



## Chinese Hamster Ovary (CHO) Cell Analysis Using the Beckman Coulter® Vi-Cell™

**VI-CELL XR™**  
Part of the Cell Lab family



**Chinese Hamster Ovary Cells (CHO)** are among the most widely used mammalian cells for the expression of a wide variety of recombinant proteins. The cells are routinely cultured on a large scale in bioreactors. The heterogeneous protein product produced is further refined downstream and ultimately used for pharmaceutical purposes. In order to determine the health of these cell cultures, both cell concentration and percentage viability are measured over time. For percentage viability, the Vi-CELL automates the labor-intensive hemacytometer method using Trypan Blue dye.

### Equipment Used

Beckman Coulter,  
Vi-CELL XR  
Validated Vi-CELL XR  
reagent pack

### Instrument Settings

When using the Vi-CELL most cells can be analyzed using the default instrument settings. However, in some cases certain cell lines may require modification of these analyses parameters. The intuitive software allows for easy user selection of the optimum parameters thus ensuring accurate results. The proper instrument settings for CHO cells are the following:

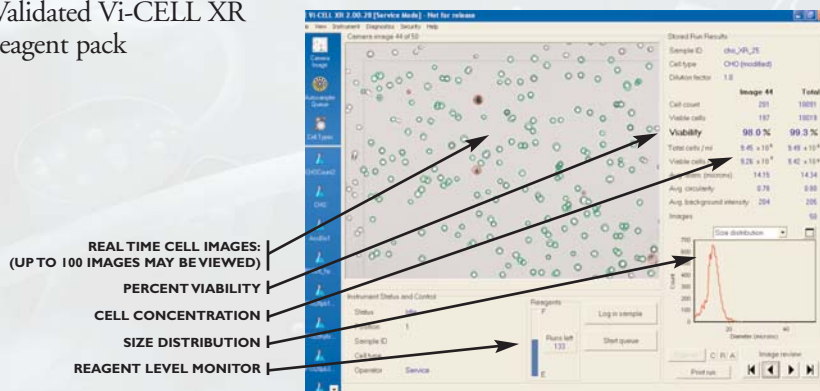
<b>Min. Size (µm) = 6</b>	<b>Mixing Cycle = 3</b>
<b>Max. Size (µm) = 50</b>	<b>Number of Images = 50</b>
<b>Aspirate Cycle = 1</b>	<b>Cell Brightness = 85</b>
<b>Cell Sharpness = 100</b>	<b>Viable Cell Spot Brightness = 75</b>
<b>Viable Cell Spot Area = 5</b>	<b>Min. Circularity = 0</b>
	<b>Decluster Degree = Medium</b>

### Results

The results reported by the Vi-CELL are shown in the Results Section of Figure 1. The percentage viability and total cell concentration show excellent agreement when compared to the manual method. Percent viability and total cell concentration for this run were 85.2% and  $3.56 \times 10^6$  respectively. Among other important cell culture parameters, the Vi-CELL reports viable cell concentration, mean diameter and cell circularity.

### Conclusion

The Beckman Coulter Vi-CELL automates the standard manual method, providing accurate results and removing the subjective nature inherent in the manual method.



## THE VI-CELL

The Vi-CELL automates the widely accepted Trypan Blue Dye Exclusion method. The Vi-CELL combines the state of the art in imaging technology, proprietary algorithm and fluidics management. At the heart of the Vi-CELL is the customized liquid handling system. This system, which allows sample aspiration, reagent handling and subsequent instrument cleaning, is fully automated. Once the cellular suspension has been aspirated and mixed with the trypan blue dye, it is pumped to the flow cell for imaging. The Vi-CELL can analyze up to 100 images for a given analysis increasing total volume from 15 to 30 times over the manual method with result in a less than 2.5 minutes.

## MANUAL TRYPAN BLUE DYE EXCLUSION METHOD

As mentioned, the standard method for measuring cell viability is the Trypan Blue Dye Exclusion method. Trypan blue stain (0.4%) is mixed with an equal volume of cells. Viable cells, given their intact membranes, exclude the trypan blue stain; non-viable cells, membrane permeable, stain dark blue. The manual method, however, requires a technician, using a hemacytometer and microscope, to enumerate both stained and unstained cells and manually calculate the percent viability. In addition to being labor intensive, this technique has substantial accuracy error due to its subjective nature.

- Prepare**
  - Automated liquid handling
  - Automated lysing
  - General purpose centrifugation
  - High performance centrifugation
  - Ultracentrifugation
- Identify**
  - Automated fluorescence microscopy
  - Cell counting
  - Cell markers
  - Cell viability analysis
  - Flow cytometry
  - Monoclonal antibodies
- Probe**
  - Automated liquid handling
  - Flow cytometry
  - Microarray technology
  - Monoclonal antibodies
  - Signal transduction assays
- Sort**
  - Cell sorters
  - Micro-piezo electric tips
  - Reagents (various)
- Evaluate**
  - Monoclonal antibodies
  - Multi-mode plate reading
  - Genomics solutions
  - Proteomics solutions
  - Software informatics
- Diagnose**
  - Automated liquid handling
  - Flow cytometry
  - Immunoassays
  - Monoclonal antibodies
  - Software algorithms

## VI-CELL TECHNICAL SPECIFICATIONS

<b>INSTRUMENT FUNCTION:</b>	<b>POWER REQUIREMENTS:</b>
Concentration Range: 5 x 10 <sup>4</sup> to 1 x 10 <sup>7</sup> cells / mL	Power 50 watts (65 Watts Max.)
*Counting Accuracy: ± 6%	Voltages 100V, 120V, 220V or 240V 50/60 Hz
<b>OPERATING SYSTEM:</b>	<b>TEMPERATURE:</b>
Windows® 98	10° to 40° C (50° to 104° F)
Windows® 2000	
Windows® XP	
<b>INSTRUMENT TYPE:</b>	<b>WEIGHT:</b>
Video imaging through a quartz flow cell	11.3kg (25lb)
	<b>UNIT DIMENSIONS:</b>
	44.5cm (17.5") height
	38cm (15") width
	41cm (16") depth

## VI-CELL SERIES

	PN	AUTO SAMPLE	SIZE RANGE (µm)	SAMPLE VOLUME (mL)	ANALYSIS TIME (Min)	VIABILITY RANGE	IMAGING TECHNOLOGY
VI-CELL XR	383556	Yes	2-70	0.5	<2.5	0-100	Auto-focus routine Firewire Camera 1394 X 1040 CCD array
VI-CELL AS	6605769	Yes	5-70	1.0	<3.5	0-100	Manual focus routine Image frame grabber 640 X 480 CCD array
VI-CELL S	383080	No	5-70	1.0	<3.5	0-100	Manual focus routine Image frame grabber 640 X 480 CCD array
VI-CELL XR QUAD PACK	383722						
VI-CELL AS, S QUAD PACK	383198						
VI-CELL CONCENTRATION CONTROL	175478						
VI-CELL FOCUS CONTROL	175474						



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