Scientists hope to use synthetic biology to find cures, create food and sustain resources

Samantha Boh

The current buzz in science and gene splicing is in synthetic biology. There are many definitions of this new field on the block, but most can agree that it means designing biological organisms with new traits. This includes both bacteria and animals faster. This means about how to read and manipulate with desirable traits.

By selectively breeding those which dictates what they look like biological systems. This is an emerging area of research that has the potential to bring about the production of new plants and animals. It is looking at a more creative solution than just a new pill.

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Imagine Singapore becoming a wine-making country because climate no longer matters or mums baking chocolate-flavoured bread without having to use cocoa. The search for the secret to producing such food and drinks, and more, is now under way internationally and researchers from the National University of Singapore (NUS) are part of the exploration team called the International Synthetic Yeast Genome Consortium.

The prize discovery is to come up with synthetic yeast whose characteristics can be modified at will. It begins with creating the synthetic version of each and every one of the 16 chromosomes found in the garden-variety baker’s yeast found in supermarkets.

The consortium of scientists from various institutions, including the universities of Edinburgh in Scotland, Johns Hopkins in the US and Tianjin in China, have each been given a chromosome to create. The NUS team is designing chromosome 15 and it is led by Associate Professor Matthew Chang, who heads the NUS Synthetic Biology for Clinical and Technological Innovation programme. When all the 16 synthetic chromosomes are constructed, they will be incorporated into a living yeast cell, by replacing the original chromosomes residing in it. In doing so, an entirely new yeast strain is created.

The consortium hopes to get the synthetic genome done by 2017. When completed successfully, it will be the first time scientists have built the whole genome of a eukaryotic organism – an organism whose cells contain a nucleus, like plant, animal and human cells. This could lead to the development of plants that can withstand climate change or are resistant to pathogens, said Prof Chang.

Meanwhile, a team from Johns Hopkins and New York universities successfully modified a chromosome from scratch last year. The process involves reducing the genome size by removing non-essential features and adding new genetic components. “The whole premise is to reduce the size of the chromosomes to bare necessities and introduce choice elements which will allow design, engineering and evolution of the genome,” said Prof Chang, from NUS’ Department of Biochemistry, Yong Loo Lin School of Medicine.

He is also leading a team to create anti-cancer compounds by reprogramming a particular type of probiotic cell, where the cells convert a compound common in cruciferous plants like broccoli, into anti-cancer compounds. “The research targets can-cer patients in remission. Humans “consume a lot of vegetables, so if we can supply the reprogrammed therapeutic cells, like in the form of a drink, we think the cancer can be managed to a certain extent”, he said.

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Associate Professor Matthew Chang is leading an NUS team which will be creating a synthetic version of a chromosome found in yeast. ST PHOTO: CHEW SENG KIM

Synthetic biology

Cooking up new ways to create food and medicines

The emerging field of synthetic biology has opened up exciting opportunities for harnessing new biological systems. Samantha Boh looks at the scientists creating artificial life forms here.

Admissions Day

Associate Professor Matthew Chang is leading an NUS team which will be creating a synthetic version of a chromosome found in yeast. ST PHOTO: CHEW SENG KIM