DFT-ab Initio Study on Conformational Dependence of Atomic Charges of Neutral- and Cationic- Epinephrine Molecule

Goncağül Serdaröğlu

Cumhuriyet University 58140 Sivas, TURKEY
*serdaroglu@cumhuriyet.edu.tr

The internal biochemistry of the human body is regulated by a number of relatively small molecules known as neurotransmitters. The design of such drugs has generally been optimized by systematically altering the functional groups of a known compound (such as adrenaline) and testing the resulting species for effectiveness, selectivity and toxicity. Rational drug design can be facilitated by a better understanding of the structures involved particularly with regard to the binding site of the receptor and by more complete studies of the conformational preferences of the neurotransmitter itself. Toward this end, an exploration of the conformational landscapes of a number of natural and man-made neurotransmitters has been initiated, using gas phase ab initio calculation.

Although several molecular orbital calculations on Epinephrine have been reported, these have been primarily concerned with the conformation of the molecule\textsuperscript{1,3} and descriptions of the electron distribution have been confined to Mulliken population analysis, whose limitations are well known. To explore these questions as they relate to the specify of drug-receptor interactions, I have focus on the conformational dependence of the properties such as the $E_{\text{HOMO}}$, $E_{\text{LUMO}}$, energy gap, atomic charge.

The conformational flexibility of epinephrine in N- protonated and neutral forms shown in Figure 1 have been considered at the B3LYP/6-31G* level\textsuperscript{4-6}, taking into account the orientation of the two hydroxyl groups located on the catechol ring and the interconversion pathways between their stable arrangement. These results can serve as an aid for designing suitable structures for better pharmaceutically important forms.

![Figure 1. Structures, the energetical parameters (hartree) and dipole moments of the most stable conformers](image)

**REFERENCES**