# Scientists discover key gene for producing marine molecule with huge environmental impacts

February 26 2018

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Researchers at the University of East Anglia have discovered a key gene for the synthesis of one of the world's most abundant sulfur molecules.

Dimethylsulfoniopropionate (DMSP) is an important nutrient in marine environments with more than one billion tonnes produced annually by marine phytoplankton (microscopic plant-like cells), seaweed and

bacteria.

When marine microorganisms break down DMSP, they release a climate-cooling gas called dimethylsulfide (DMS), which also gives the seaside its characteristic smell.

The discovery of a gene (named DSYB) responsible for synthesising DMSP, published today in *Nature Microbiology*, represents a huge step forward in the field of sulfur cycling in marine environments. It could also allow scientists to better predict the impact of climate change on DMSP production.

The team discovered that this gene, and therefore DMSP synthesis itself, likely originated in marine bacteria and was later passed onto phytoplankton, which have evolved to be marine factories for this molecule.

Lead researcher Dr Jonathan Todd, from UEA's School of Biological Sciences, said: "DMS is a very important gas. Across the world's oceans, seas and coasts, tens of millions of tonnes of it are released by microbes that live near plankton and marine plants, including seaweeds and some salt-marsh grasses.

"DMS is thought to affect climate by increasing cloud droplets that in turn reduce the amount of sunlight reaching the ocean's surface. These same clouds are vital in the movement of large amounts of sulfur from the oceans to land, making the production of DMSP and DMS a critical step in the global sulfur cycle.

"Marine phytoplankton produce the majority of global DMSP. Until now, we didn't know any of the phytoplankton genes responsible for the synthesis of this highly abundant marine nutrient."

The discovery of genes involved in the production of DMSP in phytoplankton, as well as bacteria, will allow scientists to better evaluate which organisms make DMSP in the marine environment and predict how the production of this influential molecule might be affected by future environmental changes, such as the warming of the oceans due to climate change.

Dr Todd said: "The identification of the DMSP synthesis genes in marine bacteria and phytoplankton allows us to evaluate for the first time which organisms produce DMSP in the environment. This discovery represents a huge step forward in the field of sulfur cycling in marine environments."

Dr Andrew Curson, also from UEA's School of Biological Sciences and one of the lead researchers on the paper, said: "The DSYB gene is found in all the major phytoplankton groups that produce this environmentally important molecule. Also, because it is involved in such a critical step in the synthesis pathway, the regulation of the DSYB gene by environmental conditions is of great significance in determining how much DMSP is ultimately produced."

PhD student Beth Williams, who was also a major contributor to the research, added: "The discovery of the evolutionary link between bacterial and phytoplankton DSYB was both surprising and interesting, as it indicated that the ability to synthesise DMSP through this pathway originated in bacteria. This suggests that bacteria may play an even more important role in global DMSP synthesis, both historically and in the present day."

**More information:** Andrew R. J. Curson et al. DSYB catalyses the key step of dimethylsulfoniopropionate biosynthesis in many phytoplankton, *Nature Microbiology* (2018). DOI: 10.1038/s41564-018-0119-5

Provided by University of East Anglia