biosensors

MDPI

Article

Supplementary Material File - Using Rapid Prototyping to Develop a Cell-Based Platform with Electrical Impedance Sensor Membranes for In Vitro RPMI2650 Nasal Nanotoxicology Monitoring

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1. Content. Figure S1; Figure S2; Figure S3; Figure S4; Figure S5; Table S1

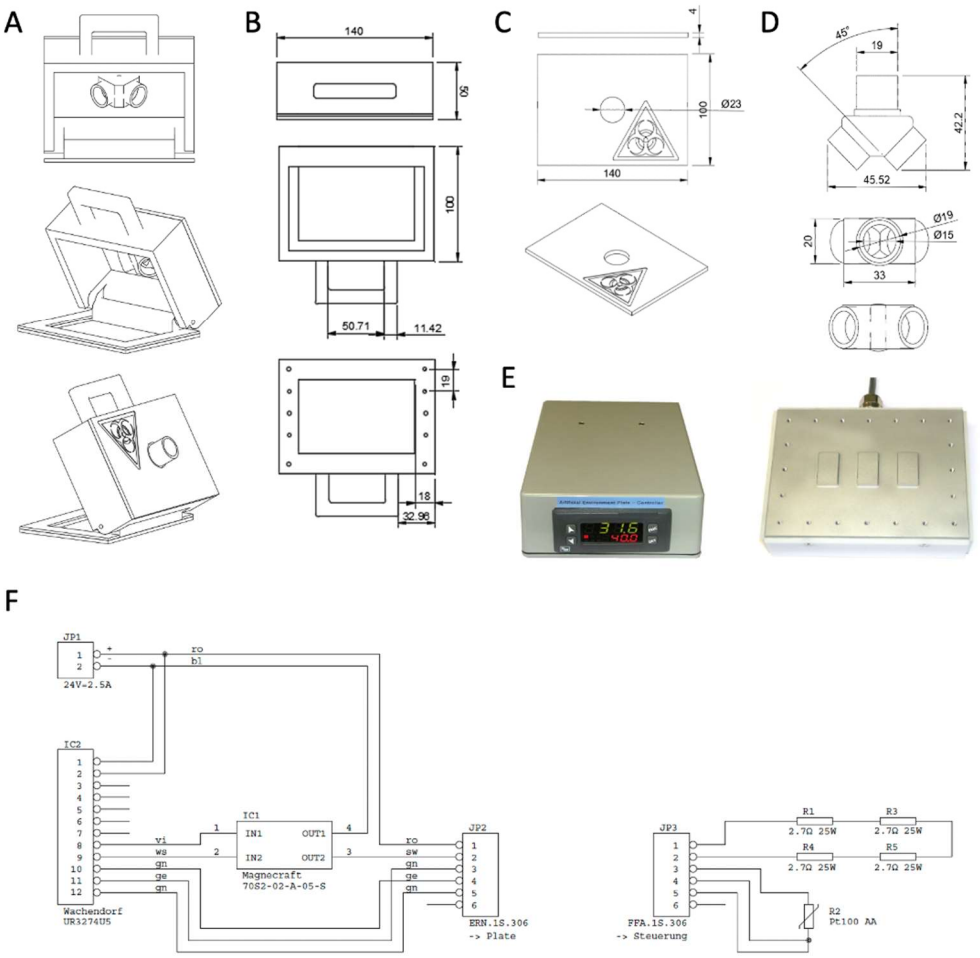

Figure S1. A) Technical drawings of A-C) the platform cover, and D) the bifurcated top inlet for humification. E) Images of the external control unit and the heating base plate of the platform with F) circuit drawings of the resistive heating approach.

Table S1. Environmental control platform specifications.

Maximum	
Voltage/current	24 V/ max. 2.5A
Heating capacity	50W
Heating velocity	4.4°C/min
Heating temperature	90°C
Stability	±0.03°C (t=3 h)

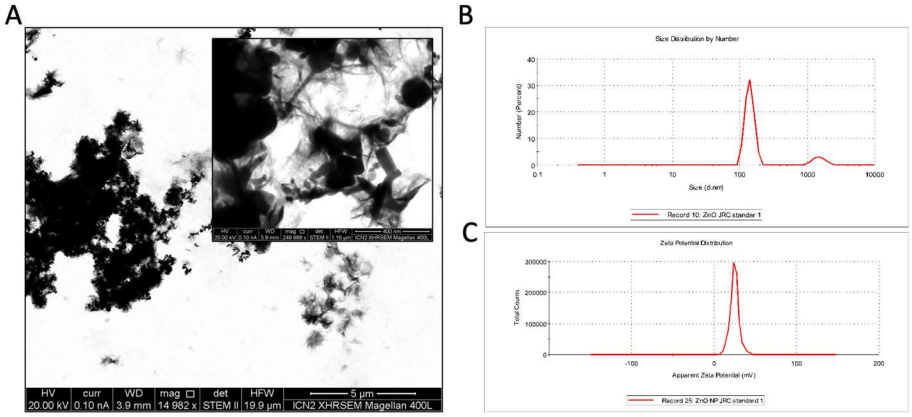

Figure S2. Characterization of the zinc oxide reference nanoparticles NM62101a of the JRC nanomaterial repository including **A)** transmission electron microscopy, **B)** dynamic light scattering (DLS) analysis and **C)** zeta potential analysis dispersed at a concentration of 8mg/mL in Milli-Q water.

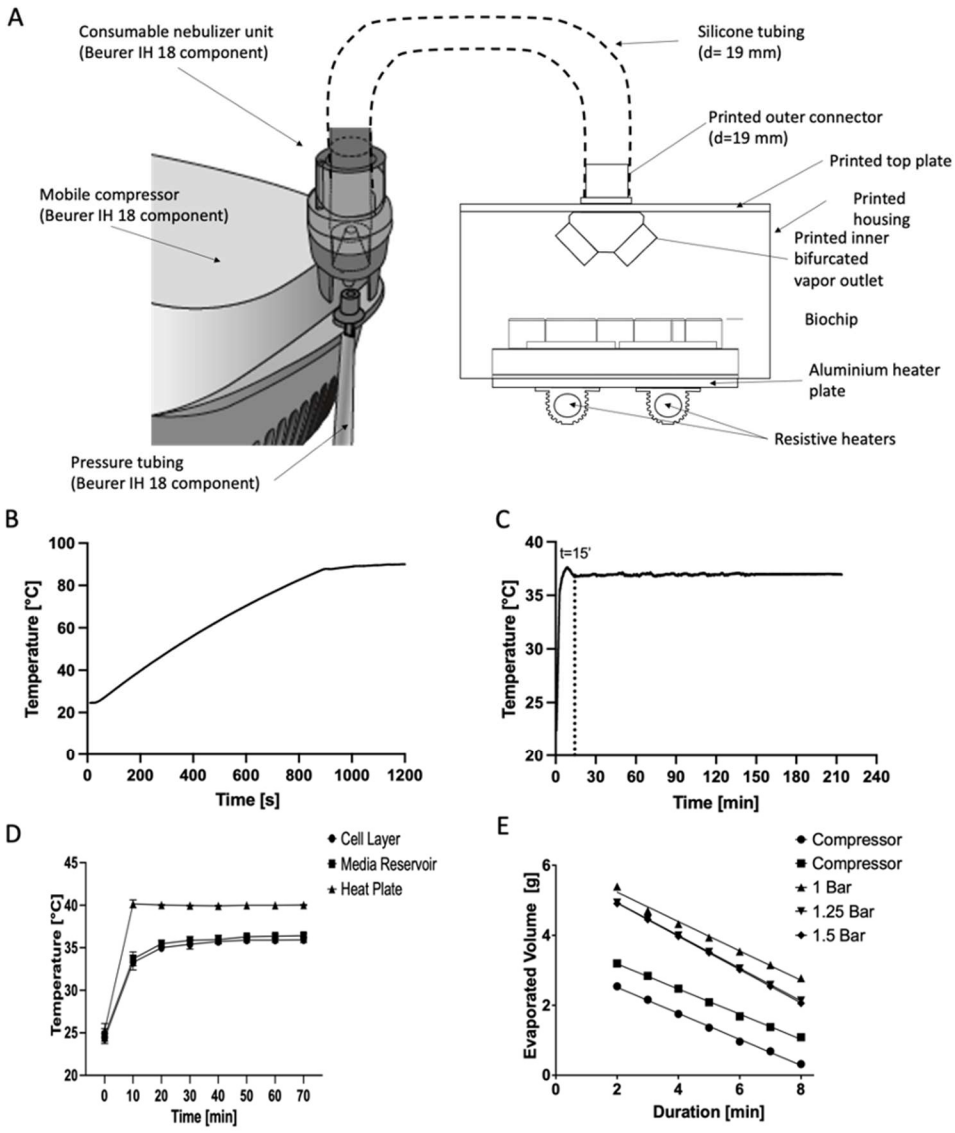

Figure S3. A) Overall concept of the physical humidification of the top part and the temperature control of the bottom part of the environmental control platform with **B)** maximal heating speed, **C)** transient behavior of the resistive heater setup, and, **D)** offset temperatures between the bottom

heat plate and the medium filled baso-lateral medium reservoir and apical side of the electrode membrane for cell adhesion. **E)** Evaporation volume analysis of the chamber humidification strategy by physical nebulizing between the modular commercially available compressor unit of the Beurer IH18 setup compared to an in-house wall-mounted pressure line.

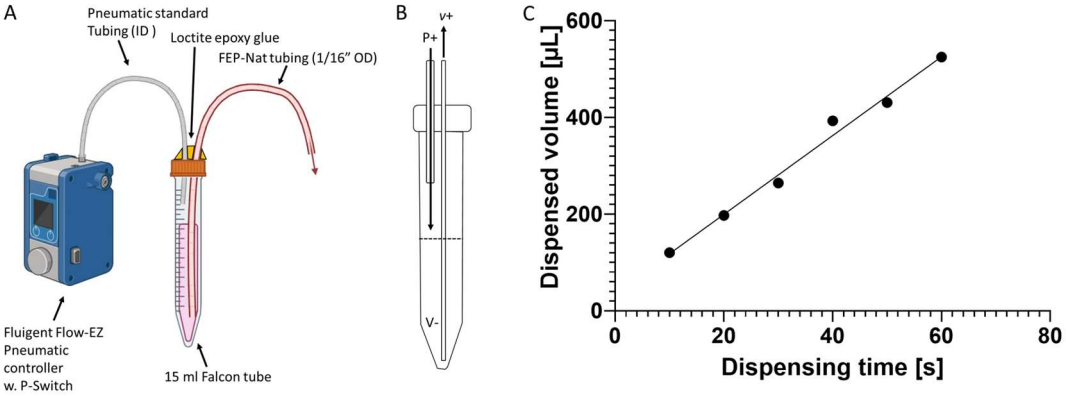

Figure S4. (A) Schematic drawing and cross-section view (B) of the micro-dispenser and (C) the characterization of the dispensed volume over time.

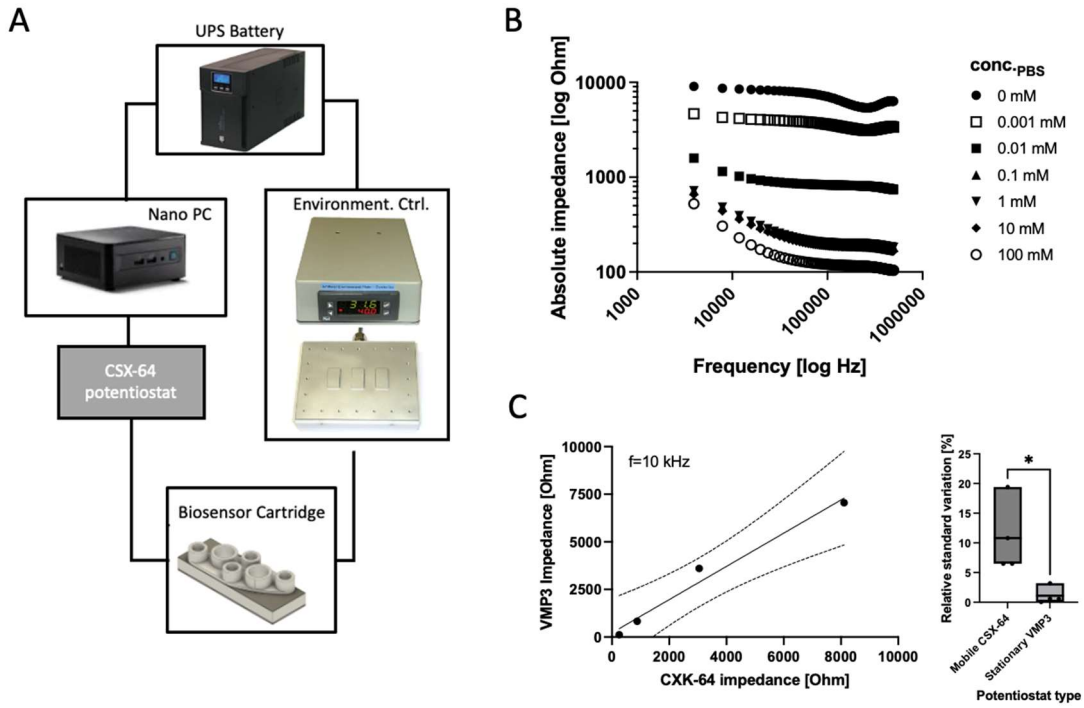

Figure S5. (A) Schematic drawing of the mobile stand-alone biosensing setup comprising an uninterruptible power supply (USP), a nano-PC, a mobile CSX-64 multi-channel impedance module, the environmental control base platform, and the prototyped cell-based biosensor platform. (B, C) Frequency behaviour and comparative sensor response of the VMP3 potentiostat and the CSX-64 potentiostat module for increasing PBS concentrations between 0 and 10 mM with analysis of the relative standard deviation of the respective impedance read-outs (unpaired t-test, n=4 readings).