

Maxwell[®] RSC FFPE Kits: A Comparison to QIAcube[®] Methods

A Maxwell[®] RSC FFPE DNA Kit and Maxwell[®] RSC FFPE RNA Kit Application Note

Materials Required:

- Formalin-fixed paraffin-embedded tissue sections
- Maxwell[®] RSC FFPE DNA Kit (Cat.# AS1450)
- Maxwell[®] RSC FFPE RNA Kit (Cat.# AS1440)
- QuantiFluor[®] ONE dsDNA System (Cat.# E4871)
- QuantiFluor[®] RNA System (Cat.# E3310)

Instrument Requirements:

- Maxwell[®] RSC Instrument (Cat.# AS4500)
- NanoDrop[®] Spectrophotometer
- Quantus[™] Fluorometer (Cat.# E6150)

Performance Comparison:

- QIAGEN QIAamp[®] FFPE DNA Tissue Kit automated on the QIAcube[®]
- QIAGEN RNeasy[®] FFPE RNA Kit automated on the QIAcube[®] Instrument

The Maxwell[®] RSC Instrument and FFPE DNA and RNA purification kits provide equivalent or better performance than QIAcube[®] methods, without the use of organic solvents.

Introduction

The Maxwell[®] Rapid Sample Concentrator (RSC) provides automated purification of DNA, RNA or total nucleic acids from up to 16 samples in a single run. Used with the prefilled reagent cartridges supplied in the Maxwell[®] purification kits, the Maxwell[®] RSC Instrument can purify DNA or RNA from a wide range of sample types. The intuitive graphical user interface makes the instrument easy to use, and the integrated Quantus[™] Fluorometer lets you collect purification and quantification data in one report.

The Maxwell[®] RSC FFPE DNA and FFPE RNA Kits provide a simple semi-automated method for purifying nucleic acids from formalin-fixed paraffin-embedded tissues on the Maxwell[®] RSC Instrument. Here, we compare the performance of Maxwell[®] RSC FFPE purification methods with extraction methods using the QIAamp[®] FFPE DNA Tissue Kit and the RNeasy[®] FFPE RNA Kit on the QIAcube[®] Instrument.

Methods

One or three FFPE tissue sections were used for DNA isolation, and one FFPE tissue section was used for RNA isolation. RNA purification was performed using the Maxwell[®] RSC FFPE RNA Kit and Maxwell[®] RSC Instrument, or the RNeasy[®] FFPE RNA Kit and QIAcube[®] Instrument. DNA from FFPE tissues was purified using the Maxwell[®] RSC FFPE DNA Kit and Maxwell[®] RSC Instrument or the QIAamp[®] FFPE DNA Tissue Kit and QIAcube[®] Instrument. All experiments were performed in triplicate.

DNA Purification Results

DNA Yield and Purity: Figure 1 shows the concentration of DNA purified from human colon, mouse spleen and mouse skin FFPE tissue samples using each purification method. The Maxwell[®] RSC FFPE DNA Kit-purified DNA was more concentrated than DNA purified with the QIAamp[®] method. Only the mouse spleen samples generated DNA of sufficient concentration for purity assessment by absorbance (>2ng/μl); Maxwell[®] RSC FFPE DNA-purified samples were of higher purity, as determined by $A_{260/230}$ ratio (Figure 2).

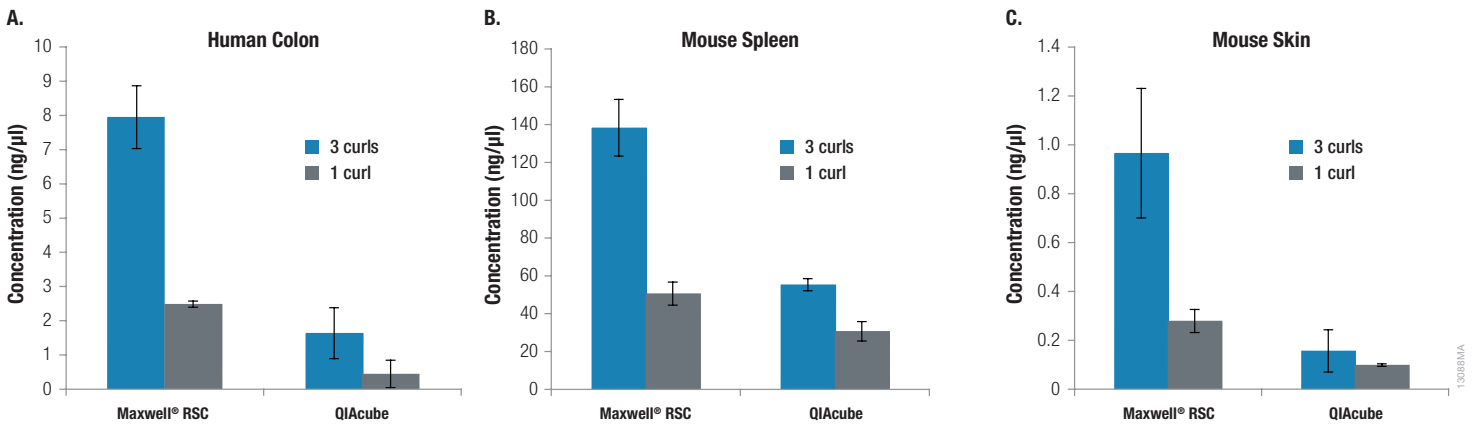


Figure 1. Concentration of DNA isolated from FFPE tissue sections. Data show the mean and standard deviation for three replicate samples from each tissue and purification method. DNA quantitation was performed with the QuantiFluor® ONE dsDNA System on the Quantus™ Fluorometer.

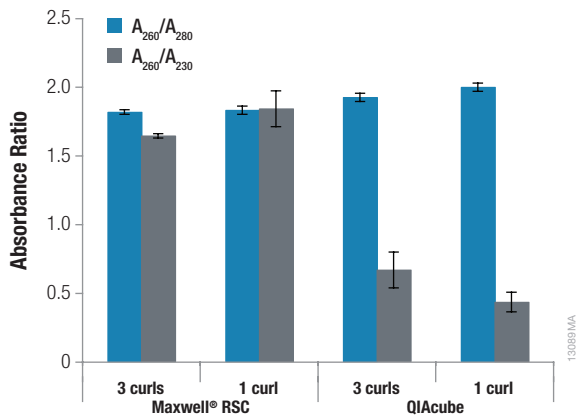


Figure 2. Purity of DNA isolated from mouse spleen FFPE tissue sections. Data show the mean and standard deviation for three replicate samples from each tissue and purification method.

qPCR Performance: Yield of amplifiable DNA isolated from FFPE tissue sections was determined by qPCR (Figure 3). Maxwell® RSC-purified samples had consistently higher yields compared to the QIAcube® samples, regardless of input tissue amount.

RNA Purification Results

RNA Yield and Purity: Figure 4 shows the concentration of RNA purified from colon and lung FFPE tissues with each method. Equivalent concentrations of purified RNA were obtained for colon samples, and lower concentrations were obtained using the Maxwell® RSC FFPE RNA Kit compared to the RNeasy® kit/QIAcube® method for lung samples. Similar or slightly lower purity ratios were observed with the Maxwell® RSC FFPE RNA Kit compared to the RNeasy® purified samples for each tissue tested (Figure 5).

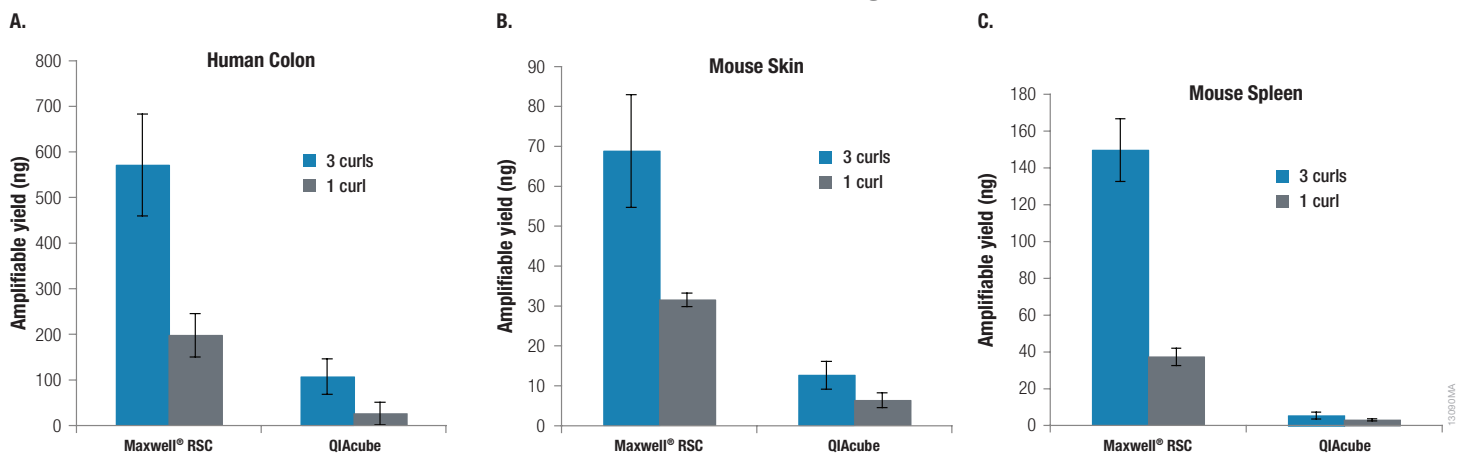


Figure 3. DNA Yield from FFPE tissue sections determined by qPCR. Data show the mean and standard deviation for three replicate samples for each tissue and purification method.

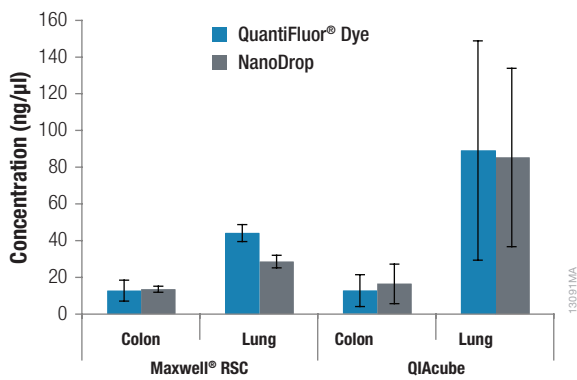


Figure 4. Concentration of RNA isolated from FFPE tissue sections. Data show the mean and standard deviation for three replicate samples from each tissue and purification method. RNA quantitation was performed with the Quantifluor® RNA System on the Quantus™ Fluorometer.

qPCR Performance: Yield of amplifiable RNA isolated from FFPE tissue sections was determined by RT-qPCR (Figure 6). Maxwell® RSC-purified samples had consistently higher yields than RNeasy®-purified samples.

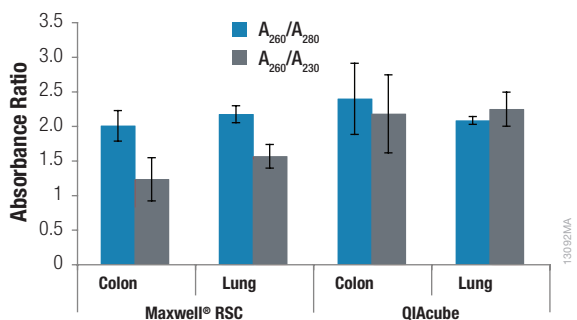


Figure 5. Purity of RNA isolated from FFPE tissue sections. Data show the mean and standard deviation for three replicate samples for each tissue and purification method.

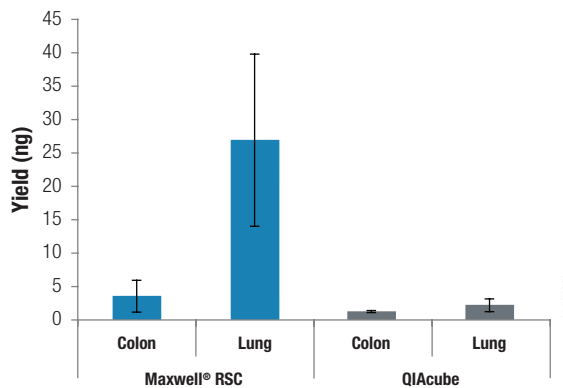


Figure 6. RNA Yield from FFPE tissue sections determined by RT-qPCR. Data show the mean and standard deviation for three replicate samples from each tissue and purification method.

Conclusions

The Maxwell® RSC FFPE DNA and RNA kits provide consistent, high-quality nucleic acid purification options for FFPE samples. The data shown here indicate better or equivalent performance for Maxwell® RSC FFPE Kits with respect to DNA/RNA concentration, purity and amplification results, for most sample types compared to the QIAcube® methods. The Maxwell® RSC FFPE DNA Kit purified more DNA from one and three FFPE sections (three sections is the recommended input for the QIAamp® Kit). Maxwell® RSC-purified DNA and RNA also gave robust and consistent results in qPCR and RT-qPCR. In addition to these performance benefits, the Maxwell® RSC FFPE Kits do not use organic solvents for de-paraffinization, providing a safer and easier purification method. The QIAamp® and RNeasy® methods require xylenes.

Table 1. Summary of Results Comparing Maxwell® RSC FFPE RNA Kit, RNeasy® FFPE RNA Kit, Maxwell® RSC FFPE DNA Kit and QIAamp® DNA FFPE Tissue Kit.

FFPE Purification Kit	Concentration by Quantifluor®	Input	Elution Volume	Amplifiable Yield	Preprocessing Time
Maxwell® RSC FFPE DNA Kit	0.3–138.3ng/μl	1–3 curls	50μl	31–571ng	4 hours, 52 minutes
QIAamp® DNA FFPE Tissue Kit	0.1–55.3ng/μl	1–3 curls	60μl	3–107ng	2 hours, 35 minutes
Maxwell® RSC FFPE RNA Kit	6.2–49.3ng/μl	5μm curl	50μl	4–27ng	2 hours, 10 minutes
RNeasy® FFPE RNA Kit	2.7–58.2ng/μl	5μm curl	20μl	1–2ng	1 hour, 20 minutes

Ordering Information

Product	Cat.#
Maxwell® RSC FFPE DNA Kit	AS1450
Maxwell® RSC FFPE RNA Kit	AS1440
Maxwell® RSC Instrument	AS4500
QuantiFluor® ONE dsDNA System	E4870
QuantiFluor® RNA System	E3310
GoTaq® Probe 1-Step RT-qPCR System	A6120

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