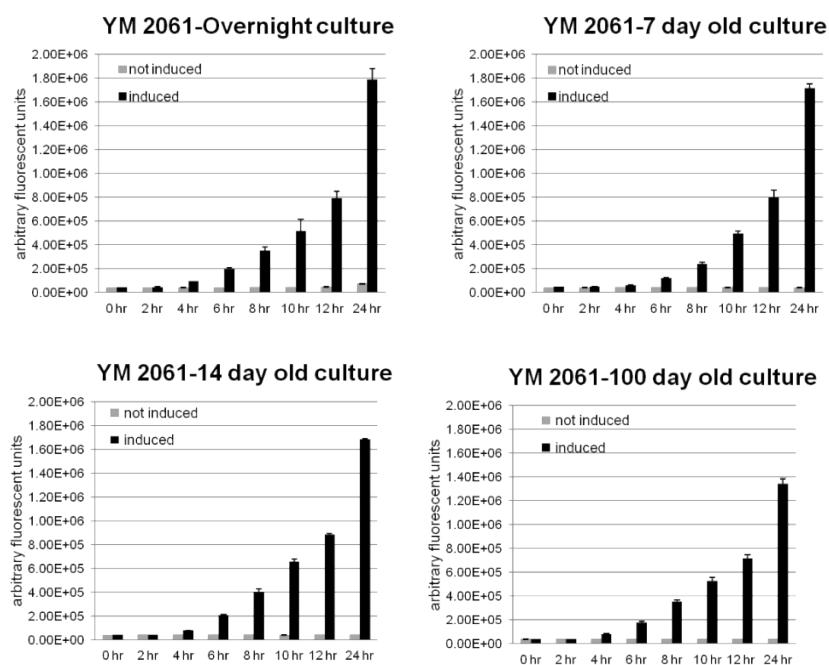


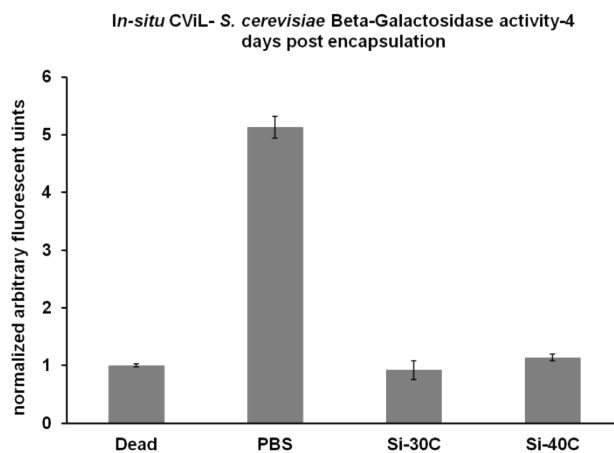
## Sol-Generating Chemical Vapor into Liquid (SG-CViL) Deposition- A Facile Method for Encapsulation of Diverse Cell Types in Silica Matrices

Robert Johnston<sup>1</sup>, Snezna Rogelj<sup>2</sup>, Jason C. Harper<sup>3</sup>, Michaelann Tartis<sup>1&4</sup>

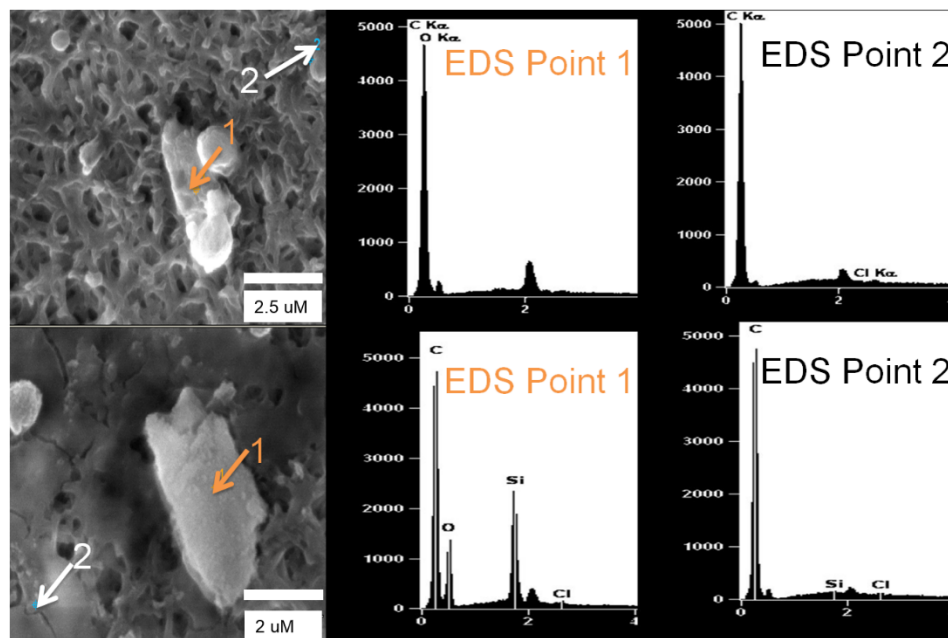
### SUPPLEMENTARY INFORMATION



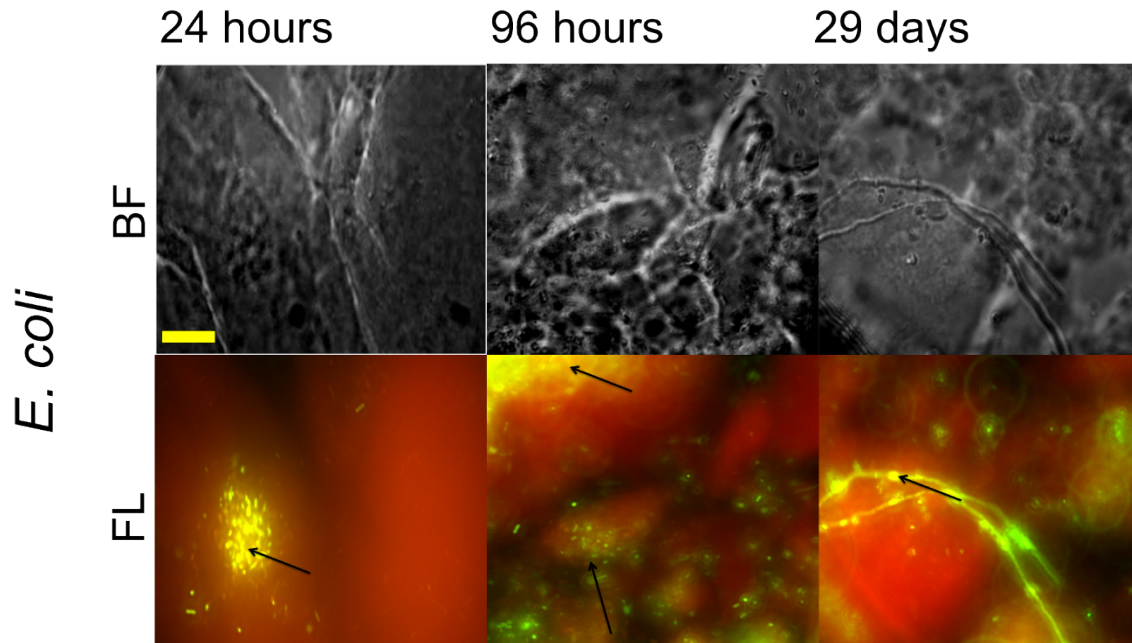
**Figure S1.** YM 2061 beta-gal induction time course. YM 2061 cells from overnight, 7 day, 14 day, and 100 day old cultures were exposed to galactose for 0, 2, 4, 6, 8, 10, 12, and 24 hours.



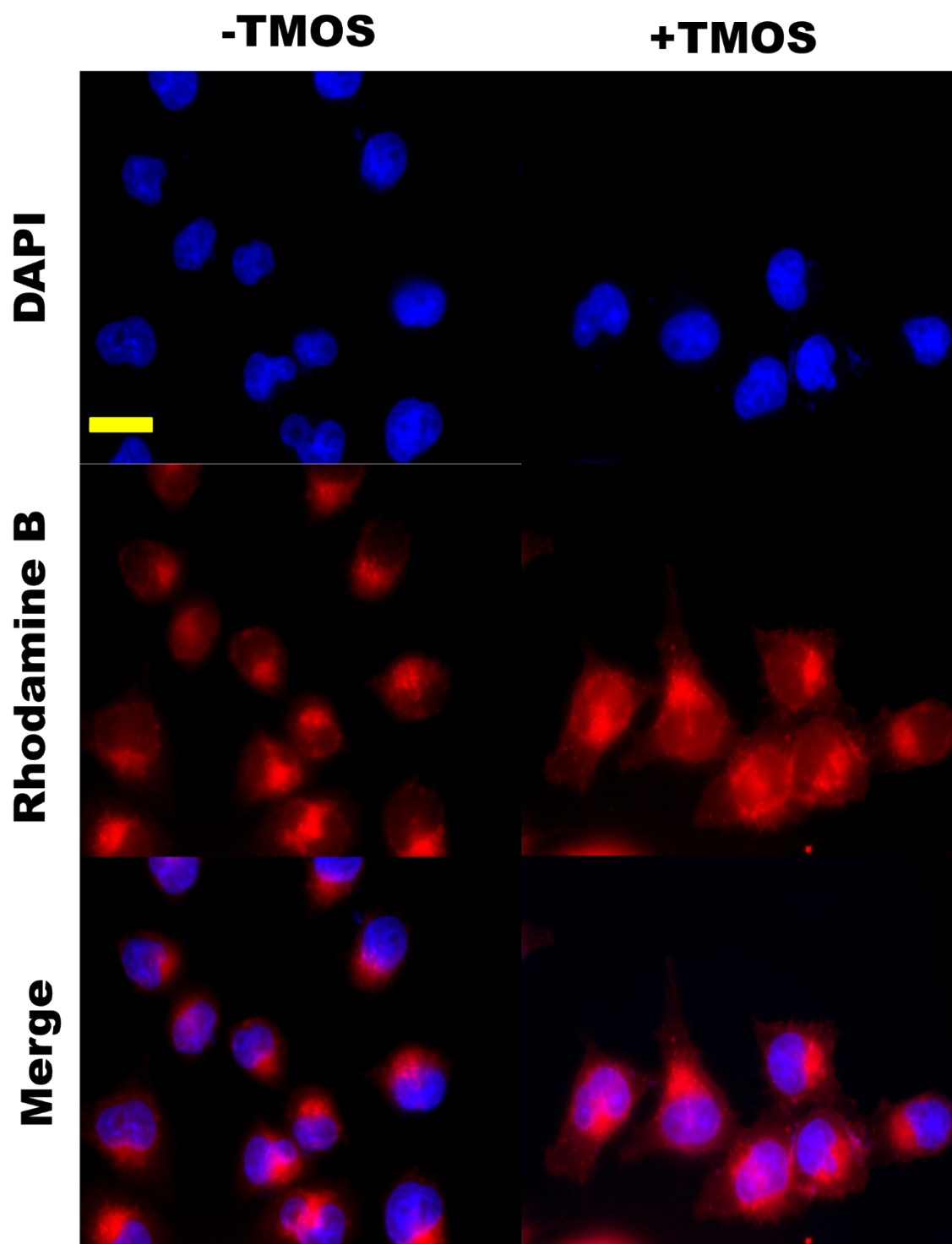
**Figure S2.** Responsiveness of *S. cerevisiae* encapsulated in silica via *in-situ* CViL. Cells encapsulated at either 30°C or 40°C show beta-galactosidase activity similar to that of dead cells, indicating cells are incapable of protein transcription and translation, or are non-viable.



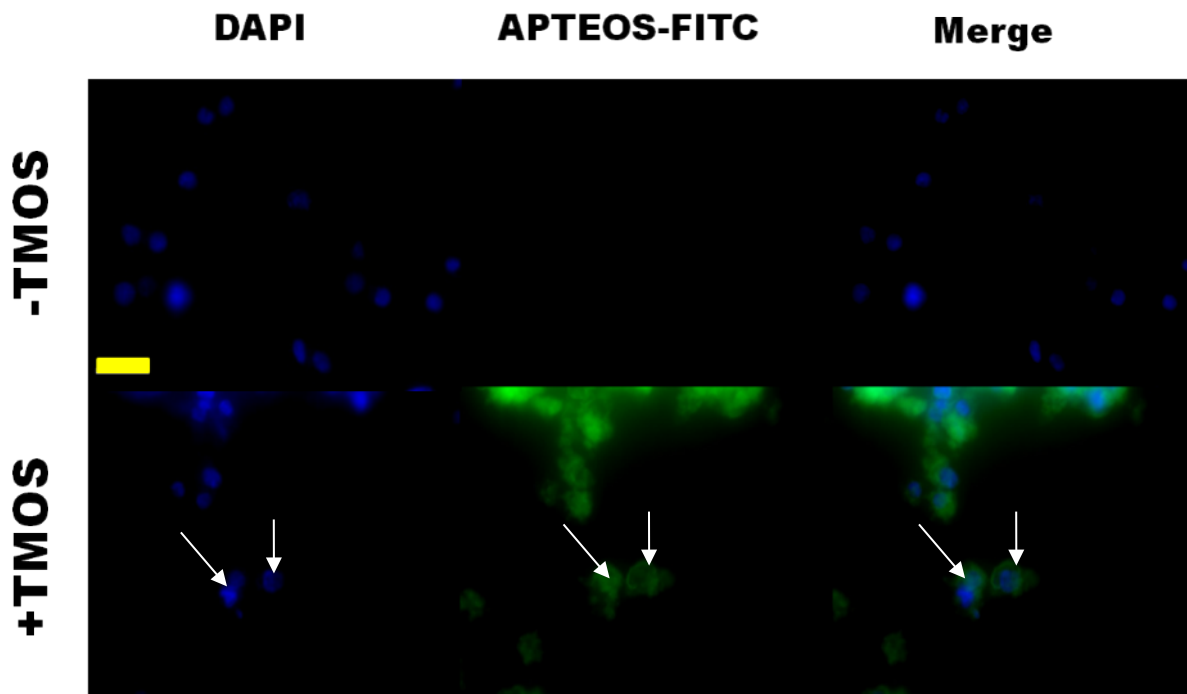
**Figure S3.** SEM-EDS of SG-CViL treated *E. coli* cells. Top panel: PBS control; Bottom panel: *E. coli* SG-CViL-40°C. EDS spectra from samples were obtained from two different points. EDS point 1 (orange arrow) in each image corresponds to cells. Point 2 (white arrows) corresponds to background. Silicon peaks are present at EDS point 1 and 2 for *E. coli* SG-CViL-40°C and are absent in PBS control samples, indicating silica species generated during SG-CViL associates with cells.



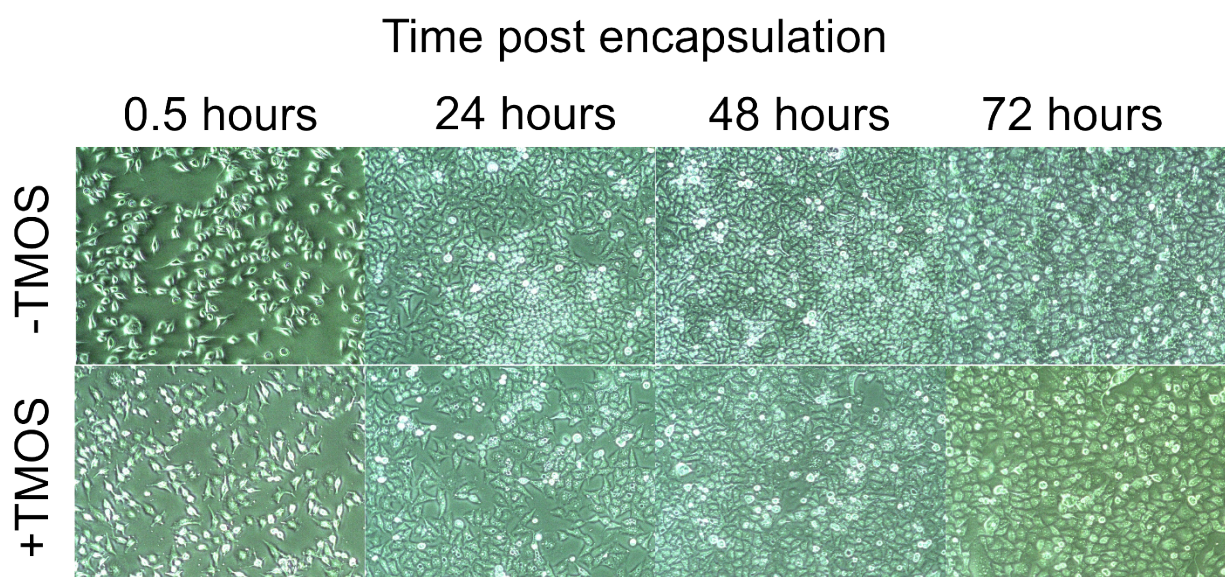
**Figure S4.** Viability staining of encapsulated *E. coli* 24 hours, 96 hours, and 29 days post encapsulation. Cells emitting green fluorescence are considered viable; yellow and red emitting cells are considered non-viable. All images were taken at the same magnification. Scale bar = 20 microns. *E. coli* cells are  $57 \pm 10\%$  viable 24 hours post encapsulation and are  $47 \pm 7\%$  viable 29 days post encapsulation



**Figure S5.** Silica deposition on HeLa cells using SG-CViL. HeLa cells were stained with the DNA binding dye, DAPI (blue fluorescence), and mixed with SG-CViL solution (+TMOS) or PBS (-TMOS) containing Rhodamine B. Cells exposed to TMOS show a slight increase in surface staining when compared with cells exposed to PBS (-TMOS), suggesting that silica species are associating with cells in a somewhat conformal manner. However, this staining is uneven. Images in each image set taken at same magnification and exposure settings. Scale bar = 20 microns.

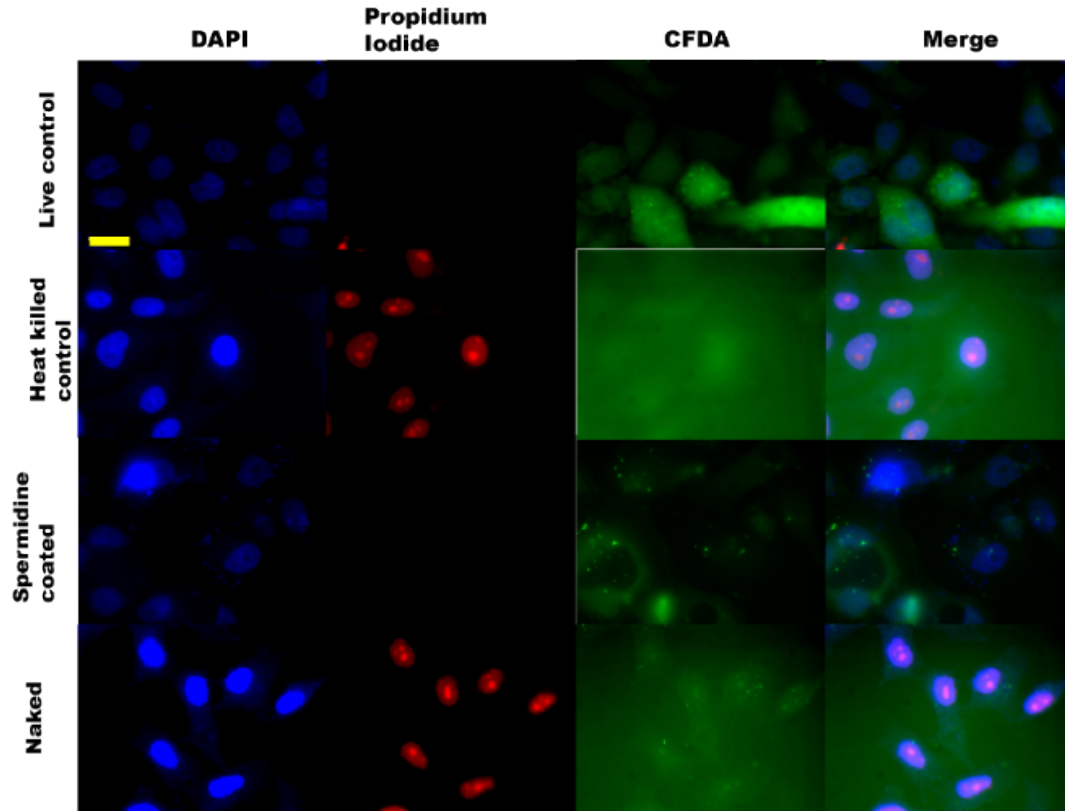


**Figure S6.** Encapsulation of Jurkat cells using SG-CViL. Jurkat cells were stained with the DNA binding dye DAPI (blue fluorescence), washed with spermidine, mixed with SG-CViL silica sol (15 min CViL, 40°C) for 5 min at 40°C under agitation and exposed to APTEOS-FITC. Cells exposed to TMOS are enveloped in a thin silica layer (green fluorescence, white arrows) whereas cells not exposed to TMOS show no silica presence. All images taken at same magnification. Scale bar=20 microns



**Figure S7.** Viability analysis of silica encapsulated HeLa. HeLa cells were incubated with spermidine, washed, and exposed to either SG-CViL solution (+TMOS) or PBS control solution (-TMOS) for 10 min. Cells were washed with PBS and returned to culture conditions after addition of 3 mL culture media to plates. Cells were visualized 0.5, 24, 48, and 72 hours post encapsulation using a phase contrast microscope and 10X objective. SG-CViL exposed cells show minimal signs of cell death (i.e. detachment of cells from the plate) and similar morphology to cell exposed to PBS, indicating encapsulation using SG-CViL does not lead to cell death.





**Figure S8.** Examination of membrane integrity and enzymatic activity of HeLa cells encapsulated with and without a spermidine coat. CFDA/PI staining was used To assess the enzymatic activity and membrane integrity of HeLa which were or were not coated with spermidine and then exposed to SG-CViL silica generated by depositing TMOS for 1 hour. Images show that 48 hours post encapsulation, HeLa which are coated with spermidine and then exposed to silica sol show staining similar to cultured cells (live control) due to enzymatic activity contained within cells (green fluorescence) as well as preservation of nuclear integrity (blue fluorescence) and membrane integrity as cells are Propidium Iodide negative (lack of red staining). In contrast, cells which are encapsulated without a spermidine coat (naked cells) show staining similar to heat killed controls by the presence of diffuse enzymatic activity, being PI positive, and showing DAPI staining throughout the cell body, suggesting slight loss of nuclear integrity.