![QIAGEN logo]

RNA by the numbers

RNA distribution in a typical mammalian cell[1]

RNA by mass

tRNA · mRNA · lncRNA · Other ncRNA · rRNA

- ■ 80–90%
- ■ 10–15%
- ■ 3–7%
- ■ 0.03–0.2%
- ■ 0.1–1%

RNA by number of molecules

rRNA · mRNA · lncRNA · snRNA · snoRNA · miRNA · 7SL · tRNA

- ■ $3–10 \times 10^7$
- ■ $3–10 \times 10^6$
- ■ $3–10 \times 10^4$
- ■ $3–50 \times 10^3$
- ■ $1–5 \times 10^5$
- ■ $2–3 \times 10^5$
- ■ $1–3 \times 10^3$
- ■ $3–20 \times 10^4$
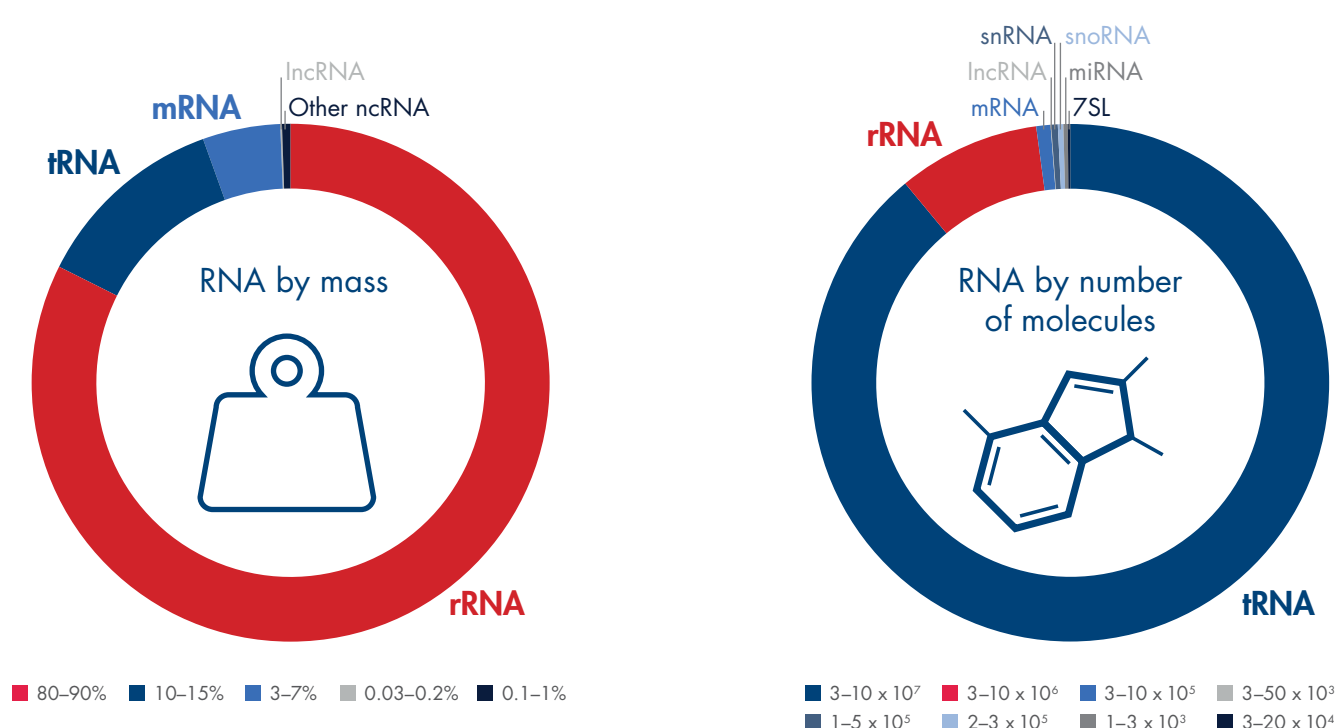
[1] Palazzo AF and Lee ES (2015) Non-coding RNA: what is functional and what is junk? *Front. Genet.* 6:2.

Average yield of total RNA from various sources#

Mammalian tissue (10 mg)

Cell line (1 x 10⁶ cells)

Human blood (1 ml)

Plant (100 mg leaves)

Yeast (1 x 10⁷ cells)

- ■ 10–35 µg
- ■ 10–60 µg
- ■ 25 µg
- ■ 25–60 µg
- ■ 3 µg
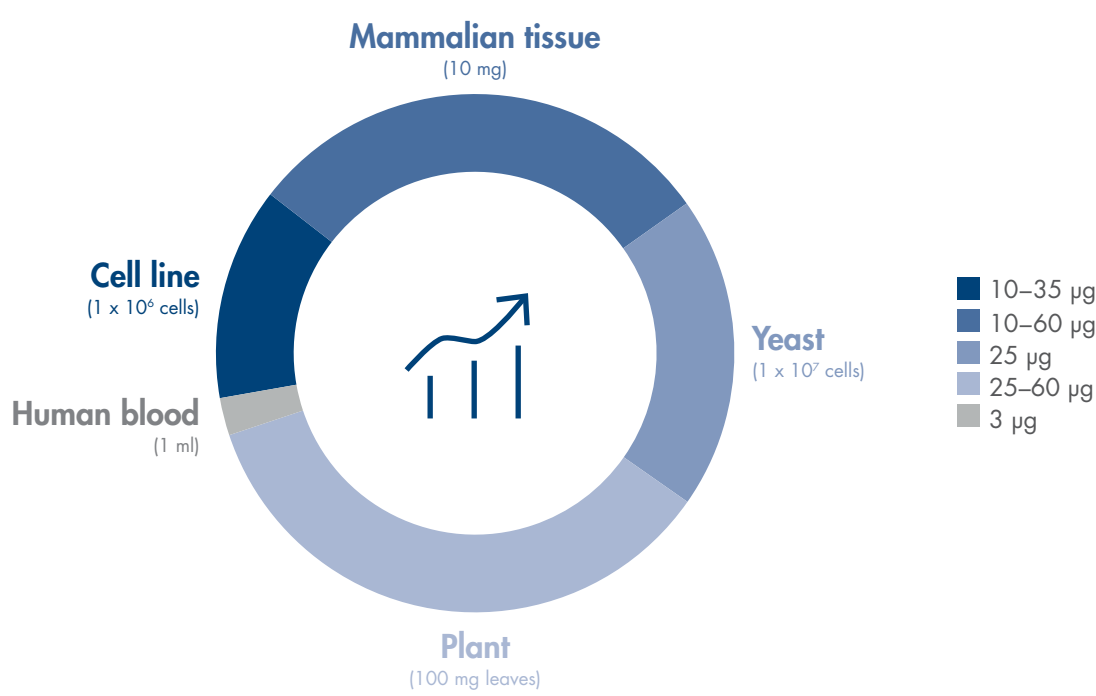
Please consider that the yield of RNA may vary depending on species, developmental stage, growth conditions and treatment of the starting material.

RNA sizes and molecular weights – Prokaryotic vs. Eukaryotic

E. coli

RNA	Nucleotides	Molecular weight (daltons)*
mRNA	75–3000	$2.5 \times 10^4–10^6$
tRNA	75–90	$2.3–3.0 \times 10^4$
5S rRNA	~120	$~4.1 \times 10^4$
16S rRNA	~1500	$~5.1 \times 10^5$
23S rRNA	~2900	$~9.9 \times 10^5$
28S rRNA	4500–5500	$~1.7 \times 10^6$

Human

RNA	Nucleotides	Molecular weight (daltons)*
mRNA	~1900	$~6.6 \times 10^5$
tRNA	75–90	$2.3–3.0 \times 10^4$
5S rRNA	~120	$~4.1 \times 10^4$
16S rRNA	~160	$~5.4 \times 10^4$
23S rRNA	1800–1900	$~6.4 \times 10^5$
28S rRNA	4500–5500	$~1.7 \times 10^6$

* MW of a single-stranded RNA molecule = (# of bases) x (340 daltons/base)
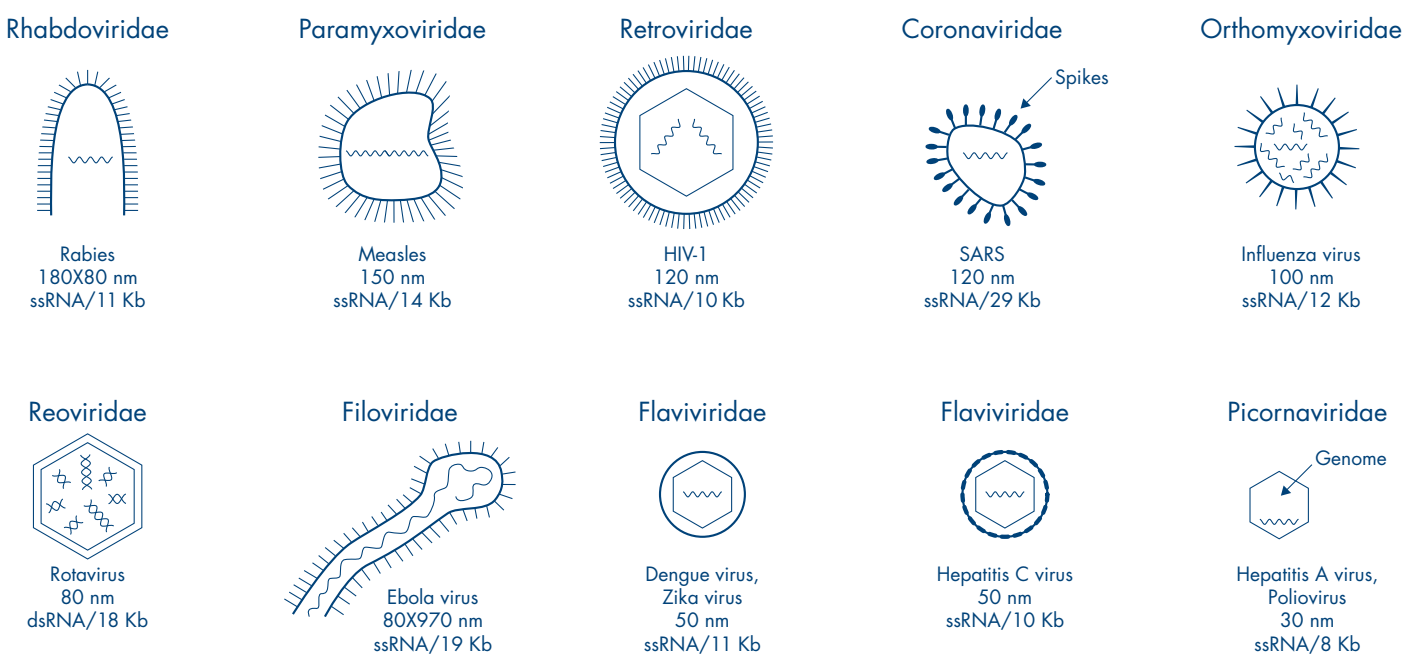
RNA conversions

Mass to Moles

moles ssRNA = mass of ssRNA (g)/molecular weight of ssRNA (g/mol) where, 1 g/mol = 1 Da (dalton)

Mass to Molecules

ssRNA copy number = moles of ssRNA x Avogadro's Number where, Avogadro's Number = 6.022×10^{23} molecules/mol (see above to calculate moles ssRNA from mass)

Most common human RNA viruses[2]

Rhabdoviridae
Rabies
180X80 nm
ssRNA/11 Kb

Paramyxoviridae
Measles
150 nm
ssRNA/14 Kb

Retroviridae
HIV-1
120 nm
ssRNA/10 Kb

Coronaviridae
Spikes
SARS
120 nm
ssRNA/29 Kb

Orthomyxoviridae
Influenza virus
100 nm
ssRNA/12 Kb

Reoviridae
Rotavirus
80 nm
dsRNA/18 Kb

Filoviridae
Ebola virus
80X970 nm
ssRNA/19 Kb

Flaviviridae
Dengue virus, Zika virus
50 nm
ssRNA/11 Kb

Flaviviridae
Hepatitis C virus
50 nm
ssRNA/10 Kb

Picornaviridae
Genome
Hepatitis A virus, Poliovirus
30 nm
ssRNA/8 Kb

[2] http://viralzone.expasy.org/all_by_species/5216.html