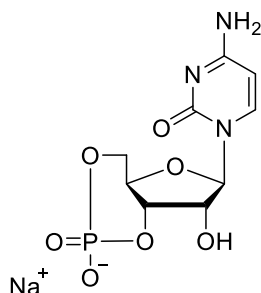


## Technical Information about Cytidine-3', 5'-cyclic monophosphate

Update: May 13, 2022 AI



**Abbreviation:** cCMP

Formula	CAS No.	Molecular Weight	UV	BIOLOG Cat.No.
C <sub>9</sub> H <sub>11</sub> N <sub>3</sub> O <sub>7</sub> P·Na	[54925-33-6]	327.2	λ <sub>max</sub> 270 nm / ε 9000 / pH 7	C 001

**Name:** Cytidine- 3', 5'- cyclic monophosphate, sodium salt

**Description:** cCMP is a cyclic nucleotide with a pyrimidine nucleobase.

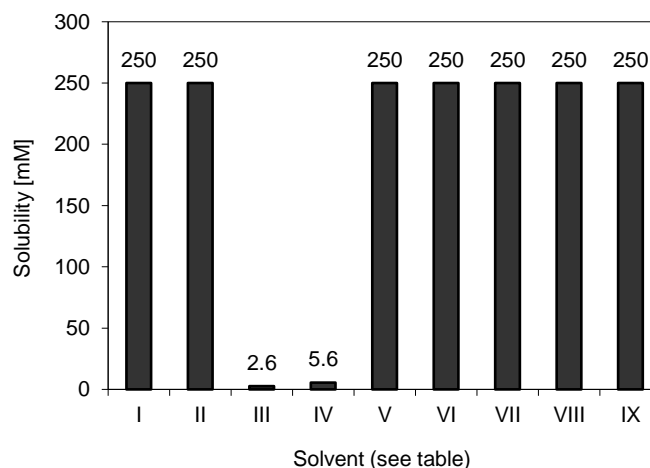
**Properties:** cCMP has been identified in multiple biological systems, but its biological role as a second messenger has long remained unclear. A recent study reveals cCMP and the related cUMP (Cat. No. U 001) as nucleotide second messengers synthesized by specific bacterial pyrimidine cyclases and functioning in bacterial immunity against phages (Tal et al. 2021).

**Specification:** Lyophilized or crystallized sodium salt. The free acid or other salt forms are available upon request. Equal concentrations of cCMP can appear very different in volume due to sensitivity of the lyophilized form to humidity. The compound can even contract to small volume droplets. Normally the product is located in the conical bottom of the tube. Micromolar quantities are determined by UV at λ<sub>max</sub>.

**Purity:** Typical analysis is better than 98% (HPLC / UV / 270 nm). The product is not sterile and has not been tested for endotoxins.

**Solubility:** Detailed information on the solubility of cCMP in water and various buffers are listed in the solubility chart below. Concentrations have been determined at ambient temperature and can be considered as minimum concentrations usually obtainable, however, slight batch-to-batch variations cannot be ruled out. When opening the tube please make sure that no substance is lost within the cap. Please rinse tube walls carefully and preferably use ultrasonic or vortex to achieve total and uniform mixing.

No.	Solvent	Solubility [mM]
I	H <sub>2</sub> O	250
II	DMSO	250
III	DMF	2.6
IV	Ethanol 96%	5.6
V	Methanol	250
VI	PBS, pH 7.4	250
VII	100 mM Na <sub>2</sub> HPO <sub>4</sub> , pH 7.0	250
VIII	25 mM Hepes/NaOH, pH 7.2	250
IX	25 mM Tris/HCl, pH 7.4	250



**Stability and Storage:** cCMP is chemically rather stable. Nevertheless, we recommend that the compound should be stored in the freezer, for longer storage periods preferably in freeze-dried form.

**Toxicity and Safety:** Since cCMP could have multiple tasks in every organism it is not unlikely that it could interfere with many cell regulation processes *in vivo*. However, due to the rather small quantities to work with no health hazards have been reported.

Nevertheless please keep in mind that the *in vivo* properties of this compound are not sufficiently characterized up to now. Avoid skin contact or ingestion and allow only trained personnel to handle the product.

Our products are designed, developed and sold for research purposes only. They are intended for *in vitro* and nonhuman *in vivo* laboratory applications. Any other use requires approval of health authorities.

**Not for drug, household or related uses!**

#### Selected References for cCMP:

Tal, N.; Morehouse, B.R.; Millman, A.; Stokar-Avihail, A.; Avraham, C.; Fedorenko, T.; Yirmiya, E.; Herbst, E.; Brandis, A.; Mehlman, T.; Oppenheimer-Shaanan, Y.; Keszei, A.F.A.; Shao, S.; Amitai, G.; Kranzusch, P.J.; Sorek, R., *Cell*, **184**, 5728 - 5739 (2021): "Cyclic CMP and Cyclic UMP Mediate Bacterial Immunity Against Phages"

Bähre, H.; Hartwig, C.; Munder, A.; Wolter, S.; Stelzer, T.; Schirmer, B.; Beckert, U.; Frank, D.W.; Tümmler, B.; Kaefer, V.; Seifert, R., *Biochem. Biophys. Res. Commun.*, **460**, 909 - 914 (2015): "cCMP and cUMP Occur in Vivo"

Beste, K.Y.; Spangler, C.M.; Burhenne, H.; Koch, K.-W.; Shen, Y.; Tang, W.; Kaefer, V.; Seifert, R., *PLoS ONE*, **8**, e70223 (2013): "Nucleotidyl Cyclase Activity of Particulate Guanylyl Cyclase A: Comparison with Particulate Guanylyl Cyclases E and F, Soluble Guanylyl Cyclase and Bacterial Adenylyl Cyclases CyaA and Edema Factor"

Jäger, R.; Russwurm, C.; Schwede, F.; Genieser, H.-G.; Koesling, D.; Russwurm, M., *J. Biol. Chem.*, **287**, 1210 - 1219 (2012): "Activation of PDE10 and PDE11 Phosphodiesterases"

Zong, X.; Krause, S.; Chen, C.-C.; Krüger, J.; Gruner, C.; Cao-Ehlker, X.; Fenske, S.; Wahl-Schott, C.; Biel, M., *J. Biol. Chem.*, **287**, 26506 - 26512 (2012): "Regulation of Hyperpolarization-Activated Cyclic Nucleotide-Gated (HCN) Channel Activity by cCMP"

Hammerschmidt, A.; Chatterji, B.; Zeiser, J.; Schröder, A.; Genieser, H.-G.; Pich, A.; Kaefer, V.; Schwede, F.; Wolter, S.; Seifert, R., *PLoS ONE*, **7**, 39848 (2012): "Binding of Regulatory Subunits of cyclic AMP-dependent Protein Kinase to cyclic CMP Agarose"

Reinecke, D.; Burhenne, H.; Sandner, P.; Kaefer, V.; Seifert, R., *FEBS Lett.*, **585**, 3259 - 3262 (2011): "Human Cyclic Nucleotide Phosphodiesterases Possess a Much Broader Substrate-Specificity than Previously Appreciated"

Göttle, M.; Dove, S.; Kees, F.; Schlossmann, J.; Geduhn, J.; König, B.; Shen, Y.; Tang, W.-J.; Kaefer, V.; Seifert, R., *Biochemistry*, **49**, 5494 - 5503 (2010): "Cytidylyl and Uridylyl Cyclase Activity of Bacillus anthracis Edema Factor and Bordetella pertussis CyaA"

Desch, M.; Schinner, E.; Kees, F.; Hofmann, F.; Seifert, R.; Schlossmann, J., *FEBS Lett.*, **584**, 3979 - 3984 (2010): "Cyclic Cytidine 3',5'-monophosphate (cCMP) Signals via cGMP Kinase I"

Scott, S.-P.; Shea, P.W.; Dryer, S.E., *Biochemistry*, **46**, 9417 - 9431 (2007): "Mapping Ligand Interactions with the Hyperpolarization Activated Cyclic Nucleotide Modulated (HCN) Ion Channel Binding Domain Using a Soluble Construct"

Hosseini, R.H.; Abadi, B., *Analytical Biochem.*, **312**, 91 - 100 (2003): "Nucleotide Profile of Mouse Liver: Response to 2'-O- dibutyryl Cytidine 3',5'-cyclic Monophosphate"

Abadi, R.H.H.B., *Anal. Biochem.*, **312**, 91 - 100 (2003): "Nucleotide Profile of Mouse Liver: Response to 2'-O-Dibutyryl cytidine 3',5'-Cyclic Monophosphate"

Newton, R.P., *Nucleosides Nucleotides*, **14**, 743 - 747 (1995): "Cytidine 3', 5'- Cyclic Monophosphate: A Third Cyclic Nucleotide Secondary Messenger"