UNIVERSITÉ Grenoble Alpes

- HYPOXA ATMOSPHERE
- RAPID OXYGEN VARIATION
- MICRO FLOW

A SOLID BUSINESS CASE IN COLLABORATION WITH
THE UNIVERSITE' GRENOBLE ALPES

GENERAL INFORMATION ABOUT THE PROJECT

TARGET OF THE PROJECT:
Intermittent hypoxia in cell culture

DEPARTMENT:
HP2 Laboratory

HEAD OF PROJECT MANAGEMENT:
Anne Briançon-Marjollet

ROLE OF MCQ INSTRUMENTS:
To deliver gas mixes to a cell culture setup, in order to obtain rapid variations of oxygen

MORE INFORMATION ABOUT THE COMPANY

Université Grenoble Alpes (UGA) is both firmly anchored at the local level and has a solid international reputation.
Its foundation stems from the aggregation of the former Université Grenoble Alpes and the most prestigious higher education and research institutions in Grenoble: Grenoble INP (School of Engineering), Sciences Po Grenoble (School of Political Science and Public Policy) and ENSAG (Grenoble School of Architecture)

DESCRIPTION OF THE APPLICATION AND THE TARGET

An innovative intermittent hypoxia model for cell cultures allowing fast PO2 oscillations with minimal gas consumption. Performing hypoxia reoxygenation cycles in cell culture with a cycle duration accurately reflecting what occurs in obstructive sleep apnea (OSA) patients is a difficult but crucial technical challenge. Our goal was to develop a novel device to expose multiple cell culture dishes to intermittent hypoxia (IH) cycles relevant to OSA with limited gas consumption. With gas flows as low as 200 ml/min, our combination of plate holders with gas-permeable cultureware generates rapid normoxia-hypoxia cycles. Cycles alternating 1 min at 20% O2 followed by 1 min at 2% O2 resulted in PO2 values ranging from 124 to 44 mmHg. Extending hypoxic and normoxic phases to 10 min allowed PO2 variations from 120 to 25 mmHg. The volume of culture medium or the presence of cells only modestly affected the PO2 variations. In contrast, the nadir of the hypoxia phase increased when measured at different heights above the membrane. We validated the physiological relevance of this model by showing that hypoxia inducible factor-1 expression was significantly increased by IH exposure in human aortic endothelial cells, murine breast carcinoma (4T1) cells as well as in a blood-brain barrier model (2.5-, 1.5-, and 6-fold increases, respectively). In conclusion, we have established a new device to perform rapid intermittent hypoxia cycles in cell cultures, with minimal gas consumption and the possibility to expose several culture dishes simultaneously. This device will allow functional studies of the consequences of IH and deciphering of the molecular biology of IH at the cellular level using oxygen cycles that are clinically relevant to OSA.

Scientific paper: https://journals.physiology.org/doi/full/10.1152/ajpcell.00098.2017

BENEFITS AND SAVINGS

We use the gas blenders to deliver gas mixes to a cell culture setup, in order to obtain rapid variations of oxygen (between 1 and 21%, changing every few minutes). We have air, N2 and CO2 inputs. The gas mix is delivered underneath cell culture plates that havea gas-permeable bottom, thus enabling rapid oxygen changes at the cell level.

COST SAVINGS: -30%

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

MICRO FLOW RATES: NO CUT-OFF

Our GB100 Series allows the University Grenoble Alpes 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 Grenoble Alpes can bring forward experiments in automation,

SUCCESSFUL ACHIEVEMENT:

Obtaining rapid variations of oxygen (between 1 and 21%), changing every few minutes. The gas mix is delivered underneath cell culture plates that have a gas-permeable bottom, thus enabling rapid oxygen changes at the cell level.

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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