

Are the extractables from Nalgene Rapid-Flow receiver bottles lower when compared to similar devices?

Yes, under specific conditions. In three different extractable analyses, the Thermo Scientific™ Nalgene™ Rapid-Flow™ receiver bottles were lower in extractable content compared to three equivalent devices from different manufacturers.

What are extractables?

Extractables are possible contaminants from plastic products that most commonly originate from the synthesis of the polymer, resin components, manufacturing process, or use of additives, which are necessary for the performance of the product. Extractables can be inorganic, may contain metals, and/or organic compounds.

How can extractables impact my sample?

Extractables may be released from a plastic device under certain conditions and, if present, may represent a risk of passively migrating (or “leaching”) into the sample leading to unintended consequences. If a filtration device has a high level of extractables there is a risk of contaminating the filtrate. It is important to be mindful of these compounds and consider how they could impact an experiment or accumulate in downstream processes.

What methods were used to test for extractables?

Methods developed were based on United States Pharmacopeia (USP) extraction conditions and testing requirements for plastic components. Triplicates from the same lot of polystyrene receiver bottles from three manufacturers were tested with 100 mL of three extraction solutions (water, 50:50 ethanol:water, and 2% nitric acid in water). The polystyrene receiver bottles with respective extraction solutions were incubated for 21 days at 50°C before analysis.



Figure 1. Image depicting overall averages of the total organic carbon (TOC) and λ_{max} absorbance extractable results from the Nalgene Rapid-Flow receiver bottle compared to three other equivalent receiver bottles. Results depicted also include metals analysis.

Three analyses were run on each of the extracts. Total organic carbon (TOC) was measured from the water extracts using a Hach™ QBD1200 Laboratory TOC Analyzer. The λ_{max} absorbance was measured from the 50:50 ethanol:water extracts using the Thermo Scientific™ Evolution 220 UV-Vis spectrophotometer. Thermo Scientific™ iCAP™ RQ inductively coupled mass spectrometry (ICP-MS) was used for elemental analysis of 2% nitric acid in water.

What are the results and conclusions?

TOC results show that the Nalgene Rapid-Flow filtration units were 50–70% lower in detected TOC levels when compared to the equivalent receiver bottles from three

other suppliers (Figure 1). In direct comparison, the Nalgene Rapid-Flow receiver bottle had 996 parts per billion (ppb) versus 2074 ppb for supplier M (Figure 2). TOC often results from the catalysts used during the synthesis of the polymer, the polymer itself, or from the slip agents used during molding.

Absorbance data (λ_{max}) at 245 nm show that the concentration of extractables was 30–40% less in the Nalgene Rapid-Flow receiver bottles when compared to the equivalent receiver bottles from three other suppliers (Figure 1). In direct comparison, the Nalgene Rapid-Flow receiver bottle absorbance results were 0.153 versus 0.217 for supplier M (Figure 3). Increased absorbance is directly proportional to an increased concentration of extractables when comparing similar λ_{max} values.

The metals analysis results show that there were no detectable metals in the Nalgene Rapid-Flow receiver bottles whereas silicon (^{28}Si), titanium (^{47}Ti), and tantalum (^{181}Ta) were detected among the equivalent receiver bottles from supplier M (Figure 4).

When evaluating extractables, **less is more**. The lower the extractables, the less chance of those compounds leaching into your filtered sample. The Nalgene Rapid-Flow receiver bottles had less extractables present compared to all other equivalent filtration devices. Thermo Fisher Scientific sources only virgin resins from the highest quality suppliers to ensure consistency and quality as well as optimizes products and processes to avoid the use of various additives and slip agents whenever possible. Furthermore, to provide additional transparency, the **product change notification system** alerts customers of any changes, including from suppliers, made to a product—adding another level of confidence in trusting Thermo Fisher Scientific products.

Total organic carbon (TOC)

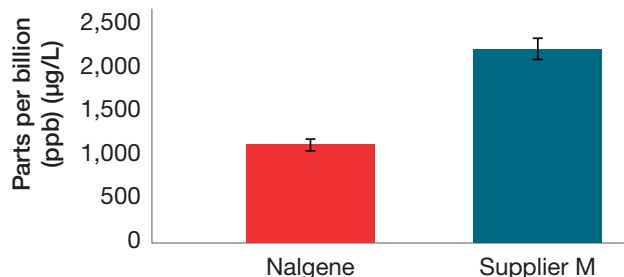


Figure 2. TOC results from the Nalgene Rapid-Flow receiver bottle compared to supplier M receiver bottles.

Extractable absorbance (λ_{max} at 245 nm)

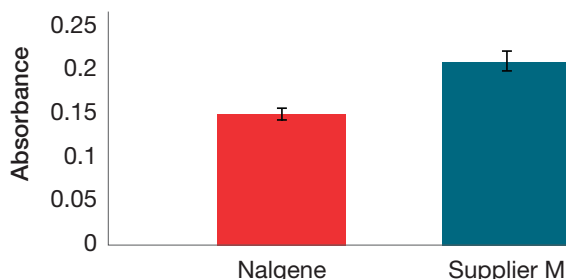


Figure 3. Absorbance (λ_{max}) results from the Nalgene Rapid-Flow receiver bottle compared to supplier M receiver bottles.

Total detectable metals

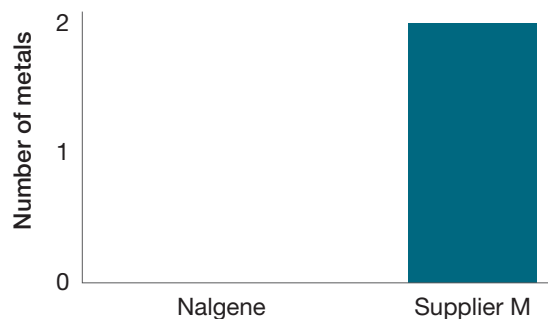


Figure 4. Metal analysis results from the Nalgene Rapid-Flow receiver bottle compared supplier M receiver bottles.

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