ChargeSwitch technology

Comparison to traditional purification methods

Green benefits

- Less hazardous: no ethanol, chaotropic salts, or organic solvents needed
- Less waste: ≥75% less plastic consumables

Introduction

We are committed to designing products with the environment in mind—it's part of how we enable our customers to make the world healthier, cleaner, and safer. This fact sheet provides the rationale behind the environmental claims that use of these products results in reduced exposure to hazardous materials and generates less waste than comparable products. Invitrogen™ ChargeSwitch™ technology eliminates the need to use hazardous solvents to extract nucleic acids from a wide variety of sample sources, including bacteria, tissues, cells, blood, forensic samples, and buccal cells.

Product description

ChargeSwitch technology is used in a variety of formats—from magnetic beads to coated plates to spin columns—and is a simple, clean, and effective means of purifying both DNA and RNA. Unlike other DNA/RNA purification methods, ChargeSwitch nucleic acid purification technology is 100% water-based and does not require the use of ethanol, chaotropic salts, organic solvents, or time-consuming precipitation steps.

Green features

Less hazardous

Traditional DNA/RNA purification methods require clean-up using hazardous reagents such as:

- Ethanol—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

ChargeSwitch technology requires none of the hazardous chemicals mentioned above.

Less waste

Traditional methodologies for RNA/DNA purification require multiple steps for RNA/DNA extraction and clean-up—requiring the use of multiple disposable tubes, vials, pipettes, and pipette tips. ChargeSwitch technology requires fewer plastic consumables than traditional technologies— generating less waste and saving money on auxiliary materials. A comparison of the Invitrogen™ ChargeSwitch™ gDNA Tissue Kit with traditional technology showed that ~30 g of plastic waste (tubes, pipettes, pipette tips) was generated with traditional DNA purification, compared to ~6 g (Table 1)—an 80% reduction in waste generation. A comparison of the Invitrogen™ ChargeSwitch™-Pro Plasmid Miniprep Kit with traditional technology showed that 44 g of plastic waste (tubes, pipettes, pipette tips) was generated with traditional DNA purification, compared to 11 g (Table 1)—a 75% reduction in waste generation.

Table 1. Comparison of the amount of waste generated using a traditional gDNA purification method vs. the ChargeSwitch gDNA Tissue Kit.

Traditional DNA extraction methods (spin column), quantities per reaction		
Steps in procedure	Plastics used	Total weight (g)
1. Add 100% ethanol to wash buffers	One 10 mL tip	20.8
2. Add RNase	One 0.2 mL tip	0.3
3. Add lysis buffer and incubate	One 0.2 mL tip	0.3
4. Add high salt buffer	One 0.2 mL tip	0.3
5. Transfer to microcentrifuge tube and incubate at 4°C	One 0.2 mL tip, one microcentrifuge tube	1.3
6. Transfer to spin column	One 1 mL tip, spin column	2.0
7. Centrifuge and place into a clean tube	One collection tube	1.0
8. Wash with buffer I and place the column into new tube	One 1 mL tip, collection tube	2.0
9. Wash with buffer II and centrifuge	One 1 mL tip	1.0
10. Elute	One 0.2 mL tip, one elution tube	1.3
Total		~30

ChargeSwitch gDNA Tissue Kit (magnetic beads), quantities per reaction		
Steps in procedure	Plastics used	Total weight (g)
1. Add lysis buffer	One 1 mL tip, microcentrifuge tube	2.0
2. Add proteinase K	One 0.02 mL tip	0.3
3. Add RNase	One 0.02 mL tip	0.3
4. Add binding buffer	One 0.2 mL tip	0.3
5. Add CST™ beads	One 0.2 mL tip	0.3
6. Place on magnet		
7. Wash (2x)	Two 1 mL tips	1.9
8. Elute	One 0.2 mL tip, microcentrifuge tube	1.3
Total		~6

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