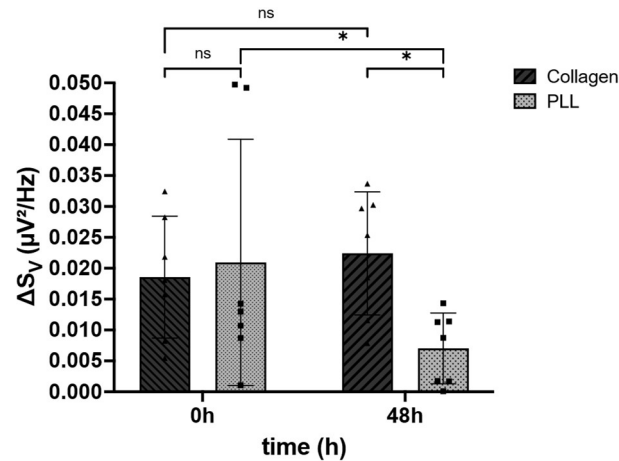


## Supplementary Material

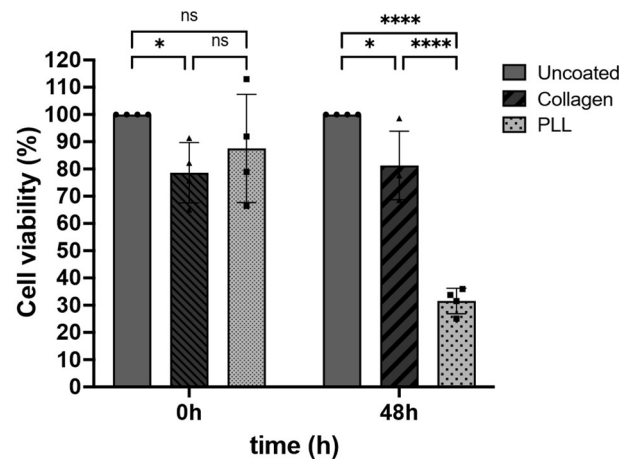
### 1 Assessment of cell proliferation on coated substrates

#### 1.1 Non-constant cell adhesion noise for cells on different coatings



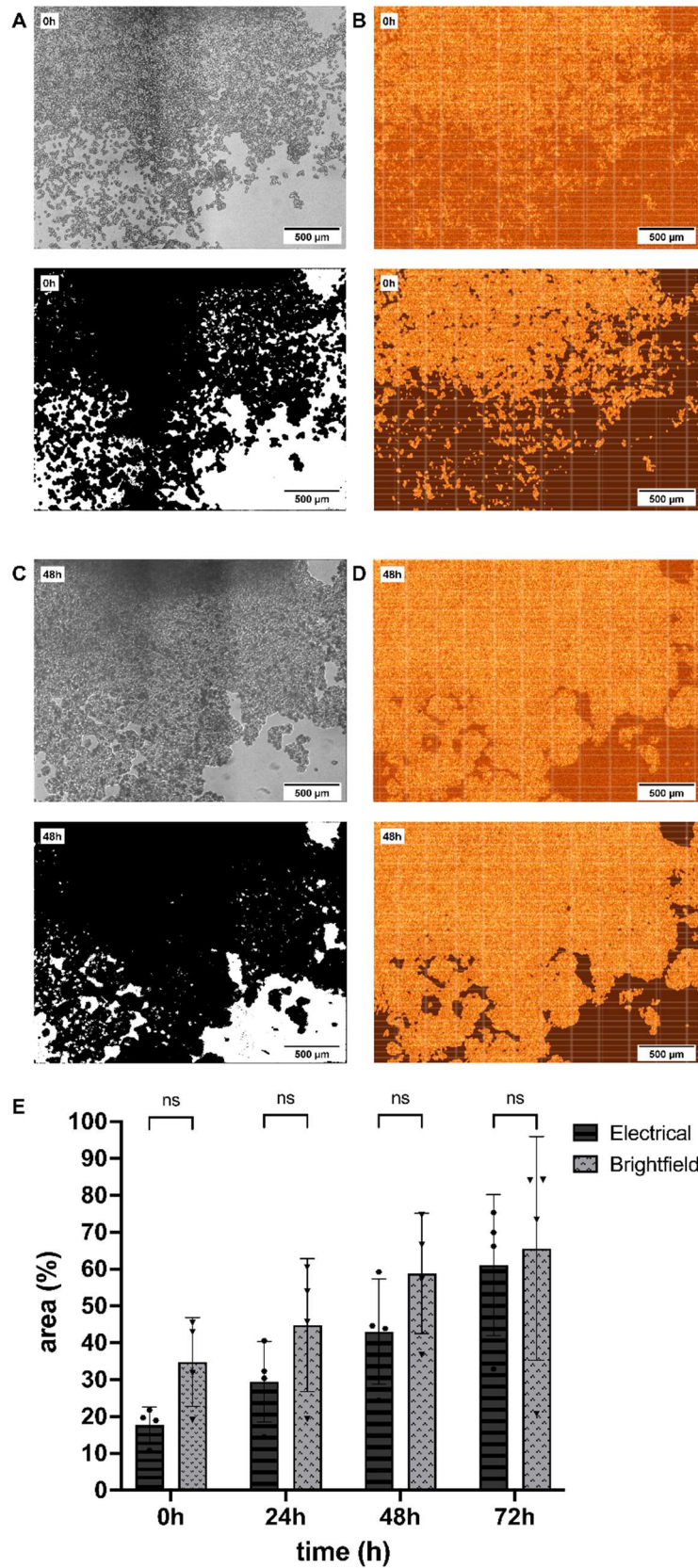
**Supplementary Figure S1.** Stable cell adhesion noise  $\Delta S_V$  of HT-29 cells for collagen-I-coated CMOS microelectrode arrays (MEAs) and non-constant  $\Delta S_V$  for cells on PLL-coated MEAs. Statistics: Two-way ANOVA,  $n=7$ . Statistical significance via asterisks: ns, not significant. \*,  $P \leq 0.05$ .

#### 1.2 Cell viability for different substrate coatings



**Supplementary Figure S2.** Statistical analysis of CCK-8-based cell viability and OD of uncoated, collagen-, and PLL-coated 96-well plates. Cells in uncoated 96-well plates served as control group. Statistical significance via asterisks: ns, not significant. \*,  $P \leq 0.05$ . \*\*,  $P \leq 0.01$ . \*\*\*,  $P \leq 0.001$ . \*\*\*\*,  $P \leq 0.0001$ .

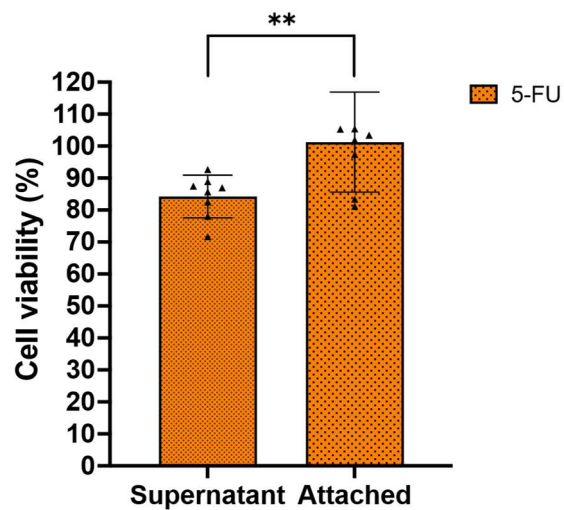
### 1.3 Cell segmentation of microscopy images aligns with segmentation of electrical images



**Supplementary Figure S3:** Cell segmentation of brightfield (BF) microscopy images via Fiji matches the results of Python-segmented electrical images for untreated cells. **(A)** BF microscopy image (A-i) and Fiji-based cell segmentation of microscopic image (A-ii) on collagen-coated microelectrode array (MEA) at 0 h culture time. **(B)** Electrical image via cell adhesion noise (CAN) spectroscopy (B-i) and Python-based cell segmentation (B-ii); same sample as in (A). **(C)** Same as in (A) at 48 h culture time. **(D)** Same as in (B) at 48 h culture time. **(E)** Statistical comparison of the cell-covered area between Fiji-based cell segmentation of BF images and Python-based segmentation of electrical images. Statistical significance via asterisks: ns, not significant.

## 2 Assessing the effect of the chemotherapeutic drug 5-FU on cell adhesion

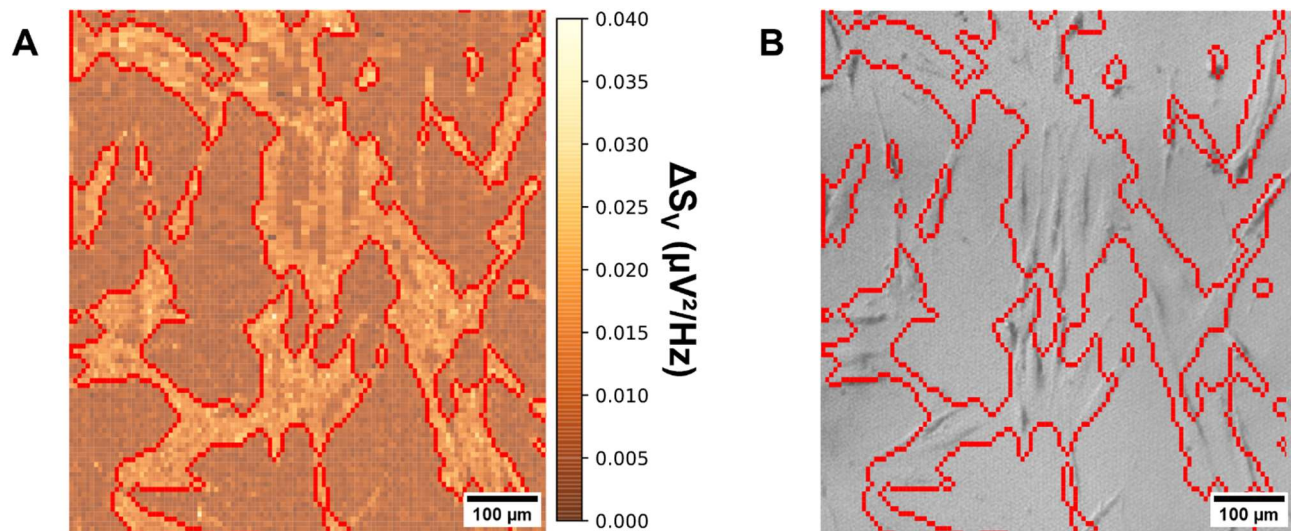
### 2.1 Longterm analysis of early apoptosis



**Supplementary Figure S4:** Cell viability from CASY recordings of HT-29 cells in the supernatant and on the chip after 5 days (120 h) of treatment with 5-FU. Statistics: paired t-test. Statistical significance is indicated by asterisks ( $n_{\text{HT-29}}=4$ ,  $n_{\text{HDF}}=4$ , ns, not significant. \*,  $P \leq 0.05$ . \*\*,  $P \leq 0.01$ ).

### 3 Discussion

#### 3.1 Electrical imaging of non-electrogenic cells with subcellular resolution



**Supplementary Figure S5:** Cell segmentation of electrical images via Python for untreated human dermal fibroblasts (HDFs). **(A)** Raw electrical imaging data overlaid with electrically detected cells (red contours). Background noise: brown, cell adhesion noise ( $\Delta S_V$ ): orange. **(B)** Brightfield microscopy image overlaid with electrically detected cells (red contours).