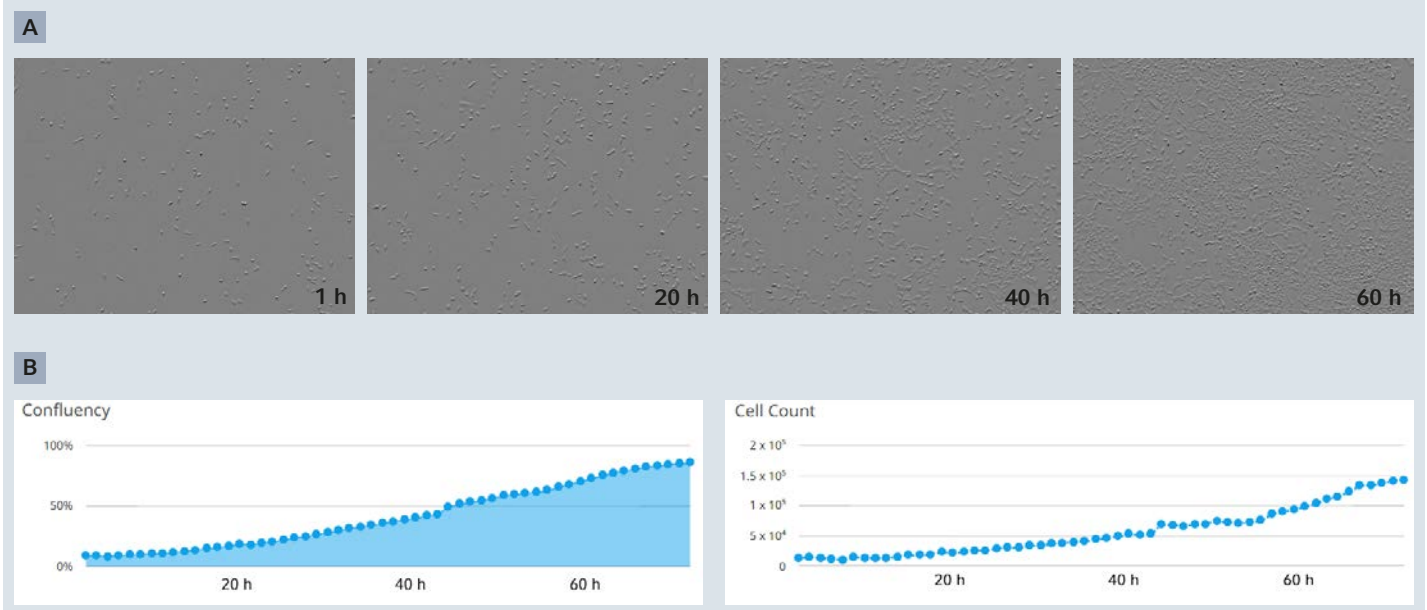
Remote and quantitative cell culture monitoring: Vero cells

Performance of Olympus Provi™ CM20 incubation monitoring system in the CellXpert® C170i CO_2 incubator

Introduction & Aim: Systems for remote monitoring of confluency and cell count can significantly reduce efforts in cell culture. As CO_2 incubators are thermally insulated and typically do not have active cooling, additional heat introduced by monitoring devices may interfere with the CO_2 incubators temperature control. Furthermore, the size of the device may interfere with the airflow. Both factors can lead to a higher risk of condensation and temperature control failure. Therefore, it is recommended to test the combination of systems to ensure optimal performance.

Procedure: Vero cells were seeded in appropriate culture medium (RPMI 1640, 10 % FBS). Two cell culture vessels were placed each on one Provi™ CM20 incubation monitor head, installed in the CellXpert C170i CO_2 incubator from Eppendorf in a room at a temperature of 21.2 °C. Cells were incubated at 37 °C and 5 % CO_2. Cell growth was monitored for approximately 60 hours after seeding. CO_2 concentration and temperature homogeneity were simultaneously documented. The temperature homogeneity in the CO_2 incubator was measured by external probes at 27 measuring points distributed on the top, middle, and bottom shelf according to DIN 12880:2007-05 standard.



Representative microscopic images of Vero cells (A) scanned regularly with the CM20 system during the incubation period to determine confluency and number of cells (B).

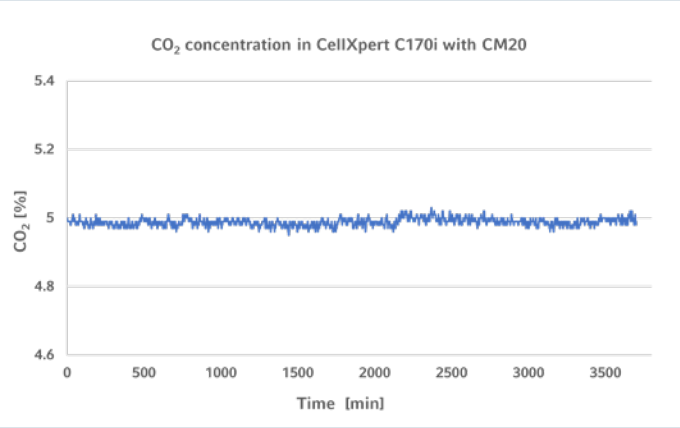
Results: The two monitoring heads did not reduce the specified temperature homogeneity of ±0.3 °C (at 37 °C) inside the CellXpert C170i incubator. Furthermore, neither interference with CO_2 control nor condensation due to airflow interference was detected.

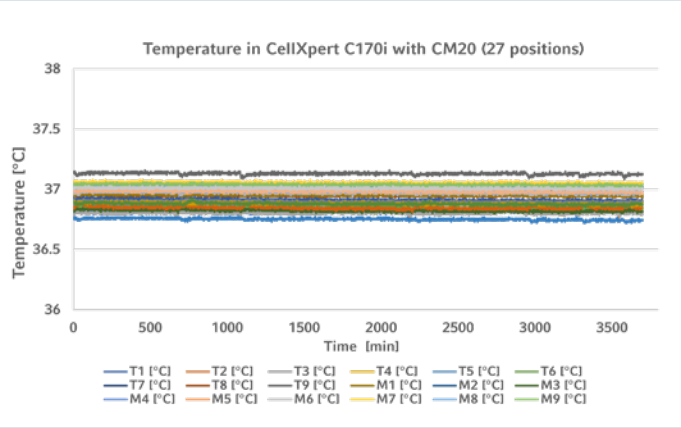
Conclusion: Here, we have shown the compatibility of two Olympus Provi™ CM20 incubation monitoring systems operating inside the CellXpert C170i CO_2 incubator from Eppendorf. Thus, this setup ensures equal growth conditions for cells at different locations inside the CO_2 incubator, even on the top shelf (fanless design). It also proves comparability of growth conditions between experiments performed with the CellXpert C170i with vs. without the use of the Olympus Provi™ CM20 system.

Average temperature measured at 27 positions (DIN 12880)

Top shelf	T7	T8	T9
	36.98	36.95	37.13
	T4	T5	T6
	36.88	36.88	36.85
	T1	T2	T3
	36.81	36.84	36.80
Mid shelf	M7	M8	M9
	37.06	37.01	37.04
	M4	M5	M6
	37.03	36.98	36.97
	M1	M2	M3
	36.95	36.90	36.82
Bottom shelf	B7	B8	B9
	36.98	36.98	37.01
	B4	B5	B6
	36.88	36.75	36.88
	B1	B2	B3
	36.91	36.85	36.90

Setup of the CellXpert C170i with 27 external temperature probes according to DIN 12880 to monitor the chamber temperature.





The set CO_2 as well as temperature parameters and their homogeneity are maintained throughout the experimental incubation period.

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