Quickening the Pace of Understanding

The fully automated Vectra® 3, 6-slide or 200-slide quantitative pathology imaging system is a state-of-the-art instrument for extracting proteomic and morphometric information from intact FFPE tissue sections or TMAs. Vectra 3 and inForm software analysis combine the power of multiplexed biomarker imaging and quantitative analysis all within a familiar digital workflow to accelerate cancer immunology research.

Vectra 3 introduces the Phenochart whole slide viewer with annotation capability into the digital workflow, where you can navigate around slides and identify areas of interest for high power acquisition. The system features automated slide handling, multispectral imaging technology, and unique pattern-recognition-based image analysis. It accurately measures protein and biomarker expression and morphometric characteristics in distinct tissue regions of interest or on whole slides for translational studies.
Example Applications:

- Phenotyping immune cells for cancer immunology research
- Transduction signaling pathway activity: (pERK, pS6, P13K/mTOR, MAPK, or EGFR)
- Apoptosis and/or proliferation assays
- Necrosis and fibrosis using conventional stains
- Cell cycle characterization
- DNA damage determination
- Inflammation
- Lymph node metastasis

**Phenoptics solution for Phenotyping Immune Cells in situ using Vectra**

The Vectra automated quantitative pathology imaging system is a part of PerkinElmer’s Phenoptics research solution, Figure 1, for cancer immunology and immunotherapy research, which includes multiplexed staining reagents and methodologies, instrumentation with unique channel-separation technology, and advanced image analysis software that can be trained to phenotype cells and measure checkpoint, activation and functional markers between cells and within the tumor microenvironment.

**Discover New Phenotypes Associated with Drug Response or Clinical Outcomes**

It’s now possible to phenotype cells and extract per-cell multiparameter data in FFPE enabling new biomarkers to be discovered and validated which rely on expression and contextual spatial information. These biomarkers could lead to the development of tests to assess safety in pre-clinical studies and potentially to predict efficacy of therapies.

**Stain**

**Multiplex Biomarker Detection in Intact Tissue**

Sections can be labeled with conventional stains such as H&E and trichrome, or labeled with either immunohistochemical (IHC) or immunofluorescent (IF) dyes, such as PerkinElmer’s Opal™ multiplex reagent kits. With IHC or IF, single or multiple proteins can be measured on a per-tissue, per-cell, and per-cell-compartment basis, even if those signals are spectrally similar, are in the same cell compartment, or are obscured by autofluorescence.

The Opal approach, Figure 2, enables the specific staining of multiple tissue biomarkers, reaching up to 6-plex in a single tissue section. It provides researchers with a valuable tool to simultaneously interrogate multiple pathways while retaining the context provided by tissue sections. This approach provides information that is not available from alternative techniques such as the analysis of single markers in serial sections. The method is compatible with the standard IHC workflow in your lab and is amenable to automation. Opal reagents are available individually or in 5-, 6-, and 7-color kits with easy-to-follow protocols for FFPE tissue.

**Figure 1.** The four elements of PerkinElmer’s Phenoptics solution.

**Figure 2.** Opal schematic (left). Breast cancer tissue using Opal reagent kits. Blockade marker 1 overlaid on DAPI (A). CD8 signal overlaid on DAPI (B). CK signal overlaid on DAPI (C) and composite image of all markers overlaid onto DAPI (D). Additional markers were used, FOXP3, and blockade 2 and 3 (data not shown).
Image and Visualize

Reveal Multiple Tissue Biomarkers in Context

For cancer immunology researchers who are seeking to understand the role of immune cells within solid tumors and their microenvironment, the Vectra 3 automated, high-throughput multiplexed biomarker imaging system visualizes, analyzes, quantifies and phenotypes immune cells in situ in FFPE tissue sections and TMAs. Unlike alternative instrumentation, which are limited by the number of colors that can be imaged on one slide, Vectra can separate up to 7 colors allowing the quantification of multiple biomarkers, revealing spatial context, all within a digital workflow.

Two fully automated configurations, (Figure 3), of Vectra 3 are now available: a 6-slide lower capacity and a 200-slide higher capacity instrument. Process up to 200 slides in a single run or analyze every core in a TMA.

Additional Features of the Vectra 3 System Include:

- 10x whole slide imaging and scanner-like intuitive workflow in brightfield and fluorescence provides context for higher-power quantitative multispectral imaging regions
- Phenochart whole slide viewer with annotation capability is installable on multiple computers – regions can be manually or automatically selected using Vectra software or marked for review by a pathologist
- TMA core detection – select cores for high-resolution MSI acquisition
- inForm® Pathology Views™ for visualization of fluorescence imagery in traditional brightfield mode (H&E, DAB and hematoxylin)
- Two seats of inForm Tissue Finder software for automatically identifying cell phenotypes in different tissue sections
- Reduces auto-fluorescence through powerful multispectral imaging
- Export to additional software packages e.g. Indica Labs HALO™ whole slide image analysis software
Analyze

Measure and Quantify Multiple Biomarkers *in situ*

Obtain per-cell and per-cell-compartment multiparameter data, and accurately and reliably separate multiple biomarker signals from one another and from autofluorescence in multiplexed assays. Use this rich data to generate tissue-based analysis that retains the architectural context of the intact tissue.

inForm Tissue Finder automates the detection and segmentation of specific tissue types using patented user-trainable algorithms that can recognize morphological patterns. It includes per-cell phenotyping functionality to differentiate marked cell types (e.g. T-cells, macrophages) within a segmented area (e.g. tumor versus stroma) (Figure 7).
PerkinElmer’s Phenoptics Solutions for Quantitative Pathology Imaging and Analysis

**Features of inForm Tissue Finder Software:**

- User-trained feature recognition algorithms enable automatic identification of specific tissue types based on tissue morphology
- Quantitative per-cell analysis of biomarker expression in tissue sections and TMAs
- Separation of weakly expressing and overlapping markers
- Cellular analysis of H&E, IHC and immunofluorescence in FFPE tissues
- Per-cell phenotyping to differentiate cell types
- Pathology Views: creates brightfield pathology (H&E, DAB and hematoxylin) renderings from the original fluorescence image
- Push acquired images from Vectra to inForm in order to develop algorithms for automation

PerkinElmer digital slide data (.qptiff) can also be exported into Indica HALO software which enables analysis of whole slide imagery. Users can select analysis modules from an extensive list based on their analysis needs and add additional modules as required at a later date. Indica’s image analysis portfolio includes solutions for oncology, neuroscience, metabolism and toxicologic pathology.

In addition, inForm unmixed images (inForm 2.2 or later) and unmixed MSI fields (Brightfield or fluorescence) can be analyzed using the HALO High-Plex analysis module. Individual workstation and group perpetual licenses are available.

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**PerkinElmer’s Phenoptics Solutions for Quantitative Pathology Imaging and Analysis**

**Stain**
The Opal™ method is a practical approach for specific staining of multiple tissue biomarkers up to 6-plex and beyond in a single tissue section.

**Image**
Vectra automated quantitative pathology imaging system and Mantra™ workstation for simultaneous quantitative measurement of multiple biomarkers within a single FFPE tissue section.

**Analyze**
Analyze, quantify, visualize and phenotype cells *in situ* using inForm Cell Analysis and Tissue Finder software.

**Research Services**
Don’t have the time or resources to do the work yourself? Our in-house experts can perform multiplexed staining, imaging and analysis to move your research to the next stage.
## Vectra Specifications

<table>
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<th>Specification</th>
<th>Details</th>
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<tr>
<td>Tissue formats</td>
<td>Tissue microarrays (TMAs) and tissue sections</td>
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<tr>
<td>Spectral range</td>
<td>440 – 720 nm (tunable)</td>
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<tr>
<td>Modality</td>
<td>Brightfield and Fluorescence (multispectral or color)</td>
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| Scan time (1.5 cm x 1.5 cm sample) | 5-band Fluorescence, 10x 8.0 minutes  
5-band Fluorescence, 4x 2.5 minutes  
Brightfield, 10x 3.5 minutes  
Brightfield, 4x 0.8 minutes |
| Throughput – total time (1.5 cm x 1.5 cm sample, scan plus 10 MSI fields at 20x) | 5-band Fluorescence, 10x 18 minutes  
5-band Fluorescence, 4x 12 minutes  
Brightfield, 10x 10 minutes |
| Automation             | Fully automated walk-away acquisition and analysis for up to 200 slides at a time  
A 6-slide version is also available |
| Multiplexing capability | Separates up to 7 colors even if overlapping |
| Image Analysis Software (inForm) | Intuitive learn-by-example interface to automatically segment and quantitate tissue structures, cells and sub-cellular signatures |
| Resolution             | 4x (2.5 µm/pixel), 10x (1 µm/pixel) and 20x (0.5 µm/pixel) |
| Supported barcode reader (200-slide only) | Data Matrix (ECC 0-200), QR Code, PDF417, Micro PDF417, GS1 Databar (Composite and Stacked), Code 39, Code 128, BC 412, 12 of 5, UPC/EAN, Codabar, Code 93 |
| File format            | PerkinElmer whole slide scan image (qptiff), multispectral images (.im3), color images (JPEG, BMP, PNG) |
| Operating system       | Microsoft® Windows® 7 64-bit |
| Computer               | Dual Quad-Core processors with 1 Terabyte for data storage |

*Note: Product specifications subject to change. Refer to PerkinElmer’s website for current information.*

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For research use only. Not for use in diagnostic procedures.