Product information

Retinoic Acid

Vitamin A acid, ATRA, Tretinoin, all-trans-Retinoic acid

R2625

Physical Description

Appearance: Yellow to yellow with an orange cast powder

Molecular formula: $C_{20}H_{28}O_2$

Molecular weight: 300.4

E^M(351 nm) = 45,000 (methanol)[4]

E^M(350 nm) = 44,300 (ethanol)[5]

Melting point: 180-182 °C[4]

Purity: 98% by HPLC[3]

Acid or alkaline impurities in absolute ethanol affect the absorption maxima and extinction coefficients of retinoic acid (RA) solutions.[5] The observed maximum wavelength of about 349.6 nm for RA dissolved in USP grade ethanol was shifted to 336-337 nm upon addition of 2 drops of 0.01 N NaOH to 1 mL of the solution. The maximum wavelength shifted back to about 349.6 upon addition of 2 drops of 0.01 N HCl to 1 mL of the above solution. Methods for assaying purity have been reported.[6]

Method of Preparation

RA is synthetically prepared. A method of preparation and purification has been reported.

Stability/Storage as Supplied

RA is expected to be stable for at least one year when stored at -20 °C unopened in the ampule (packaged under argon gas). The product is extremely sensitive to UV light, air, and oxidizing agents. It is recommended to use all the powder immediately after opening the ampule. Any unused portion should be protected by an atmosphere of inert gas and protected from light.[8]

Precautions and Disclaimer

For R&D use only. Not for drug, household, or other uses. Please consult the Safety Data Sheet for information regarding hazards and safe handling practices.

Solubility/Solution Stability

RA is more sensitive to light, heat, and air in solution. It is practically insoluble in water; slightly soluble in alcohol and chloroform, sparingly soluble in ether, and soluble in methylene chloride.[8] RA is soluble at about 50 mg/mL in chloroform and at about 2.7 mg/mL in 95% ethanol (vortexing may be needed). A stock solution of 0.01 M (3 mg/mL) RA in absolute ethanol was stored at -70 °C for up to two weeks.[9] Subsequent dilutions were made in growth medium with a final ethanol concentration of 0.1% (v/v) which did not affect the described system. A 3 mg/mL solution was prepared in chloroform and stored in light protected vials at -20 °C and diluted with tissue culture medium right before use.[10] RA in corn oil was administered to animals intraperitoneally by injection or given orally to animals as a suspension.[11,12] Perform sterile filtering RA solutions before addition to suspension cells.[13] All solution preparations should be performed in subdued light[14] and preferably in a glove bag under an atmosphere of inert gas. Solutions should be stored under argon, in the dark and at -70 °C, preferably or at -20 °C.[9,10] Solutions of RA in pure organic solvents when stored in the dark are reasonably stable whereas aqueous solutions deteriorate quickly.[6]

Usage/Applications

Differential effects of RA and 9-cis retinoic acid in gene expression and neuroblastoma cells were reviewed.[15] RA may act as a type of signal molecule working through a nuclear receptor in the regulation of region differentiation of the central nervous system.[16] RA induces morphological and functional terminal differentiation of a cell line of human promyelocyte leukemia at 1 nM (maximal differentiation at 1 µM)[14] indicating that retinoids may also be involved in the differentiation of certain hematopoietic cells.[14,17] RA can indirectly modulate differentiation of neurons through the modification of expression of neuronal cell surface receptors to peptide growth factors.[18] An in vitro induction of differentiation of neuroblastoma cells by RA is linked to a rapid decrease of phosphatidylinositol turnover.[9] In the chick limb RA is a local chemical mediator with morphogenetic properties, example it triggers growth and differentiation of cells and tissues by virtue of its concentration.[19,20] It was reported that the modulation of proliferation and adhesion in epithelial cells and fibroblasts of human skin by RA is associated with changes in the extracellular matrix production of Ca^{2+} metabolism.[21] A 10^{-5} M concentration of RA maximally decreased the incorporation of ^{3}[H] proline into collagen and other proteins of fetal lung fibroblasts possibly by altering the function of Na^{+} -dependent ATPase transport system for amino acid uptake.[22] RA (at 1.7nmoles) was an effective inhibitor of TPA induced ornithine decarboxylase activity (mouse epidermal) which is proposed as essential for tumor promotion.[11] RA and other retinoids inhibited cellular proliferation[23] and stimulated tyrosinase activity (associated with an increase in differentiation function) in a human melanoma cell line.[10] Metabolites of RA (both in vitro and in vivo in the hamster) have been reported.[24] RA (10 µM) and other retinoid compounds effectively induced sanguinarine and chelerythrine (benzophenanthridine alkaloids) accumulation in suspension-cell cultures of Sanguinaria canadensis in a way similar to fungal elicitation.[13]

General Notes

RA, a retinoid, exerts a wide range of biological effects. It is involved in the control of cellular differentiation and cellular proliferation in normal and transformed cells (may control oncogenes).[10,23,25,26] The pharmaceutical grade has been used in the treatment of different skin disorders. RA may be an immunomodulator and both a preventive and therapeutic anticancer agent.[27] It is also a teratogen effecting different patterns of malformations when mammalian embryos at different developmental stages are exposed to it.[28] Mechanisms of action [11,26,29] and the pharmacokinetics have been described.[30] RA inhibits the cell-substrate adhesion and motility in melanocytes.[31]

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