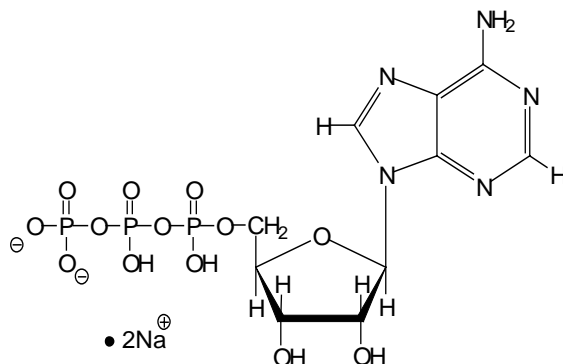


ADENOSINE 5'-TRIPHOSPHATE, DISODIUM SALT
Sigma Prod. No. A5394**CAS NUMBER:** 51963-61-2**PRODUCT DESCRIPTION:**

Equine muscle source, high purity (not less than 99%), low vanadium content (less than 1 ppm), recommended for general enzyme applications and bioluminescent experiments, and a very stable material in crystalline form and in neutral aqueous solutions.

STRUCTURE:Formula - $C_{10}H_{14}N_5O_{13}P_3Na_2$ Formula Weight - 551.1

Apparent molecular weight may be calculated from the water and organic solvent content provided on the label. For each mole of water per mole of ATP salt, add 18 to the formula weight. This calculated number is then corrected for organic solvent by dividing by the following factor: [(100 - per cent of solvent content)/100].

GENERAL INFORMATION:

ATP is a basic component of energy exchange in many biological systems. The purification and crystallization of ATP from equine muscle led to the entry of the Sigma Chemical Company into the research biochemical market. Sigma became the first to offer stable, crystalline ATP with a purity approaching 100%. The initial products were isolated from muscle tissue and precipitated with ethanol.¹ Currently, products are isolated from equine muscle or prepared by bacterial fermentation. Production of high quality ATP is now synonymous with Sigma and today the focal point of the entrance to the Sigma Chemical Company headquarters is a 15 foot high, rotating, molecular model of ATP suspended from the ceiling.

ADENOSINE 5'-TRIPHOSPHATE, DISODIUM SALT
Sigma Prod. No. A5394

GENERAL INFORMATION: (continued)

Over the years, ATP has been reported to contain various trace ionic impurities which affect enzyme systems. Vanadate ions have been reported to inhibit Na/K ATPase activity.^{2,3,4,5} In response to this concern, Sigma offers products with less than 1 ppm vanadium content. Other papers have detailed the metal ion content of commercial ATP preparations.^{6,7} This may be due to chelation of the metal ions by the ATP.⁸ Methods have been suggested for treatment of ATP solutions, if removal of metal ions is necessary.^{9,10,11} A very slow dismutation of 2 ATP molecules in the powdered product results in the formation of ADP and adenosine 5'-tetrphosphate. Other possible trace impurities are AMP or other nucleotides.

PHYSICAL PROPERTIES:

Appearance: white, crystalline powder

pKa¹²: (amino) (secondary phosphate)
 4.1 6.5

UV Absorption ¹³ :	EmM	Wavelength (nm)	pH
15.4	259	7	
15.4	259	11	
14.7	257	2	

Purity: not less than 99% (Enzymatic and HPLC assay)

STABILITY / STORAGE AS SUPPLIED:

The product is routinely shipped at ambient temperature without degradation. For long term storage it is suggested to routinely store the powder frozen with desiccation. A decomposition of <0.5% per year is observed.

SOLUBILITY / SOLUTION STABILITY:

The sodium salt is water soluble, routinely yielding a clear solution at 50 mg/ml. This solution is mildly acidic (pH approximately 3.5). Neutral ATP solutions stored frozen are stable for at least one year. A refrigerated solution would be stable for at least one week (see special concerns regarding standards for bioluminescence). ADP is the first hydrolysis product formed, with additional hydrolysis leading to the formation of AMP. Acid lability has been used to characterize phosphorus compounds. ATP has a half-life of 8 minutes in 0.1 N acid at 100°C and 67% hydrolysis will occur in 7 minutes at 100°C in 1 N acid.¹⁴ It is stable several hours in a 7% TCA solution at 0°C. In alkali solutions, ATP will hydrolyze to AMP and pyrophosphate.¹⁵

ADENOSINE 5'-TRIPHOSPHATE, DISODIUM SALT
Sigma Prod. No. A5394

APPLICATIONS & PROCEDURES:

Sigma currently offers two bioluminescent kits (FL-AA and FL-SCA) for the assay of ATP. The sodium salt of muscle origin has several products which can be used as a standard for bioluminescent experiments: A5394 (bulk material to be weighed by user) and A3147, 660-30, and FL-AAS (preweighed vials). Standard solutions of 1 mg/ml or less should be used for one day. Solutions at higher concentrations may be frozen in aliquots at -20°C for at least one year. Other methods for the enzymatic assay of ATP have been published.^{16,17}

The sodium salt is usable in other enzyme systems including protein kinases A and C. Products A6559 (Molecular Biology) and A6419 (Tissue Culture) have been tested for specialized applications.

REFERENCES:

1. Berger, L., *Biochim. Biophys. Acta*, 20, 23 (1956).
2. Cantley, L.C., Jr. et al., *J. Biol. Chem.*, 252, 7421 (1977).
3. Josephson, L. and Cantley, L.C., Jr., *Biochem.* 16, 4572 (1977).
4. Hudgins, P.M. and Bond G.H., *Biochem. Biophys. Res. Comm.*, 77, 1024 (1977).
5. Beaugè, L.A. and Glynn I.M., *Nature*, 268, 355 (1977).
6. Schloss, J.V. et al., *Analytical Biochem.*, 120, 176 (1982).
7. Tornheim K. et al., *Analytical Biochem.*, 103, 87 (1980).
8. Wilson, J.E. and Chin A., *Analytical Biochem.*, 193, 16 (1991).
9. Solheim, L.P. and Fromm H.J., *Analytical Biochem.*, 109, 266 (1980).
10. McCarty, R.E., *Analytical Biochem.*, 205, 371 (1992).
11. Seidel, J.C. and Gergely, J., *J. Biol. Chem.*, 238, 3648 (1963).
12. Roger Phillips, S.J., *Chem. Rev.*, 66, 501 (1966).
13. Bock, R.M., Ling, N.S., Morell, S.A., and Lipton, S.H., *Arch. Biochem. Biophys.*, 62, 253 (1956).
14. Leloir L.F. and Cardini C.E., *Methods in Enzymology*, III, 840 (1957).
15. Data for Biochemical Research 3rd Edition, 78 (1986).
16. *Methods of Enzymatic Analysis*, 2nd Ed., Edited by H. Bergmeyer, Volume 4, 2097-2126.
17. Schultz, V. et al., *Analytical Biochemistry*, 215, 302 (1993).