Thursday 30 August

7th EuCheMS Chemistry Congress

Supramolecular chemistry and self-assembly	Computational and theoretical chemistry	European Young Chemists' Network - Industry session	What is the purpose of practical work and how to teach in labs?	How can chemistry earn public trust?
Room 11	Auditorium 1C	Room 12	Room 4A	Room 4B
Steven De Feyter	Jean-François Halet	Sebastian Sobottka	Michael Seery	TBC
KO06 **Can We Synthesize Life In The Lab? How Chemistry May Become Biology** Sijvren Otto *University of Groningen, Netherlands*	KP08 **Predicting materials for energy from first principles** Giulia Galli *The University of Chicago, USA*	YO17 8.30 - 9.00 **From mgs to kgs: Stories from scale-up** Jackie O'Neil *Alkermes, USA*	AO43 8.30 - 9.30 **Assessing practical competency in laboratory education including the use of digital badges**	AO44 8.30 - 10.30 **How can chemistry earn public trust?** Susan Vickers *Royal Society of Chemistry, UK*
OO45 **Luminescent Pt(II) complexes and their assemblies** Luisa De Cola *Université de Strasbourg, France*	OP57 **Functional assignment of Structural Genomics proteins through computed chemical properties, graph representation of active sites, and biochemical validation** Caitlyn Mills *Northeastern University, USA*	YO18 9.00 - 9.30 **Young chemists in European industries: opportunities and challenges** Mauro Davanzo *Germany*		
OO46 **Connecting the structure and properties of porous molecular crystals** Samantha Chong *University of Liverpool, UK*	OP58 **What governs the stability of reverse micelles in rare-earth separation: a chemical model based on a multiscale approach** Magali Duvail *France*			
OO47 **Metal-Organic Cages: Expanding the Toolbox of Stimuli-Responsive Behaviour** Anna McConnell *Kiel University, Germany*	OP59 **Serine HydroxyMethylTransferase: Inhibit it or Improve it?** Henrique Fernandes *Faculdade de Ciências da Universidade do Porto, Portugal*	9.30 - 10.00 **Talk TBC**		
OO48 **Peptide Chemistry and Nanotechnology for Responsive Delivery of Antimicrobials** Paco Fernandez-Trillo *University of Birmingham, UK*	OP60 **To exact change and beyond: Building a linear-scaling two-electron integral engine for quantum chemistry in a generalized Wannier basis** James Womack *University of Southampton, UK*		AO43 9:45 - 10:30 **Designing a laboratory curriculum – progressive development of laboratory skills**	

Serine HydroxyMethylTransferase: Inhibit it or Improve it?

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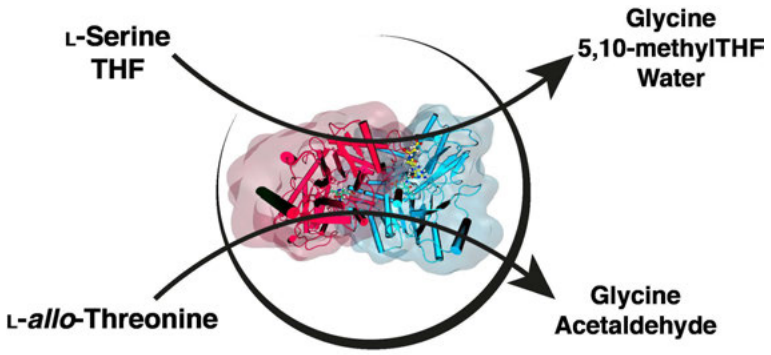
Computational methods provide a unique way to unravel the catalytic mechanism of enzymatic reactions at an atomistic level that cannot be obtained by experimental means. In this work, the catalytic mechanism of Serine HydroxyMethylTransferase (SHMT) was studied using computational means. SHMT requires pyridoxal-5'-phosphate (PLP) [3] and tetrahydrofolate (THF) as a cofactor to catalyze the conversion of L-Serine to Glycine. This enzyme has been classified as an important drug target against malaria [1] and an important industrial catalyst that can be used to produced enantiomeric pure compounds.

The calculations were carried out using QM/MM methodologies using the ONIOM scheme B3LYP/6-31G(d):FF99SB for the geometry optimizations and B3LYP/6-311++G (3df,2pd):FF99SB for the single-point energy calculations.

Our calculations revealed that the α-elimination of L-serine and consequent conversion of THF into 5,10-methyl-THF occurs in six sequential steps. The first step involves the nucleophilic attack of a nitrogen atom of the THF to the β-carbon of the substrate (bounded to the PLP cofactor) leading to the α-elimination of the substrate. This is the rate-limiting step of the full reaction that has an activation energy of 18.8 kcal/mol, which closely agrees with the experimental kinetic results (k_{cat} = 5.44 s^{-1}; ~18.2 kcal/mol) [2].

SHMT is also able to catalyze the production of aldehydes in a THF-independent mechanism, e.g., L-allo-threonine is converted to acetaldehyde and glycine. Experimental results showed an increase in the activity of the enzyme when an active site glutamate is mutated by a glutamine. The mechanism behind this alternative reaction is also being investigated as well as, further modifications that can enhance the efficiency of SHMT to produce these pure enantiomeric compounds. These results will propose new and improved ways to enhance the production of regio- and stereoselective compounds which is one of the Achilles' heels of the chemical industries.



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References

[1] World Malaria Report 2016, World Health Organization, **2016**, ISBN: 9789241511711

[2] Sopitthummakhun, K. et al., FEBS Journal, **2009**, 276, 15.

[3] Fernandes, HS, Ramos, MJ, and Cerqueira, NMFSA, Chem. Eur. J., **2017**, 23, 9162.