

# The RNA Modification Database: 1999 update

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## ABSTRACT

The RNA Modification Database (<http://medlib.med.utah.edu/RNAmods/>) provides a comprehensive listing of naturally modified nucleosides in RNA. Each file includes: chemical structure; common name and symbol; type(s) of RNA in which found and corresponding phylogenetic distribution; Chemical Abstracts registry number and index name; and initial literature citations for structure characterization and chemical synthesis. New features include capability to search database files by name or substructural features, modifications in tmRNA, and links to related data and sites.

## INTRODUCTION

More than 95 different post-transcriptionally modified nucleosides are presently known in all types of RNA across all three primary phylogenetic domains. The discovery and structural characterization of new nucleosides, as well as additional reports of the phylogenetic distribution of known nucleosides, mandates a need for a comprehensive database of RNA nucleosides. The RNA Modification Database is continuously maintained as an update and extension of the initial printed report (1), and contains discussion and literature citations for a number of related topics. These data serve expanding interests (2) in the occurrence and functions of RNA modifications (3–5).

The authors invite comments concerning existing entries, errors or omissions, and suggestions for improvement. The Email address for this purpose is: [RNAmods@lib.med.utah.edu](mailto:RNAmods@lib.med.utah.edu)

## DESCRIPTION OF THE DATABASE

In general, each nucleoside file consists of the following information.

- (i) Chemical structure of the nucleoside.
- (ii) Common chemical name, symbol, elemental composition and mass.
- (iii) Type(s) of RNA in which the nucleoside occurs: tRNA, rRNA, mRNA, tmRNA, snRNA, chromosomal RNA and other RNAs.
- (iv) Phylogenetic occurrence of the nucleoside: archaea (archaeobacteria), (eu)bacteria, eukarya, and the corresponding

literature citations for each. Ribosomal RNA entries are further distinguished by RNA subunit, e.g., 16S, 28S.

(v) Chemical Abstracts registry numbers for the ribonucleoside, and corresponding base (if assigned), to permit computer-searching of the literature.

(vi) Chemical Abstracts index name, which in some cases includes stereochemical information not shown in the database chemical structure.

(vii) Literature citation to structure assignment of the nucleoside.

(viii) Literature citation to the first reported chemical synthesis of the nucleoside, or in limited cases of the base. Subsequent reports of synthesis, which often include refinements, can be accessed effectively in the literature through the Chemical Abstracts registry numbers.

(ix) Comments on any of the above entries, including additional literature citations or alternate nomenclature.

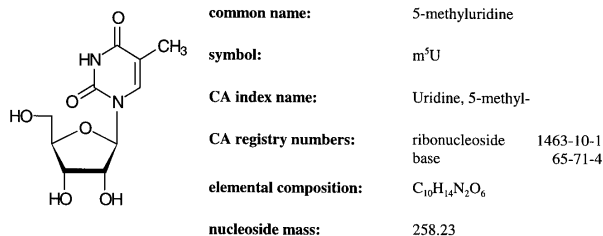
An example of a single file is given in Figure 1, for 5-methyluridine. The database currently (as of October, 1998) contains 95 ribonucleoside entries, distributed by RNA type and phylogenetic source as shown in Table 1. Users of the database are requested to cite the present paper as the source of information.

**Table 1.** Phylogenetic distribution of modified ribonucleosides reported in RNA

RNA	Source		
	Archaea	Bacteria	Eukarya
tRNA	36	42	47
rRNA		1 <sup>a</sup>	4 <sup>a</sup>
SSU	11	8	18
LSU	8	14	12
5S	3		1
5.8S			5
mRNA			13
tmRNA		2	
snRNA			11
Chromosomal RNA			2
Other small RNA			1

<sup>a</sup>Subunit origin not shown, or is reported in a mixture of SSU and LSU rRNAs.

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RNA type	Phylogenetic source		
	archaea	bacteria	eukarya
tRNA	+	+	+
rRNA		16, 23S [1] 23S [2]	

**Structure:** [3]

**Synthesis:** [4]

**Comment:** Alternate commonly used symbol is T. Other common names are thymine riboside and ribosylthymine. Occurrence is rare in archaeal tRNA. Enzymatic synthesis was reported in [5], which preceded the first report of chemical synthesis [4].

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**Figure 1.** Database record for the modified nucleoside 5-methyluridine.

## RECENT CHANGES

Changes in the database implemented during recent months include the following.

(i) Revision in the structure of the database, including provision for file searching by name, by substructural features (e.g., 'methylguanosine', 'thio' or 'deaza'), or by the column and row headings shown in Table 1.

(ii) Inclusion of tmRNA (formerly named 10Sa RNA) as a category of RNA in which modifications are found (6).

(iii) Expanded list of modifications reported in archaeal rRNA (7).

(iv) Links to related data and sites.

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