SuperScript IV CellsDirect cDNA Synthesis Kit

Introduction

We are committed to designing our products with the environment in mind. This fact sheet provides the rationale behind the environmental claims that the Invitrogen™ SuperScript™ IV CellsDirect™ cDNA Synthesis Kit reduces the use of hazardous reagents and generates 98% less plastic waste than traditional spin column RNA extraction workflows.

Product description

The SuperScript IV CellsDirect cDNA Synthesis Kit is optimized for the synthesis of first-strand cDNA directly from a mammalian cell lysate without first isolating RNA. Cell lysis and reverse transcription are performed in the same tube. The resulting first-strand cDNA is ready to use in PCR and qPCR.

The SuperScript IV CellsDirect cDNA Synthesis Kit is compatible with a wide range of mammalian cell types grown under different treatment conditions. It is optimized for performance with 1–10,000 cells per sample, showing equivalent results to those from purified RNA. The kit's single-tube format minimizes sample loss, handling time, and waste. It also allows the user to utilize the total lysate volume in the first-strand cDNA synthesis reaction, providing greater yields with a limited number of cells and enabling detection of rare transcripts.

Figure 1. SuperScript IV CellsDirect cDNA Synthesis Kit.

Green features

Less hazardous

Traditional RNA extraction protocols require cleanup using hazardous reagents such as:

- **Ethanol**—is highly flammable and causes systemic toxicity
- **Mercaptoethanol**—may be fatal when absorbed through the skin
- **Guanidine thiocyanate**—causes irritation and is harmful if swallowed or inhaled
- **Guanidine hydrochloride**—causes irritation and is harmful if swallowed or inhaled

Since the SuperScript IV CellsDirect cDNA Synthesis Kit provides a more streamlined protocol for RNA extraction, there is no need for ethanol, mercaptoethanol, or guanidine salts.

Less waste

Traditional methodologies for cDNA synthesis include multiple steps for RNA extraction and cleanup, requiring the use of several disposable tubes, vials, pipettes, and pipette tips. The SuperScript IV CellsDirect cDNA Synthesis Kit requires far fewer plastic consumables than traditional technologies, reducing costs and waste associated with lab plastics and waste disposal.

A comparison of the sample preparation step for cell lysis using the SuperScript IV CellsDirect cDNA Synthesis Kit with a traditional RNA extraction procedure showed that preparing 10 samples with traditional RNA extraction generated roughly 143 g of plastic waste (tubes, pipettes, pipette tips, columns), compared to approximately 3 g of plastic waste when the RNA extraction step is omitted with the SuperScript IV CellsDirect cDNA Synthesis Kit, proceeding directly from the cell lysis step to the cDNA synthesis reaction (Table 1). This represents a ~98% reduction in plastic waste with the SuperScript IV CellsDirect cDNA Synthesis Kit. Performing the traditional RNA extraction procedure every week over the course of one year would translate to a total of ~6.3 kg of plastic waste, which could be avoided annually by choosing the SuperScript IV CellsDirect cDNA Synthesis Kit.

Designing the SuperScript IV CellsDirect cDNA Synthesis Kit to generate less hazardous waste and significantly less plastic waste is a win for our customers, our company, and the planet.

Table 1. Comparison of plastic waste generated using a traditional RNA extraction procedure versus the optional cell lysis step with the SuperScript IV CellsDirect cDNA Synthesis Kit.*

Traditional RNA extraction method		
Steps in procedure	**Plastics used**	**Total weight (g)**
1. Add β-mercaptoethanol to lysis buffer	One 1 mL tip	0.9
2. Prepare DNase I stock solution	One 1 mL tip, One 1.5 mL tube	1.9
3. Add 100% ethanol to wash buffer 2	One 50 mL pipet	20.8
4. Tube for hazardous waste	One 50 mL tube	12.6
5. Add lysis buffer	Ten 1 mL tips	9.0
6. Add 70% ethanol	Ten 1 mL tips	9.0
7. Add wash buffer 1	Ten 1 mL tips	9.0
8. Add wash buffer 1	Ten 2 mL tips	9.0
9. Add wash buffer 2	Ten 1 mL tips	9.0
10. Add 80% ethanol	Ten 1 mL tips	9.0
11. Add water to elute	Ten 100 µL tips	1.4
12. 1.5 mL microcentrifuge tubes	Ten tubes	10.0
13. 2 mL collection tubes	Ten tubes	12.0
14. Spin columns	Ten columns	29.3
Total plastic waste generated		**142.9**

Cell lysis with SuperScript IV CellsDirect cDNA Synthesis Kit		
Steps in procedure	**Plastics used**	**Total weight (g)**
1. Prepare Lysis Solution	One 1 mL tip, One 100 µL tip	1.0
2. Add Lysis Solution	Ten 100 µL tips	1.4
3. Add Stop Solution	Ten 10 µL tips	0.9
Total plastic waste generated		**3.3**
Waste reduction		**97.7%**

* Estimate based on preparation of 10 samples.

Find out more at **thermofisher.com/cellsdirect**