Pre-treatment

Product number	Description	Quantity
19-060	Biotage® Lysera	1
19-010-310S	2 mL Tube Carriage Kit	1
19-646	Bulk 2.8 mm Ceramic Beads, 325 g	1
19-649	Bulk 2 mL Reinforced Tubes with Screw Caps	1000/pk

Automated Processing

Product number	Description	Quantity
414001	Biotage® Extrahera Classic	1
414045SP	25 mL Solvent Reservoirs	25/pk
414141	1000 µL Clear Tips	960/pk

Manual Processing

Product number	Description	Quantity
PPM-96	Biotage® PRESSURE+ 96 Positive Pressure Manifold	1
PPM-A96-CH	1 mL (Tabless) Column Holder	1
PPM-48	Biotage® PRESSURE+ 48 Positive Pressure Manifold	1
PPM-A48-1RCK	SPE Column Rack 1 mL	1
PPM-A48-3RCK	SPE Column Rack 3 mL	1

Evaporation

Product number	Description	Quantity
418000	TurboVap® 96 Dual	1
415408SP	TurboVap® LV Manifold (48 Nozzles)	1

RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.

Literature Number: PPS769

Biotage®