SwiftX™ DNA Water

(REF: SXDW-25)

Instructions for Use

Content

Intended use

SwiftX™ DNA Water is intended to be used for magnetic capture and rapid extraction of bacteria, parasitic protozoa and fungi from water samples.
The extracted DNA samples can be applied to a wide range of analytical methods, such as spectrophotometric and fluorometric analyses, real-time quantitative PCR, digital PCR, isothermal amplification, microarray analysis, and next-generation sequencing.

Principles of the method

Using magnetic cell capturing, SwiftX™ DNA Water enables to enrich various cell types from large volumes of water. After enrichment, cells are lysed with high efficiency and their nucleic acids are purified by reverse purification. This is how the different kit components function together:

Buffer DWC stabilizes biological cells such as those from bacteria, fungi, protozoa, and others during the magnetic cell capturing step and enables efficient binding to the paramagnetic particles.

Buffer BPE (Optional for manual workflow) facilitates the removal of contaminants, impurities, and inhibitors.

Beads A are paramagnetic particles with broad binding properties to cells and proteins. This effect is leveraged in two ways during SwiftX™ DNA Water-based extraction. Firstly, Beads A enable a species-independent concentration of cells from water samples. Secondly, during and after heat lysis, Beads A are utilized to remove cell debris and other particulate matter from the lysis mixture.

In conjunction with the bead-beating process facilitated by the glass beads in **Tube G 0.1**, **Buffer TLS** enables an efficient lysis and elution of various cell types. The heat incubation step in the protocol further improves the cell lysis.

Content of the kit

Buffer DWC
Buffer BPE
Buffer TLS
Beads A
Tubes G 0.1

Equipment to be provided by the user (manual process)

For performing the nucleic acid extraction procedure, the following laboratory equipment is required and needs to be provided by the user:

- Appropriate personal protective equipment
- Pipets and disposable pipet tips (aerosol barriers recommended)
- 1.5mL microcentrifuge tubes (safe-lock-caps recommended)
- Sample tubes with appropriate volume
- Magnetic stand (Xpedite Diagnostics REF: MAG-12, MAG-1x50, MAG-4x50)
- Vortexer (Xpedite Diagnostics REF: VOR-01)
- Heating block (Xpedite Diagnostics REF: ACC-15)
- Mini spin centrifuge (Xpedite Diagnostics REF: CEN-01)

Equipment to be provided by the user (automated process)

- Appropriate personal protective equipment
- Pipets and disposable pipet tips (aerosol barriers recommended)
- SwiftXtractor™ (Xpedite Diagnostics REF:SXT-SL)
- SwiftXtractor rod sleeves (Xpedite Diagnostics REF: SXT-RS-100)
- 50 mL centrifuge tubes with screw-cap (Xpedite Diagnostics REF: SXT-50mL-25)
- 2 mL microcentrifuge tubes (Xpedite Diagnostics REF: SXT-2mL-250)
- 5mL tubes (Xpedite Diagnostics REF: SXT-5mL-250 and SXT-5mLC-500)
- Optional: SwiftXtractor Sample Preparation Rack (REF: SXT-R)

Programs for automation

Use the SwiftXtractor™ SL protocol SXDW-SXT20.

The program files and program sheets are available on request: contact our technical support via sales@xpedite-dx.com.

Storage and shelf life

SwiftX™ DNA Water must be stored at 2 °C to 25 °C. Reagents are good to be used until the expiry date indicated on the label. Do not use reagents after their indicated expiry date.

After first use, SwiftX™ DNA Water kits are good to be used within 3 months.

Warnings and precautions

SwiftX™ DNA Water is free of hazardous substances. The safety data sheets (SDS) for SwiftX™ DNA Water components are available upon request.

Take care when working with biological samples and always treat them as potentially infectious. Users are advised to always wear appropriate personal protective equipment.

Be aware that the sample remains potentially infectious during the extraction process until the heat lysis is conducted. Consequently, supernatants of the cell capturing step must be treated as potentially infectious.

Nucleic acid extracts can be disposed of with regular laboratory waste. Please take your national regulations for waste sorting and treatment into consideration.

Make sure to work with clean equipment and use pipette tips with aerosol barriers to avoid carryover of specimens or nucleic acid extracts between samples.

Protocol for manual cell capture and DNA extraction

To do before starting

- Set the heating block to 95 °C.
- Shake or vortex Beads A for 30 seconds to homogenize the particle suspension.
- Invert the water sample once to ensure proper mixing. Allow it to stand for 5 minutes. (If large particles are present, centrifuge at 1000 rpm for 30 sec and collect supernatant)

1. **Fill 20 mL water sample in a tube with sufficient volume capacity.**

2. **Add 2 mL of Buffer DWC to the tube.**

   Note: If less than 20 mL of water shall be extracted, then reduce the volume of Buffer DWC to 10% of the volume of the water sample. However, do not change the amount of Beads A.

3. **Add 60 µL of Beads A, close the tube, and mix well by vortexing for 10 seconds. Ensure that no liquid is resting at the tube lid.**

4. **Incubate the sample tube at room temperature for 3 minutes.**

5. **Place the tube in a magnetic stand for 5 minutes. If the magnetic particles have not yet completely separated, extend the incubation time until separation is complete.**

6. **Open the tube while remaining in the magnetic stand. Remove and discard the supernatant by gently pouring it out.**

Optional BPE wash: Add 1 mL of Buffer BPE and rinse the Beads A from the tube wall to the bottom. Then transfer the bead suspension to a new 2 mL microtube and close it. Place sample tube into a magnetic stand and let the magnetic particles separate at room temperature for 1 minute. Open the lid while the tube remains in the magnetic stand. Remove the supernatant by pipetting. Discard the supernatant.

7. **Add 400 µL of Buffer TLS to the tube and resuspend the Beads A by vortexing for 5 seconds or pipetting up and down. Ensure all liquid is collected at the bottom of the tube.**

8. **Transfer the bead suspension to a Tube G 0.1.**

9. **Mix and grind the cells by vortexing at 5000 rpm for 3 minutes.**

10. **Incubate the microtube at 95 °C for 15 minutes.**

11. **Remove the microtube from the heating block and place in a magnetic stand for 1 minute.**

12. **Do not remove the microtube from the magnetic stand! Use the supernatant directly for molecular analysis or transfer to a new microtube.**

    Extracts can be stored for up to 7 days at 4 - 8 °C or up to 4 weeks at -20 °C. Always mix samples before downstream analysis if they have been stored.

Note: In case of very complicated sample matrices with high amounts of organic matter or low-molecular-weight degradation products such as humic acid or fulvic acids, colored extracts may occur. In this case, we recommend adding an additional gel-filtration step for the extract before downstream molecular analysis (see Troubleshooting section).

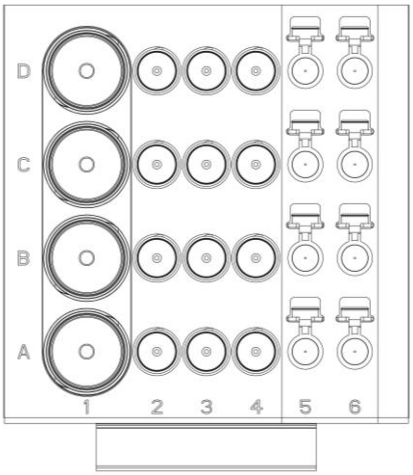
Protocol for automated cell capture and DNA extraction on SwiftXtractor™

Ensure that you are familiar with the correct operation of the workstation. Refer to the respective user manual for operating instructions.

Reagent preparation for performing **SXDW-SXT20** on SwiftXtractor™ SL:

Note: 4 samples can be processed at a time (labeled A-D, see Figure 1A)

A:



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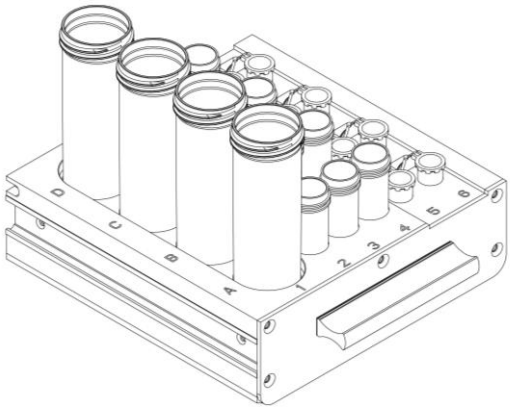

1. Prepare **Sample tubes:** Add **2 ml of Buffer DWC and 60µl BeadsA** in 50 mL tubes (and insert in position 1)
2. Prepare **Wash tubes**: Add **2 mL of Buffer BPE** into 5 mL tubes (and insert in position 2)
3. Add required amounts of "**rod sleeves**" to 2 mL microtubes (and insert into position 5)
4. Prepare **Lysis tubes**: Add **400 µl Buffer TLS** to G 0.1 microtube (and insert in position 6)

5. Add **20 mL of water into sample tubes (step 1)**.
6. Start instrument run.

Overview of buffer volumes needed (per reaction):

Position	**1**	**2**	**3**	**4**	**5**	**6**
Step	**Binding**	**Wash**	**-**	**-**		**Lysis**
Item to add	Sample+ DWC+ Beads A	BPE	-	-	Rod sleeve	TLS in Tube G 0.1
Volume/Quantity	22.06 mL	2 mL	-	-	1x	400 µl

7. After the protocol is finished, briefly spin the 2 mL Lysis tubes from position 6 and carefully transfer the supernatant to a new tube or use directly for molecular analysis.

Purified DNA can be stored for up to 7 days at 4 - 8 °C or up to 4 weeks at -20 °C. Multiple freeze-thaw cycles and long storage time may cause degradation. Always mix samples before downstream analysis if they have been stored.

Note: In case of very complicated sample matrices with high amounts of organic matter or low-molecular-weight degradation products such as humic acid or fulvic acids, colored extracts may occur. In this case, we recommend adding an additional gel-filtration step for the extract before downstream molecular analysis (see Troubleshooting section).

Troubleshooting guide

Observation	Likely caused by	Recommendation
No or weak PCR signals	**a) Low amount of target nucleic acid** Low pathogen/cell load in the original sample **b) Nucleic acid loss during extraction** Beads A not properly resuspended before use Incorrect volumes of capture mix, wash buffer, or lysis buffer **c) Nucleic acid degradation** Incorrect storage temperature after extraction Prolonged storage or repeated freeze–thaw cycles	Ensure correct sample input and reagent volumes, thoroughly resuspend Beads A Store samples at appropriate temperatures. Repeat PCR with appropriate positive, negative, and internal controls.
High background signals in qPCR	Bead carryover	Avoid disturbing the particle pellet when transferring extracted DNA to a new tube. Magnetic-particle carryover can be minimized by placing the microplate containing eluates in a suitable magnet (e.g., MAG-12) for 1 min, and transfer of the eluates to a clean tube. If a suitable magnet is not available, centrifuge the tubes containing eluates at full speed for 1 min to pellet any remaining magnetic particles, and transfer the supernatants to a clean tube.
Colored extracts	Presence of low-molecular-weight degradation products, such as humic acid or fulvic acids, in the sample. These substances may co-extract and cause visible coloration of the DNA extract.	Perform gel filtration of the extract before downstream molecular analysis to remove colored low-molecular-weight contaminants. Perform following molecular analysis with appropriate positive, negative, and internal controls.

Literature references

- Schurig *et al*. (2024) Rapid Identification of Bacterial Composition in DNA Water by Combining Reverse Purification Nucleic Acid Extraction and Nanopore Sequencing. *ACS ES&T Water 4(4): 1808*
- Schurig *et al*. (2023) Rapid Reverse Purification DNA Extraction Approaches to Identify Microbial Pathogens in DNA Water. *Microorganisms* 11(3): 813

Key to symbols

Catalog number

Number of extractions


Storage temperature

Batch number


Expiry date


Read Instructions for Use


Legal manufacturer

Legal manufacturer

Xpedite Diagnostics GmbH
Lilienthalstr. 2a
85399 Hallbergmoos
Germany

Phone: +49-811-998538-10
E-Mail: info@xpedite-dx.com
Web: www.xpedite-dx.com