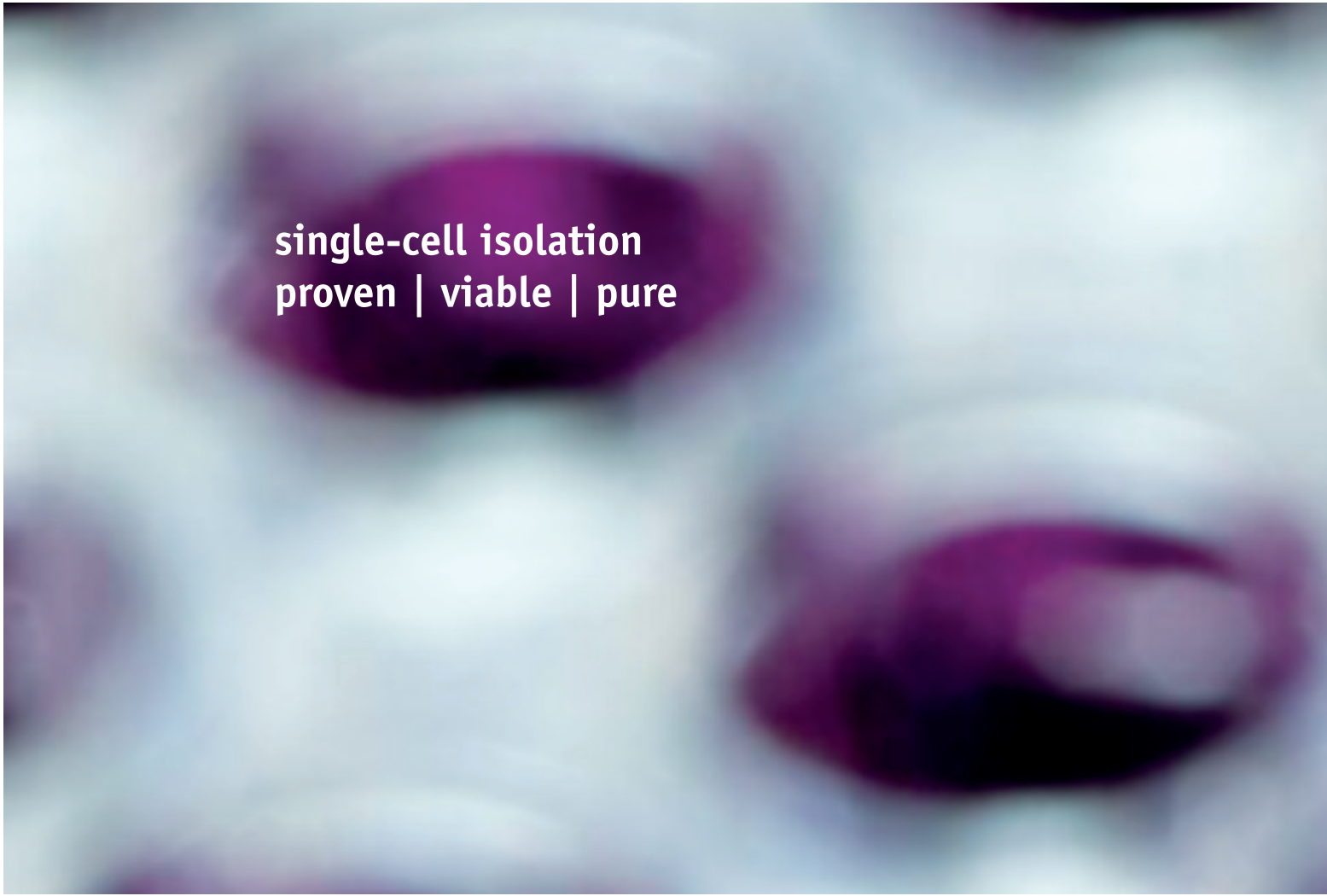
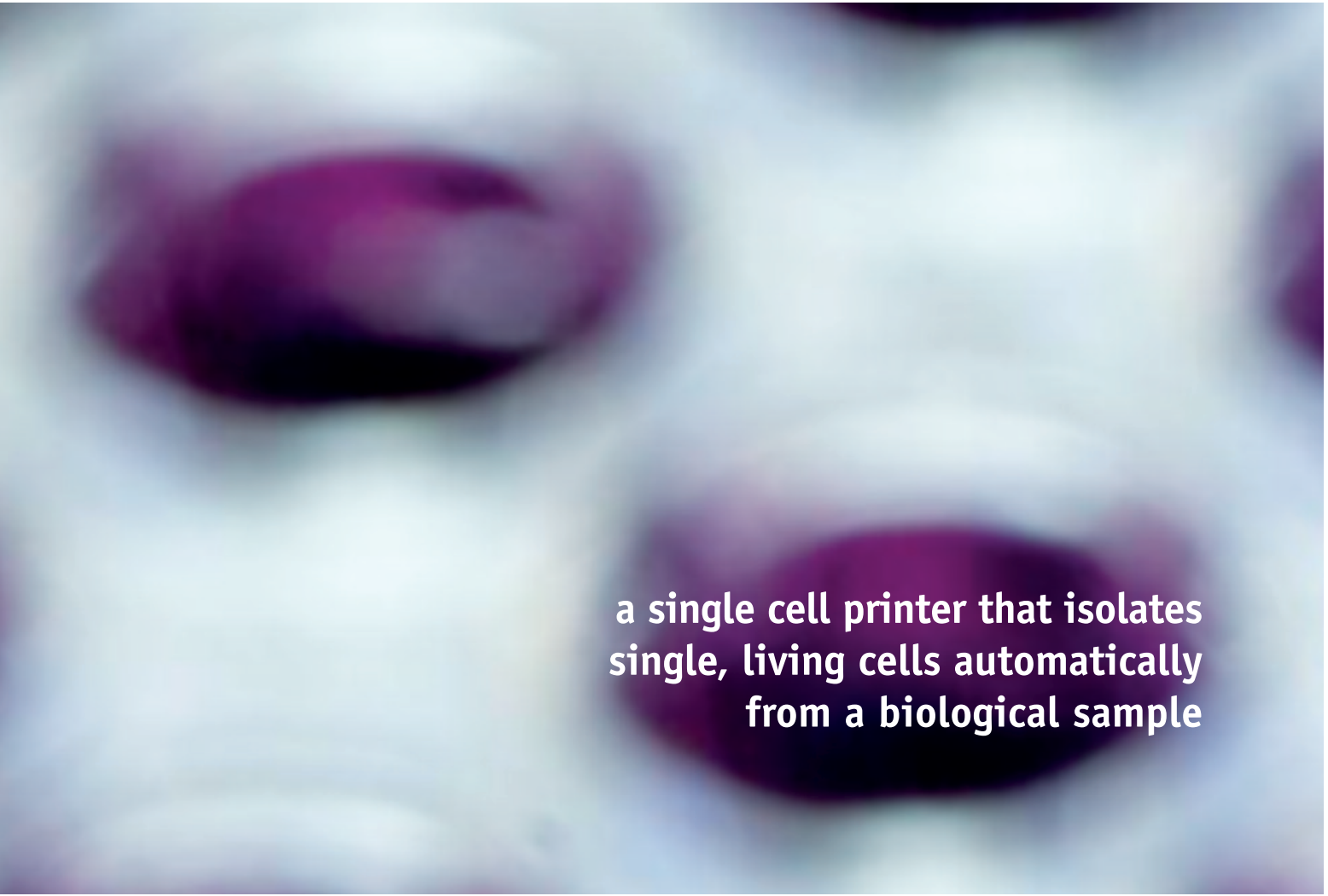
cytena

single cells on demand


single-cell isolation
proven | viable | pure


a single cell printer that isolates
single, living cells automatically
from a biological sample

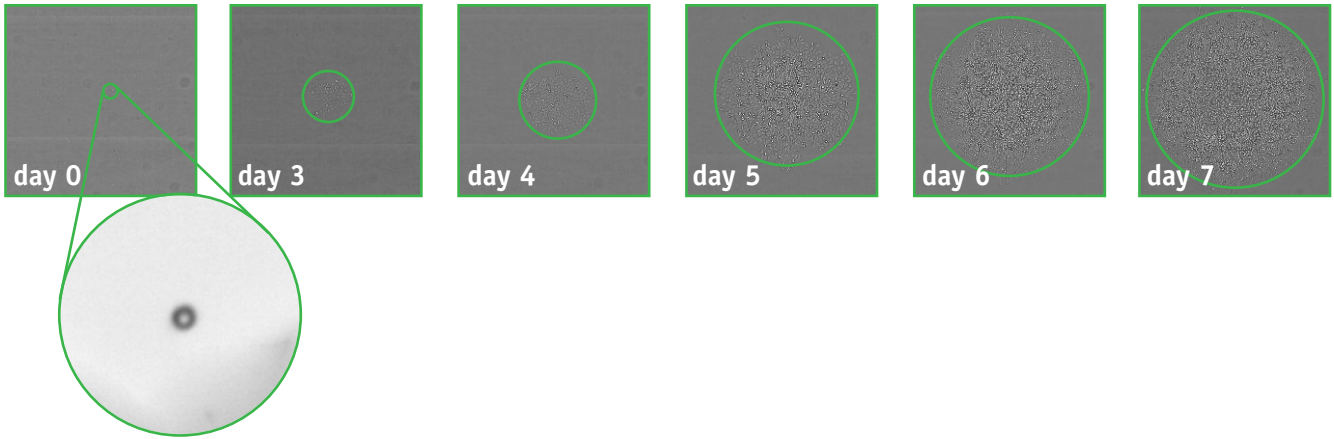
cell line development

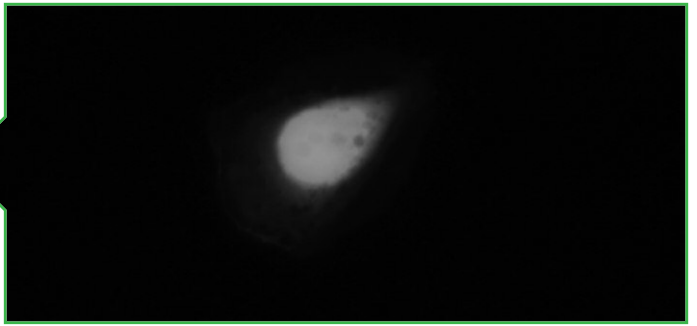
Clonal cell line development is a crucial step in various applications including generating biopharmaceuticals (eg. monoclonal antibodies). Current workflows in cell line development have major drawbacks such as missing proof of clonality, inefficient single-cell isolation and reduced cell viability.

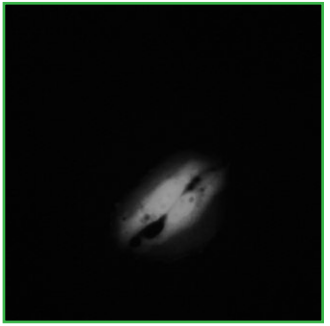
The single-cell printer technology offers documented proof of clonality and provides efficient and fast single-cell seeding combined with excellent cell viability and zero risk of cross-contamination.

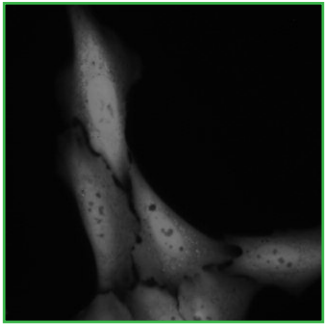
The single-cell printer supports SLAS/SBS format 96-well and 384-well plates. A great variety of typical cell lines used in cell line development such as CHO-K1, HEK 293, L929 can be processed.

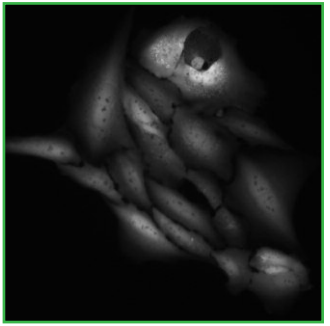
Discover the single-cell printer technology for your clonal cell line application.

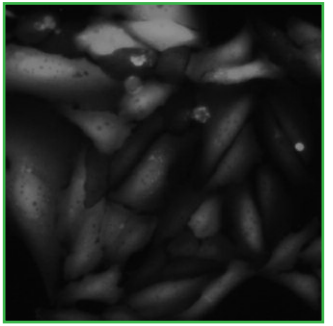












single-cell genomics

The isolation of single cells remains a challenging task in single-cell genomics. Current methods lack the evidence that only a single-cell has been isolated in the analysis vessel. It is important that the integrity of the cells is maintained prior to their lysis in order to preserve their DNA.

Furthermore, cells should undergo as little stress as possible prior to their lysis in order to preserve their RNA and its expression level. The single-cell printer deposits single cells in a very gentle manner, guaranteeing high purity and high viability.

This provides optimal basis for downstream single-cell genomic analysis.

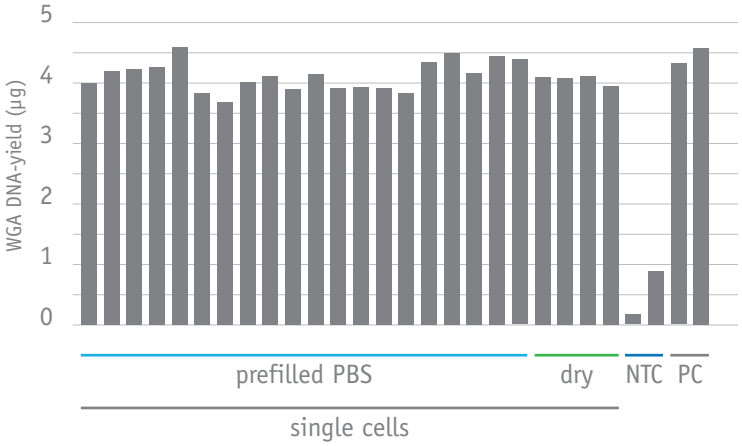
workflow

Single cells of the osteosarcoma cell line U2OS were printed in wells of a 384-well microtiter plate, preloaded with 1 µl PBS. Additional cells were printed in dry wells resulting in a total single-cell printing efficiency of 98%.

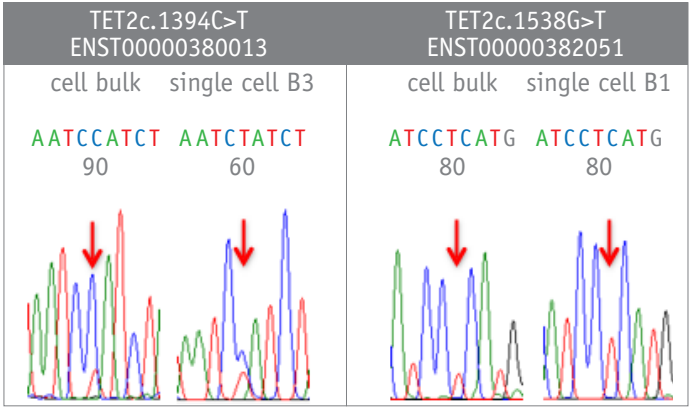
Whole genome amplification (WGA) was performed on the cells and comparable DNA yields were achieved for dry and PBS wells.
The WGA DNA was evaluated by a multiplex PCR on repetitive LINE1 transposons, which revealed positive results in all WGA samples.

In addition, U2OS-specific mutations in SLC34A2 (c.1538G>T), and in TET2 (c.1394C>T) were detected in representative WGA samples of single cells printed in PBS.

whole genome amplification



mutational analysis by sequencing



the single-cell printer: proven | viable | pure

The patented single-cell printing technology, developed by cytena, enables fully automated isolation of single cells into standard microwell plate formats. The instrument uses an inkjet-like principle featuring a disposable, one-way printing cartridge.

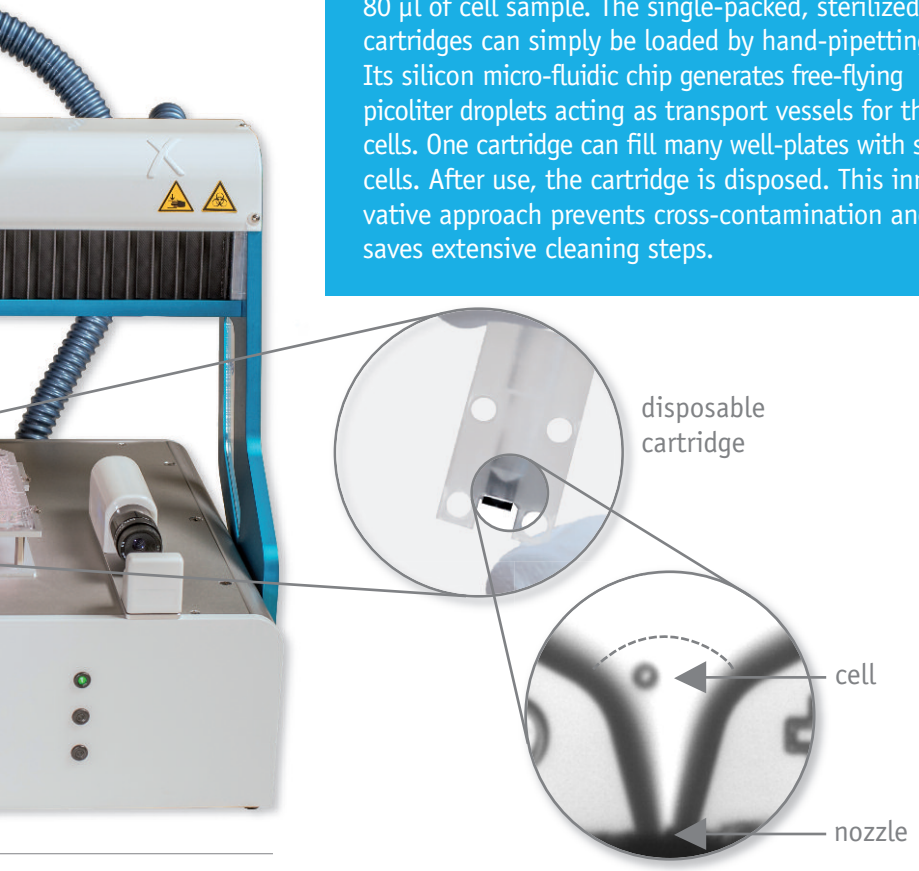
The cell sample is pipetted into the cartridge and an external actuator is used to eject droplets out of it. The integrated optical sensor allows for determination of cell number in each droplet. A fast shutter mechanism sorts the droplets containing exactly one single-cell into the substrate. Unwanted droplets are deflected into waste.

single-cell printer

cytena's single-cell printer is a benchtop size, automated laboratory instrument. Thanks to its intuitive and user-friendly software, it can be easily operated by each lab member without requiring special skills. The instrument setup time is less than 10 minutes. Filling e.g. a 96-well plate with single cells takes a few minutes only.

printing cartridge

cytena's disposable, one-way cartridge takes up to 80 µl of cell sample. The single-packed, sterilized cartridges can simply be loaded by hand-pipetting. Its silicon micro-fluidic chip generates free-flying picoliter droplets acting as transport vessels for the cells. One cartridge can fill many well-plates with single cells. After use, the cartridge is disposed. This innovative approach prevents cross-contamination and saves extensive cleaning steps.



proven

An image sequence for each single cell can be used as proof of clonality. The images are assigned to the well of the specific cell and stored on a hard-drive.

viable

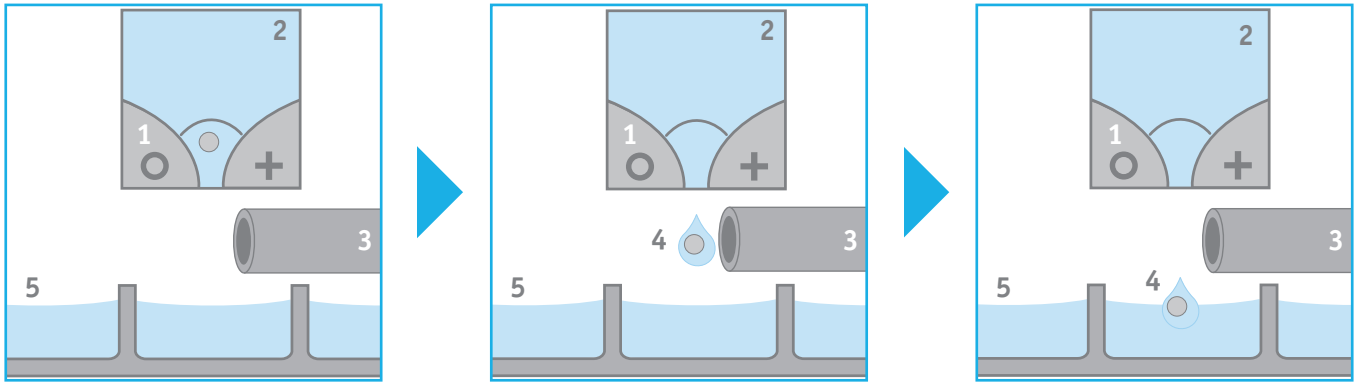
Cells are processed with an excellent viability (as gentle as pipetting). No cell labelling is required.

pure

The use of a disposable cartridge ensures the absence of any cross-contamination. This cartridge is the only part that comes into contact with cells before they are dispensed into the well.

working principle

droplet with one cell



resolution optics and software algorithm detect a single cell in the nozzle

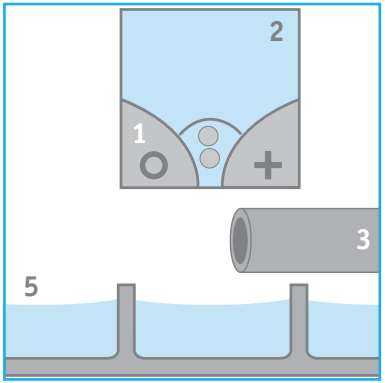
droplet with a single cell is ejected while pneumatic shutter is closed

droplet with a single cell lands in the dedicated well

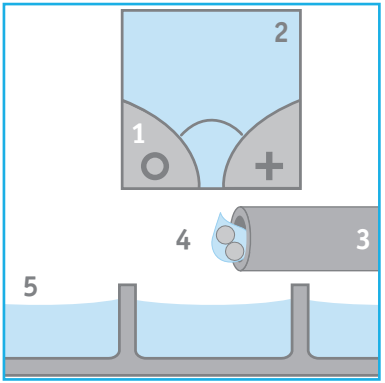
schematic

1 cartridge **2** cell suspension **3** pneumatic shutter **4** free-flying droplet **5** micro-well plate

droplet with more than one cell

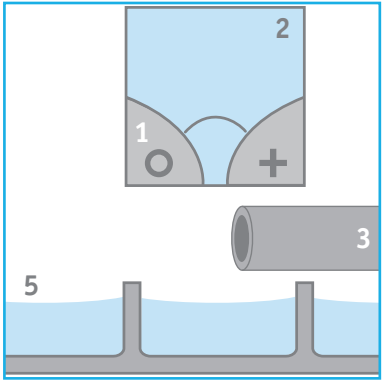


resolution optics and software algorithm detect more than one cell in the nozzle

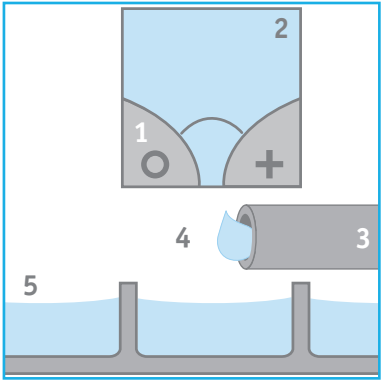


droplet with more than one cell is ejected and immediately deflected into waste by pneumatic shutter

droplet without a cell



resolution optics and software algorithm detect no cell in the nozzle

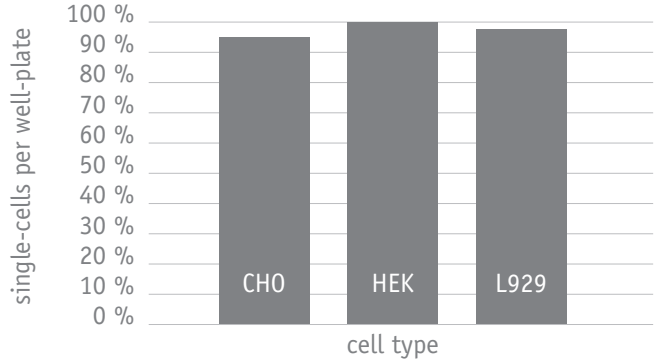


empty droplet is ejected and immediately deflected into waste by pneumatic shutter

single-cell printing efficiency

- printing efficiency* > 90 %
- confirmed and proven by single-cell images
- tested on many common cell lines
- throughput 5-10 min per 96-well plate (one cell per well)

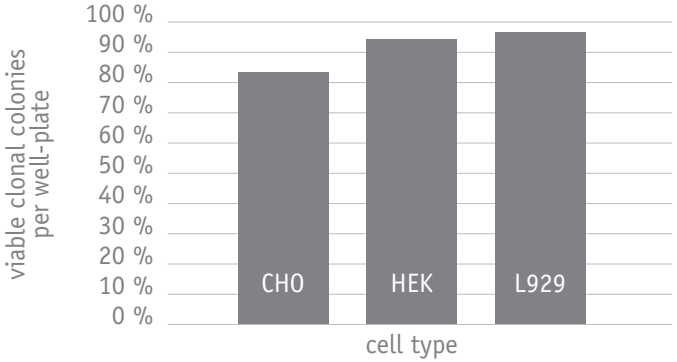
**printing efficiency = number of wells containing a single-cell per total number of wells addressed.*



single-cell viability (clonal recovery rate)

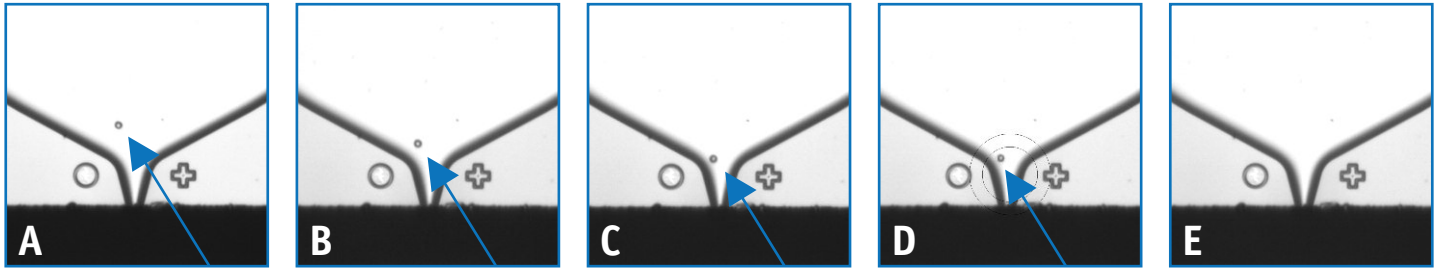
- excellent cell viability
- high clonal recovery rates*
- no pressure, no lasers, no electric fields
- as gentle as hand-pipetting

**clonal recovery rate = number of viable colonies derived from a confirmed single-cell*



proof of clonality

Proof of cell line clonality.
Images taken during the selection
and isolation process of single-cells.



before cell printing tracking a cells' way towards nozzle

targeted single-cell

targeted single-cell with contour overlay

after cell printing, confirmation that cell left nozzle

approved cell types*

human cancer cell lines	HeLa CaSki SiHa C33a U2OS
human cell lines	B-cells Jurkat Raji HEK 293 U2OS
human primary cells	fibroblasts keratinocytes
animal cell lines	CHO RBL 3T3-FIB L929

**These cell types have been successfully printed and post-printing viability is confirmed by successful proliferation*

sample requirements

sample type	suspension
prior filtering (mesh size)	40 µm
cell type	eukaryotic
min. cell diameter	5 µm
max. cell diameter	35 µm
print medium	DPBS
min. concentration	10^4 cells/ml
optimal concentration	10^5-10^6 cells/ml
max. concentration	10^7 cells/ml

cartridge characteristics

chip	silicon-glass
reservoir	polymer
min. sample volume	10 µl
max. sample volume	80 µl
dead volume	< 1 µl
microfluidic outlet (nozzle)	40 x 40 µm
droplet volume	150 pl
dispensation mode	non contact

Dr. Peter Koltay | BD

Andre Gross | CTO

Benjamin Steimle | CFO

Jonas Schöndube | CEO

founders team

cytena

single cells on demand

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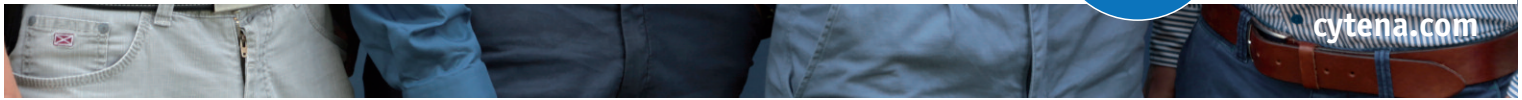

get in touch!

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cytena GmbH
Georges-Koehler-Allee 103 | 79110 Freiburg | Germany
+49 (0) 761 / 203 732 19
info@cytena.com

cytena.com