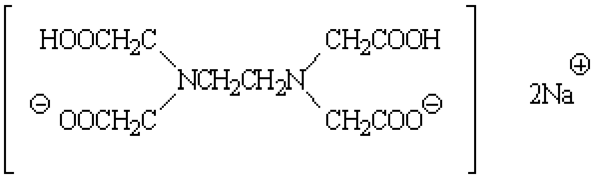
DISODIUM ETHYLENEDIAMINETETRAACETATE

Prepared at the 17th JECFA (1973), published in FNP 4 (1978) and FNP 52 (1992). Metals and arsenic specifications revised at the 61st JECFA (2003). An ADI of 0-2.5 mg/kg bw was established at the 17th JECFA (1973)

SYNONYMS	Disodium EDTA, disodium edetate; INS No. 386

DEFINITION

Chemical names	Disodium salt of N,N'-1,2-Ethanediylbis[N-(carboxymethyl)glycine]; disodium dihydrogen ethylenediaminetetraacetate; disodium dihydrogen (ethylene-dinitrilo)-tetraacetate
C.A.S. number	139-33-3
Chemical formula	$C_{10}H_{14}N_2Na_2O_8 \cdot 2H_2O$
Structural formula	
Formula weight	372.24
Assay	Not less than 99%

DESCRIPTION	White, odourless crystalline granules or a white to nearly white powder
FUNCTIONAL USES	Sequestrant, antioxidant synergist, preservative

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4)	Freely soluble in water, practically insoluble in ethanol
Infrared absorption	The infrared spectrum of the sample corresponds with that of a reference standard (a Reference standard may be obtained from the U.S. Pharmacopeia, 12601 Twin Brook Parkway, Rockville, Maryland 20852)
Test for sodium (Vol. 4)	Passes test
Chelating activity to metal ions	To 5 ml of water in a test tube add 2 drops of ammonium to thiocyanate TS and 2 drops of ferric chloride TS. A deep red solution develops. Add about 50 mg of the sample and mix. The deep red colour disappears.

PURITY

pH (Vol. 4)	4.3 - 4.7 (1 in 100 soln)
Nitrilotriacetic acid	Passes test See description under TESTS

Lead (Vol. 4)

Not more than 2 mg/kg
Determine using an atomic absorption technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4, “Instrumental Methods.”

TESTS

PURITY TESTS

Nitrilotriacetic acid

Stock test solution
Transfer 10 g of the sample into a 100-ml volumetric flask, dissolve in 40 ml of a (1 in 10) potassium hydroxide solution, dilute to volume with water, and mix.

Diluted stock test solution
Pipette 10 ml of the "stock test solution" into a 100-ml volumetric flask, dilute to volume with water, and mix.

Test preparation
Pipette 20 ml of the "diluted stock test solution" into a 150-ml beaker, add 1 ml of a (1 in 10) potassium hydroxide solution, 2 ml of a (1 in 10) ammonium nitrate solution, and about 50 mg of eriochrome black T indicator, and titrate with a (3 in 100) cadmium nitrate solution to a red end-point. Record the volume, in ml, of the titrant required as V, and discard the solution.

Pipette 20 ml of the "diluted stock test solution" into a 100-ml volumetric flask, and add the volume V of the (3 in 100) cadmium nitrate solution required in the initial titration, plus 0.05 ml in excess. Add 1.5 ml of a (1 in 10) potassium hydroxide solution, 10 ml of a (1 in 10) ammonium nitrate solution, and 0.5 ml of methyl red TS, then dilute to volume with water and mix.

Stock standard solution
Transfer 1.0 g of nitrilotriacetic acid into a 100-ml volumetric flask, dissolve in 10 ml of a (1 in 10) potassium hydroxide solution, dilute to volume with water, and mix.

Dilute stock standard solution
Pipette 1 ml of the "stock standard solution" and 10 ml of the "stock test solution" into a 100-ml volumetric flask, dilute to volume with water, and mix.

Standard preparation
Proceed as directed under "test preparation", using "diluted stock standard solution" where "diluted stock test solution" is specified.

Polarographic test
Rinse a polarographic cell with a portion of the "standard preparation", then add a suitable volume to the cell, immerse it in a constant-temperature bath maintained at 25 ± 0.5°, and de-aerate by bubbling oxygen-free nitrogen

through the solution for 10 min. Insert the dropping mercury electrode of a suitable polarograph, and record the polarogram from -0.6 to -1.2 volts at a sensitivity of 0.006 microampere per mm, using a saturated calomel electrode as the reference electrode. In the same manner, obtain a polarogram for a portion of the "test preparation". The diffusion current observed with the "test preparation" is not greater than 10% of the difference between the diffusion currents observed with the "standard preparation" and the "test preparation", respectively. (Note: An extra polarographic wave appearing ahead of the nitrilotriacetic acid-cadmium complex wave is probably due to uncomplexed cadmium. This wave should be ignored in measuring the diffusion current).

METHOD OF ASSAY

Transfer about 5 g, accurately weighed, of the sample, into a 250-ml volumetric flask, dissolve in water, dilute to volume and mix, to give the assay preparation. Place about 200 mg, accurately weighed, of reagent grade calcium carbonate of known purity in a 400-ml beaker, add 10 ml of water and swirl to form a slurry. Cover the beaker with a watch glass and introduce 2 ml of dilute hydrochloric acid TS from a pipette inserted between the lip of the beaker and the edge of the watch glass. Swirl the contents of the beaker to dissolve the calcium carbonate. Wash down the outer surface of the pipette, the watch glass and the sides of the beaker, and dilute to about 100 ml with water. While stirring the solution, preferably with a magnetic stirrer, add about 30 ml of the assay preparation from a 50-ml burette. Add 15 ml of sodium hydroxide TS, 300 mg of hydroxynaphthol blue indicator and continue the titration with the assay preparation to a blue end point. Calculate the percentage of $C_{10}H_{14}N_2Na_2O_8$ " $2H_2O$ in the sample by the formula:

$$\%\ disodium\ EDTA = \frac{92{,}980 \times W_{CaCO_3}}{V_{ASSAY} \times W_{SAMPLE}}$$

where

W_{CaCO3} = the weight in grams of calcium carbonate;

V_{ASSAY} = the volume in ml of assay preparation; and

W_{SAMPLE} = the weight in gram of the sample taken.