

## ProQuantum High-Sensitivity Immunoassay Kits



**Greener by design™**

 **Less waste:** generates 47-59% less plastic waste and uses 230 mL less water per assay

 **Responsibly packaged:** 84% less packaging material

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### Introduction

Thermo Fisher Scientific is committed to designing our products with the environment in mind. This fact sheet provides the rationale behind the environmental claim that Invitrogen™ ProQuantum™ Immunoassay Kits are responsibly packaged and generate less waste than traditional ELISA kits.

### Product description

To help better understand and ultimately treat diseases, our scientists developed ProQuantum high-sensitivity immunoassays to provide researchers with a simple yet powerful tool for protein quantification. The assay leverages proteomic and genomic technologies by combining highly specific antibodies with the high sensitivity and broad dynamic range of qPCR. We have simplified the workflow as well as eliminating wash steps to reduce waste. With higher sensitivity than traditional methods and very small sample consumption, you not only can get the most out of your precious or limited samples but also consume fewer pipette tips, conical tubes, and other plastics in your experiments.

### Green features

#### Less waste and fewer resources

A typical ELISA requires sequential wash steps to eliminate any nonspecific signal from unbound light-emitting antibody conjugates, adding to the time and plastic materials (tips, tubes, and pipettes) needed to perform the assay. ProQuantum immunoassays utilize two epitope-specific antibodies that bind the analyte simultaneously, enabling proximity-based signal amplification

in a homogeneous assay format that eliminates wash steps, simplifies the workflow, and reduces plastic waste. To run a typical experiment using an entire 96-well plate, ProQuantum kits generate just 139 g of plastic waste, whereas a representative third-party ELISA kit generates 336 g and Invitrogen ELISA kits generate 264 g—a reduction of about 50% or more (Table 1). This reduction comes in part from the use of ~76 fewer pipette tips per experiment. A summary of the plastic consumables used with each kit is given in Table 1, and details for each kit are given in Table 2. For a typical user running one plate a day, this translates to up to 51 kg of waste avoided annually, and ≥200 fewer boxes of tips.

In addition to the reduction in plastic consumables, ProQuantum kits also reduce the use of deionized water. Because no wash steps are needed, ProQuantum kits save up to 400 µL of water per well per wash step, totaling as much as 115 mL per wash step, per plate. Over the course of a year, users of ProQuantum kits may save over 60 L of water, on average. These improvements make the ProQuantum immunoassay one small way we are helping our customers reduce their environmental impact.

Table 1. Summary of plastic waste generated from ProQuantum and ELISA kits.

		ProQuantum Immunoassay Kit	Third-party ELISA kit	Invitrogen ELISA kit
Plastic item used	Mass of plastic item (g)	Number of plastic items used		
<b>Pipette tips</b>				
1 mL tip	1.0	3	3	25
20 µL tip	0.2	321	321	0
200 µL tip	0.3	14	17	392
<b>Total number of tips</b>		<b>341</b>	<b>341</b>	<b>417</b>
<b>Other plastics</b>				
1 mL tube	1.5	1	1	8
15 mL conical tube	6.8	1	1	0
50 mL conical tube	12.8	0	0	2
500 mL wash bottle	Mass not included	0	0	1
5 mL serological pipette	9.2	0	0	0
25 mL serological pipette	14.9	0	0	5
96-well plates	Masses vary*	2	2	1
Plastic seals	Masses vary**	3	3	3
Reservoir	7.5†	2	2	4
<b>Total mass of waste (g)</b>		<b>139.5</b>	<b>336.7</b>	<b>264.4</b>
<b>Reduction in plastic waste</b>			<b>59%</b>	<b>47%</b>

\* ProQuantum working plate: 12.5 g; ProQuantum PCR plate: 21.6 g; third-party PCR plate: 52.8 g; Invitrogen PCR plate: 49.9 g.

\*\* ProQuantum seals: 2 adhesive seals at 4.2 g, 1 optical seal at 1.9 g; third-party seal: 2.5 g; Invitrogen seal: 2.6 g

† Representative mass.

**Table 2. Comparison of the plastics used with the ProQuantum immunoassay and traditional ELISA kits.**

	ProQuantum Immunoassay Kit	Third-party ELISA kit	Invitrogen ELISA kit
<b>Prepare standard curve</b>			
Reconstitute standard	1 mL tip	1 mL tip	1 mL tip
Serial dilutions	7 x 20 µL tips, 8 x 200 µL tips, 96-well working plate	8 x 1 mL tips, 8 x 1 mL tubes	7 x 1 mL tips, 200 µL tip, 8 x 1 mL tubes
<b>Prepare reagents</b>			
Dilute wash buffer		25 mL serological pipette, 500 mL bottle	25 mL serological pipette, 500 mL bottle
Dilute HRP			200 µL tip, 5 mL serological pipette, 15 mL conical tube
Dilute calibrator diluent (for supernatant samples)		2 x 25 mL serological pipettes, 50 mL conical tube	
Mix substrates A and B		2 x 25 mL serological pipettes, 50 mL conical tube	
Dilute samples	24 x 20 µL tips, 8 x 200 µL tips, reservoir		
Mix Ab conjugate A and B	2 x 20 µL tips, 1 mL tip, 1 mL tube		
Mix master mix and ligase	1 mL tip, 200 µL tip, 15 mL conical tube		
<b>Run assay</b>			
PCR plate	96-well plate	96-well plate	96-well plate
Add assay dilution		8 x 200 µL tips, reservoir	8 x 200 µL tips, reservoir
Add standards, samples	96 x 20 µL tips	96 x 200 µL tips	96 x 200 µL tips
Wash 3x		8 x 1 mL tips	8 x 1 mL tips
Add detector conjugates		96 x 200 µL tips, reservoir	96 x 200 µL tips, reservoir
Wash 3x		8 x 1 mL tips	8 x 1 mL tips
Add substrate		96 x 200 µL tips, reservoir	96 x 200 µL tips, reservoir
Add stop solution		96 x 200 µL tips, reservoir	96 x 200 µL tips, reservoir
Add Ab conjugate mixture	96 x 20 µL tips		
Add master mix mixture	96 x 200 µL tips, reservoir		
Number of seals	3	3	3

### Responsibly packaged

ProQuantum immunoassays use very small reaction volumes—a total volume of just 20–50 µL per well, compared to a total volume of 600–700 µL per well in an ELISA run. The simplified workflow, consolidated reagents, and no-wash format of ProQuantum immunoassays mean that there are no wash buffers and, overall, fewer bottles in the kit. The total volume of all reagents in each ProQuantum kit is 14 mL, compared to 104 mL for an ELISA kit from another leading supplier. Additionally, because ProQuantum immunoassays do not have antibodies bound to the surface of a plate, qPCR plates do not need

to be packaged with each kit. As a result, the box used for ProQuantum kits is 89% smaller and uses 79% less packaging material than a typical ELISA kit (Figure 1, Table 3). The packaging for ProQuantum kits is made entirely from paperboard, which comes from a renewable resource and is 100% recyclable.

We have also downsized the manual included with ProQuantum kits. With a streamlined protocol and supporting information available digitally, ProQuantum kits include only 11.56 g of paper, whereas other ELISA kit manuals weigh 21–26 g, representing a reduction of 45–56%.

One major benefit of smaller packaging is that it enables more efficient use of laboratory cold storage. A 2015 study on laboratory energy consumption by the Center for Energy Efficient Laboratories (CEEL) [1] determined that California laboratories alone use at least 800 GWh of energy each year—equivalent to the yearly greenhouse gas emissions from 127,489 passenger cars [2]. According to the CEEL study, cold storage makes up approximately 25% of the energy consumption of a lab. The smaller packaging of ProQuantum kits means you can store four ProQuantum kits in the same space as just one ELISA kit. This is one small step towards using cold storage resources more efficiently.



**Figure 1. Packaging comparison: ProQuantum Immunoassay Kit (left) and Invitrogen™ ELISA kit (right).**

**Table 3. Comparison of packaging volume and mass.**

Product	Length (cm)	Width (cm)	Height (cm)	Packaging volume (cm <sup>3</sup> )	Packaging material description	Packaging material mass (g)	Total packaging mass (g)
ProQuantum Immunoassay Kit	14.29	5.72	4.13	337.58	Paperboard Paperboard insert	17.25 10.53	27.78
				<b>Reduction in packaging volume: —</b>	<b>Reduction in packaging material: —</b>		
Invitrogen ELISA kit	20.64	13.97	10.80	3,114.08	Cardboard Paperboard insert	123.66 46.02	169.68
				<b>Reduction in packaging volume: 89%</b>	<b>Reduction in packaging material: 84%</b>		
Third-party ELISA kit	20.64	15.56	9.84	3,160.20	Plastic box Plastic insert	123.66 44.91	168.57
				<b>Reduction in packaging volume: 89%</b>	<b>Reduction in packaging material: 84%</b>		

**References**

1. Allison Paradise (2015) Market Assessment of Energy Efficiency Opportunities in Laboratories. [https://www.etcc-ca.com/sites/default/files/reports/ceel\\_market\\_assessment\\_et14pge7591.pdf](https://www.etcc-ca.com/sites/default/files/reports/ceel_market_assessment_et14pge7591.pdf), accessed November 14, 2017.
2. US EPA Greenhouse Gas Equivalencies Calculator. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>, accessed November 14, 2017.

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