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Metabolic modelling to support synthetic biology in C1Net organisms.

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Gas fermentation is a process where microbial cells use gases as a carbon source and convert them into other chemicals. The C1Net is a community of researchers who create processes where microbial gas fermentation is harnessed to convert gases discharged in other industrial processes, such as petroleum refining and steel milling into valuable products. Members of C1Net use a Synthetic Biology approach where microbial cells are genetically engineered to efficiently convert carbon dioxide, carbon monoxide, methane and hydrogen to more valuable products for the chemical industry. Synthetic Biology adopts the engineering approach of developing biological parts that can be assembled in different configurations within host microorganism (chassis) to implement a wide range of bioprocesses. One of the hallmarks of engineering, widely adopted in well-established industries, is design and verification of products by computational modelling before implementation. In this Proof of Concept project we have created the first computer model of the metabolic network of *Methylococcus capsulatus* (Bath), a C1 fermenting microorganism. The model is now available to serve as blueprint for Synthetic Biology designs made by C1Net partners. Experts in genetic engineering and bioreactors will be able to test their designs before implementing them. While some predictions of the model will be wrong due to the incomplete knowledge about cellular metabolism, application of computer simulation will significantly reduce the number of alternative designs that will have to be tested. The use of the model by researchers without a modelling background is supported by Graphics User Interface of SurreyFBA software. Moreover, the *M. capsulatus* model is available in Simulocyte: the online simulation tool. The users will be given accounts in the social network environment where they will be able to access the model and share model modifications and simulation results.