

## Ab initio study on the tautomeric equilibria in water between monoanionic species of 5-fluorouracil

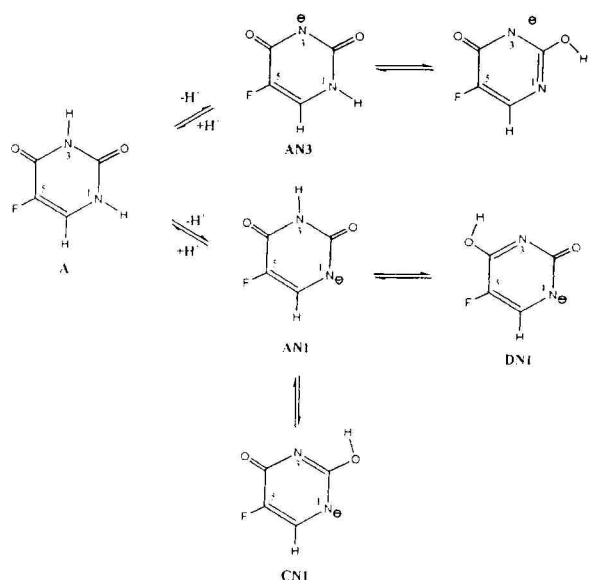
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According to IR and UV data\* the monoanions of 5-fluorouracil (5FU) are in equilibrium mixture of two tautomeric forms corresponding to dissociation of the N1 and N3 protons.

Post-Hartree-Fock *ab initio* quantum chemical calculations were performed for monoanionic species of 5-fluorouracil in the gas phase and in a four-water cluster. Full geometry optimizations of the 5-fluorouracil-water complexes were carried out at the MP2/6-31+G(d,p) level of theory. MP4/6-31+G(d,p)//MP2/6-31+G(d,p) single-point calculations were performed to obtain more accurate energies.

For 5-fluorouracil, there are two possible deprotonation sites - N1H and N3H:



According to our calculations the anion **AN1** is more stable than **AN3** in the gas phase and in water solution by 11.52 and 4.80 kcal mol<sup>-1</sup>, respectively. Because of that we have studied the tautomeric equilibria of monoanion **N1** only: **AN1**→**DN1** and **AN1**→**CN1**. In the gas phase, 2,4-dioxo tautomeric form (**AN1**) is 8.24 kcal mol<sup>-1</sup> more stable than **CN1**. Upon complexation with four water molecules, this value becomes 6.00 kcal mol<sup>-1</sup>. For tautomer **DN1**, the change is more strongly expressed: 17.49 kcal mol<sup>-1</sup> before and 6.68 kcal mol<sup>-1</sup> after complexation.

\*K. L. Wierzchowski, E. Litonska, D. Shugar, *J. Am. Chem. Soc.* 87 (1965) 4621-4629.