UNIVERSITY of MARYLAND BALTIMORE

- ANAEROBIC MICROBES
- MICRO-FLOW
- HYPOXIC ATMOSPHERE

A SOLID BUSINESS CASE IN COLLABORATION WITH
THE "UNIVERSITY OF MARYLAND BALTIMORE "

GENERAL INFORMATION ABOUT THE PROJECT

TARGET OF THE PROJECT:
Growing Strictly Anaerobic Microbes Under Microaerobic Conditions

DEPARTMENT:
University of Maryland Baltimore

HEAD OF PROJECT MANAGEMENT:
C. S. Raman

ROLE OF MCQ INSTRUMENTS:
To create and control specific hypoxic environments.

MORE INFORMATION ABOUT THE HEAD OF THE PROJECT

Opened in 1807, the University of Maryland, Baltimore (UMB) is Maryland's public health, law, and human services university, dedicated to excellence in education, research, clinical care, and public service.
The University of Maryland BioPark, Baltimore's biggest biotechnology cluster, fuels the commercialization of new drugs, treatments, and devices, giving 1,000 scientists and entrepreneurs the space to create and collaborate.

DESCRIPTION OF THE APPLICATION AND THE TARGET

Very little is known about how microbes harvest energy for long term survival in their native niches. Laboratory-based assessments of extreme energy stress in organisms, such as methane producing Archaea, are unimpressive when compared to deep-sea sediment microbes, which support cellular respiration rates of 1 e^- cell-1 sec-1. Surprisingly, recent studies have shown that oxygen (O_2) penetrates up to 75 m below the sea oor, suggesting that achieving anaerobiosis in the biosphere is rather difficult. That is, even the “strict” anaerobes cannot escape O_2 and must find ways to deal with it.

Until recently, the consensus has been that oxidative stress response systems protect these organisms from exposure to O_2. This paradigm was overturned by the finding that methanogens thriving in highly oxic conditions do not express O_2 detoxification genes. So, the question arises about why obligately anaerobic methanogens and their syntrophic partners (sulfate-reducing bacteria, SRB) encode cytochrome oxidases (COX), which are well known to be essential for the survival of O_2 respiring organisms. Consequently, the long-term goal of this project is to uncover extraordinary energy conservation mechanisms in the microbial world. In 1978, the classical view that SRB are obligate anaerobes was challenged by the discovery of these organisms in oxic environments. Although sulfate reduction is inhibited by O_2, several SRB were subsequently found to thrive in air. Over two decades ago, it was shown that SRB can mediate O_2 respiration and couple it to ATP production, but the ability of these organisms to reproducibly grow aerobically with O_2 as the terminal electron acceptor was only demonstrated in 2016 and again in 2018. Several SRB encode at least two COX systems. Whether these O_2 reductases conserve energy remains unknown. To answer this question, we are particularly interested in establishing laboratory conditions under which obligately anaerobic organisms can be cultured successfully in the presence of 0.01 - 1% O_2.

BENEFITS AND SAVINGS

COST SAVINGS: -30%

The effectiveness of our Gas Blenders reduces consistently the gas consumption of 30%

FLOW RATES: NO CUT-OFF

Our GB100 Series allows the University of Maryland to control the flow in all the calibration range, from 0,1 ml/min to 500 ml/min with NO cut-off.

TIME SAVINGS: -70%

Easier setup management of the hardware. Easier setup management of the software.

SOFTWARE AUTOMATION:

Thanks to our Software PRO Version and its option "Automatic Program", now the University of Maryland can bring forward experiments in automation.

SUCCESSFUL ACHIEVEMENT:

Setting an efficient environment which obligately anaerobic organisms to be cultured successfully in the presence of 0.01 - 1% O_2 and keeping it under control.

FLOW STABILITY:

Thanks to our revolutionary method every gas flow has a great stability making possible to have a stable flow also for lower flow-range.

READY TO TALK ABOUT YOUR SOLUTION?

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