



Instructions for use

In Cytotox - CVDE

1 - Parameter Cytotoxicity Kit

Crystal Violet Dye Elution CVDE - Nuclear Stain

Art. No. AKCV96.300

Art. No. AKCV96.310

Art. No. AKCV96.1200

Art. No. AKCV96.1210

For research use only

Version 2.0 12/2006



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Kit contents AKCV96.300/310

CVDE I	Wash solution	1 x 125 ml
CVDE II	Labeling solution	1 x 33 ml
CVDE III	Solubilization solution	1 x 33 ml

1 Instruction manual

10 sterile reagent reservoirs (KCV96.310 only)

4 96-well microplates (KCV96.310 only)

Kit contents AKCV96.1200/1210

CVDE I	Wash solution	1 x 500 ml
CVDE II	Labeling solution	1 x 132 ml
CVDE III	Solubilization solution	1 x 132 ml

1 Instruction manual

40 sterile reagent reservoirs (AKCV96.1210 only)

16 96-well microplates (AKCV96.1210 only)

Material required but not provided:

Test cells
Culture medium
Sterile water

96-well microplates (AKCV96.300/1200 only)

Sterile reagent reservoirs (AKCV96.300/1200 only)

Storage conditions

All reagents must be stored at 2-8 °C.

Precautions

Some components of this kit are potentially carcinogenic or corrosive; it is advisable to work in a hood and to wear glasses, gloves and a mask. After skin contact with any reagents of this kit wash affected areas with water and soap.

CVDE II and CVDE III may be harmful if swallowed, inhaled, or absorbed through skin. In case of contact of eyes with CVDE II or CVDE III solutions, immediately flush eyes with copious amounts of water and consult a physician.

This kit is **for research use only**, and **not for human diagnostic purposes**.

Technical information, questions

For any questions, supplementary information or suggestions, please contact:

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**Important note:
Please read the complete manual carefully before starting the assay!**

CVDE test principle

This is a simple assay useful for obtaining quantitative information about the relative density of adherent cells in 96-well plates. Crystal Violet is a dye that stains DNA. After elimination of excess dye and solubilization of the fixed dye, the amount taken up by the cells can be measured spectrophotometrically at 540 nm and can be correlated to cell number.

Protocol

Subculture of cells to 96-well plates

Note:

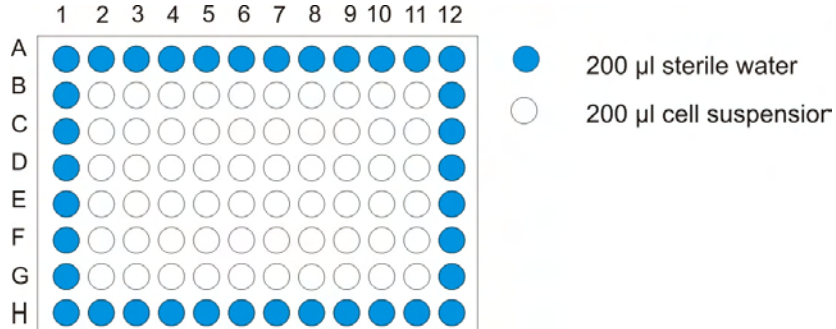
The cell seeding step can easily result in uneven cell densities in the wells of the microplates. Make sure your cell suspension is homogeneous and devoid of large cell aggregates!

Cell density:

Optimal sensitivity is obtained with near-confluent cells at the time of the assay. The actual cell number to be used depends on the size of the cells, the culture doubling time and the duration of the culture phase before the assay is performed. For average sized adherent cells such as mouse fibroblasts and a total culture phase of 48 hrs we recommend to seed 20'000 cells into each well. Fewer cells may be necessary for longer exposure times and larger cells.

- Trypsinize the cells according to the standard operating procedures of your laboratory. Optimally, cells in the log phase of growth should be used.
- Resuspend the trypsinized cells in complete culture medium such that the desired cell number per well is present in 200 µl of medium.
- Pour sterile water into a sterile reagent reservoir.

- Dispense 200 μ l of the sterile water in each well of rows A and H, and in each well of columns 1 and 12 (see figure), to reduce culture medium evaporation during incubation. (Erroneous results may be obtained upon uneven evaporation of culture fluid.)
- Pour the cell suspension into the same sterile reagent reservoir.
- Dispense 200 μ l of cell suspension into the remaining wells of the 96-well plates.



- Incubate the plate in a humidified incubator at 37°C, 5% of CO₂ overnight or for 24 hours.

Preparation of test compound stock solutions

We recommend to use the plate layout described below. This allows to evaluate 2 compounds per plate in triplicate, 8 serial dilutions, with negative and positive controls.

- Prepare 8 sterile concentrations of each test compound that are 10X more concentrated than the concentrations to be used in the assay: Prepare the highest desired concentration and then the seven lower concentrations by serial dilutions with appropriate solvent. Use culture medium as solvent if possible.
- Dilute each 10X concentration 1:10 with culture medium

Note that it may be necessary to make more concentrated stock solutions in order to avoid final solvent concentrations that may interfere with cell growth. If DMSO, ethanol or methanol are used as solvents, the final solvent concentration should not exceed 2%. Equal solvent concentrations should be used for all compound solutions.

Preparation of the negative control

For 1 plate:

- Mix 500 μ l of solvent with 4.5 ml of culture medium (if 10X concentration of test compounds is used) (SC).

Exposure of the cells with test compounds

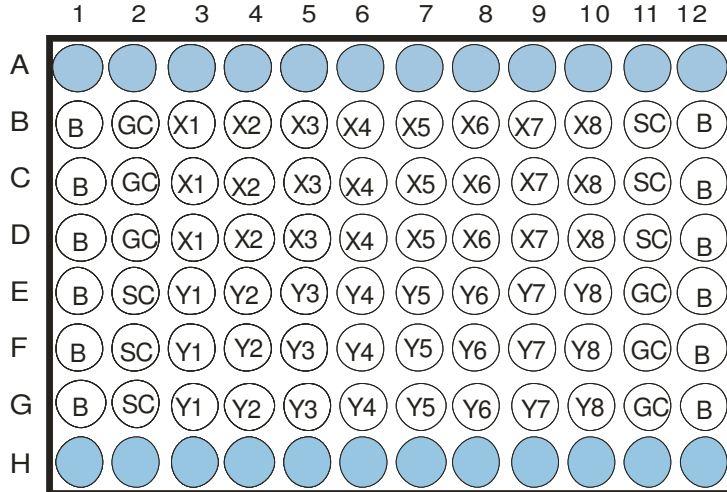
- Inspect the cells with a microscope. Cells should be distributed evenly between wells and look healthy.
- Remove the culture medium sterily from each well either with a multi-channel pipette (recommended) or by using a sterile pipette attached to a vacuum source. Avoid scratching the bottom of the wells with the cells. The removed medium should be replaced rapidly with the test compounds in medium to avoid stress and cell death due to drying cell layers.

Recommended dosing configuration (see figure below):

- Add 200 μ l of culture medium to wells B2, C2 , D2, E11, F11, and G11 (cell growth control = GC).
- Add 200 μ l of culture medium - solvent mixture (page 10) to wells E2, F2, G2, B11, C11 and D11 (solvent control = SC) and to the wells of columns 1 and 12 (blank = B).
- Add 200 μ l of the lowest test compound concentrations (X1) to wells B, C, D of column 3, 200 μ l of test compound concentration X2 to wells B, C, D of column 4 and proceed through column 10 by adding 200 μ l of test compound concentrations X3-X8.

- Add 200 μ l of the lowest test compound concentrations (Y1) to wells E, F, G of column 3, 200 μ l of test compound concentration Y2 to wells E, F, G of column 4 and proceed through column 10 by adding 200 μ l of test compound concentrations Y3-Y8.
- Incubate the plate for the desired length of time.

Recommended 96-well plate configuration



Rows A + H: sterile water

B: culture medium + solvent without cells (negative control)

GC: culture medium + cells (cell growth control)

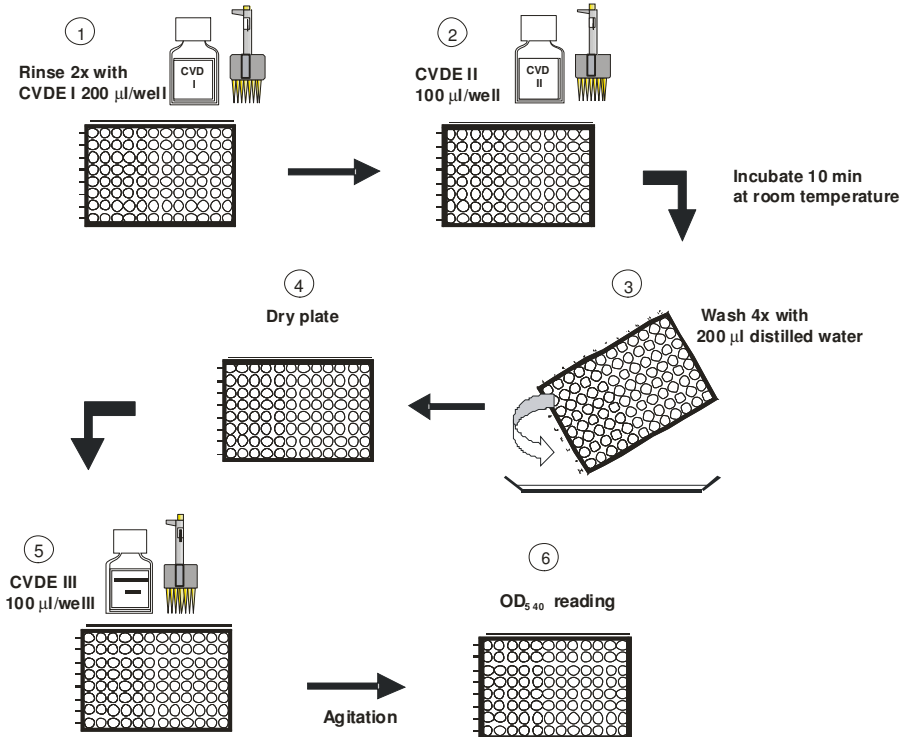
SC: culture medium + cells + solvent (solvent control)

X1, X2, ..., X8 and Y1, Y2, ..., Y8: culture medium + cells + different concentrations of two compounds X, Y.

CVDE Test Procedure

- Remove the culture medium by aspiration, with the cells remaining at the bottom of the wells
- Wash the cells 2 times with 200 μ l/well of wash solution CVDE I
- Add 100 μ l/well of labeling solution CVDE II
- Incubate the plate for 10 minutes at room temperature
- Discard the dye solution CVDE II by aspiration or by gently dumping the plate. Be careful not to disturb the cell layer.
- Wash the cells at least 4 times with 200 μ l/well of distilled or de-ionized water (not provided) until the supernatant is clear
- Dry the plates in air or by using a hair dryer.
- Dissolve the cell layer with 100 μ l/well of solubilization solution CVDE III
- Mix by pipetting up and down or by gentle swinging on a microplate shaker to enhance mixing of the solubilized dye. Read the OD at 540 nm with a reference wavelength at 690 nm.

CVDE assay



Quality control of the assay

The mean OD values in the wells without test sample (solvent control, SC) correspond to a viability of 100% (wells E2, F2, G2, B11, C11 and D11).

The solvent controls (SC) are placed at the left and right side of the 96-well microplate to detect systematic errors. The assay is acceptable, if the left and right sided mean values do not differ more than 15% from the mean of all solvent controls (+/- 15%)

The cell growth controls (GC) allow to detect solvent effects. If the solvent control values differ significantly from the growth control values, inhibition values of test compounds are to be interpreted with caution. If possible chose a different solvent.

Data Analysis

For each well subtract the OD₆₉₀ values from the OD₅₄₀ values.

Calculate the mean OD values for every test sample concentration.

Calculate the mean OD values of the blanks (columns 1 and 12). Correct the sample and solvent control OD's:

Mean OD of samples/controls – mean OD of blanks

Relative inhibition activity is then expressed as percent of solvent control:

$$\% \text{ inhibition} = 100 - (\text{corrected mean OD sample} \times 100 / \text{corrected mean OD solvent controls})$$

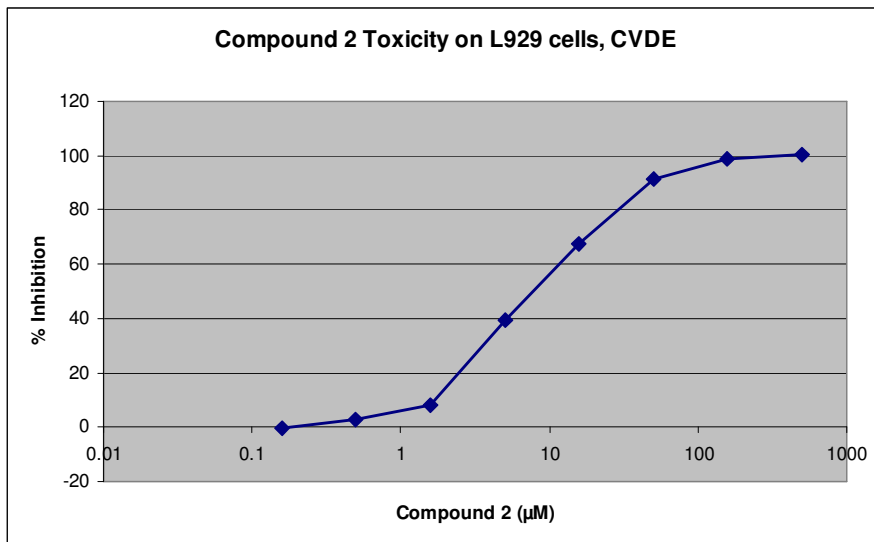
Plot the % inhibition of activity against the test compound concentration. For serial dilutions plot the concentrations on a log scale.

The 50% inhibiting concentration IC₅₀ can be determined graphically.

The example below shows the toxicity of a toxic compound on L929 cells measured with the CVDE test. IC₅₀ is around 10 µM.

Example:

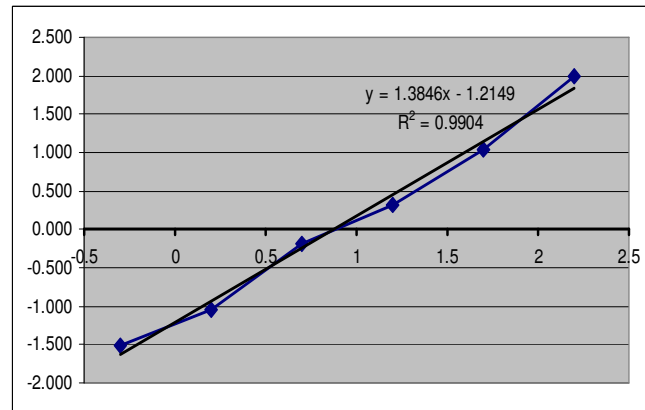
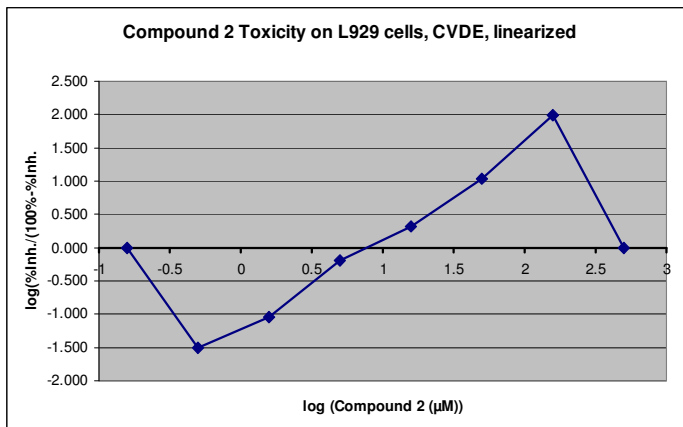
	Blank	GC	SC	0.158	0.500	1.58	5	15.8	50	158	500
Corrected	0.024	0.814	0.829	0.831	0.805	0.762	0.512	0.287	0.092	0.032	0.02
% Inhibition	0.000	0.790	0.805	0.807	0.781	0.738	0.488	0.263	0.068	0.008	-0.004
%inh/(100%-%inh)		1.863	0.000	-0.248	2.981	8.321	39.369	67.312	91.530	98.982	100.472
log (%inh/(100%-%inh))			0.000	-0.002	0.031	0.091	0.649	2.059	10.806	97.195	-212.895
			#Z AHL!	#Z AHL!	-1.513	-1.042	-0.188	0.314	1.034	1.988	#Z AHL!
log conc.				-0.80134291	-0.30103	0.19865709	0.69897	1.19865709	1.69897	2.19865709	2.69897
log (%inh/(100%-%inh))				#Z AHL!	-1.513	-1.042	-0.188	0.314	1.034	1.988	#Z AHL!



Alternatively you can plot:

Log (% inhibition / (100 -% inhibition)) vs. log (concentration)

The IC_{50} is obtained from the intercept on the x-axis. Note that values $\geq 100\%$ and $\leq 0\%$ can not be used with this analysis! A regression line using the linear part of the curve crossing the y-axis at 0, can be used to obtain a more precise estimation of the IC_{50} . In this case ($y=0$): $(\log IC_{50}) = (1.2149 / 1.3846) = 0.8774$, giving an IC_{50} of $7.5 \mu M$.



IC_{50} values can also be calculated using the CelTox software available from Xenometrix.