Miltenyi Biotec

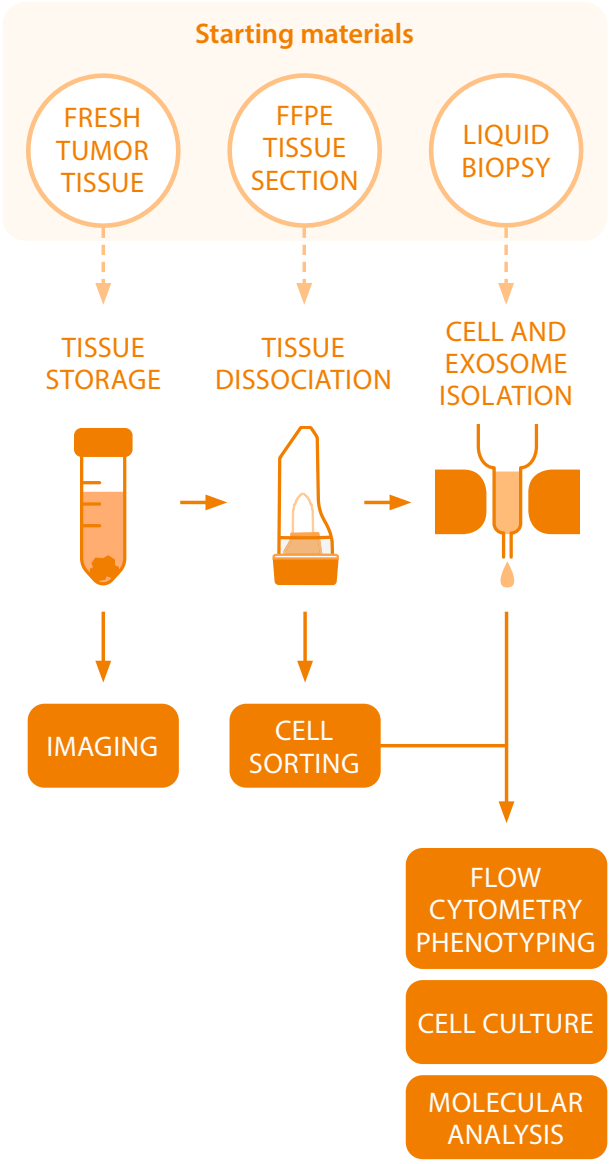
Cancer research

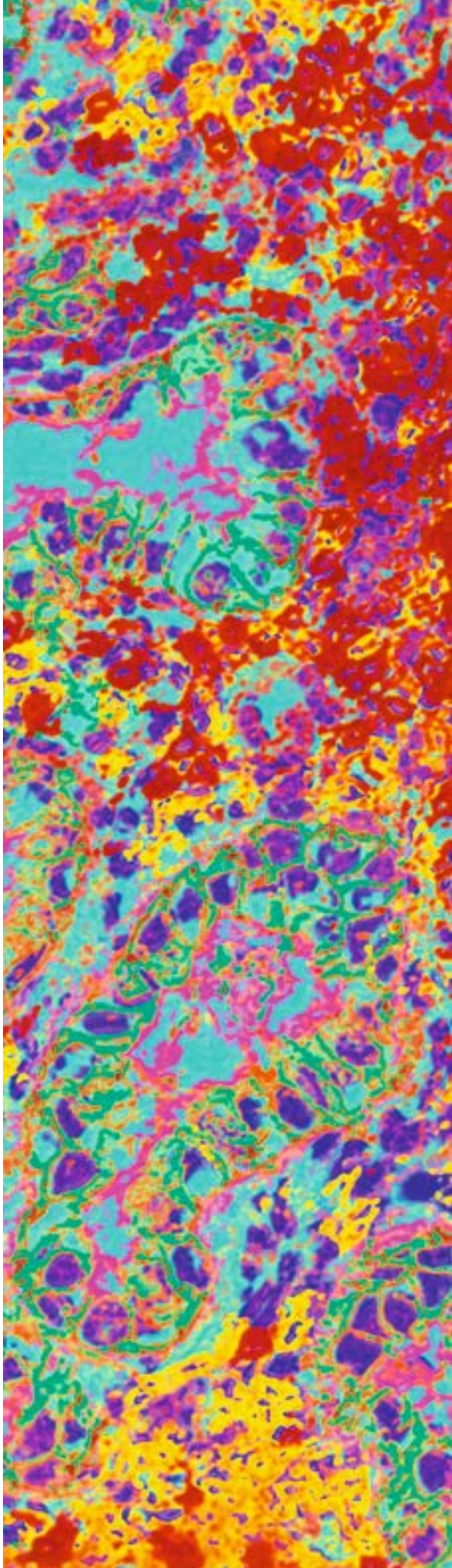
Understanding cancer begins with the cell

Cancer research workflow

Cancer research is an evolving field uncovering new mechanisms that drive tumor formation, growth, and metastasis. With advances in cancer research, Miltenyi Biotec continuously pushes the development of innovative products and technologies to meet the needs of this progressing field.

Browse through this brochure to discover solutions for every step of your specific cancer research workflow.





Contents

MACS® Tissue Storage Solution

Optimized storage of fresh tumor samples for up to 48 hours

gentleMACS™ Dissociators

Fully or semi-automated operation for standardized and gentle tumor dissociation and minimal hands-on time

Tissue Dissociation Kits

High yields of viable single cells from any tumor entity with optimized protocols and lot-to-lot consistent reagents

gentleMACS Tubes

Engineered for efficient tissue dissociation (C Tube) or for tissue homogenization for molecular applications (M Tube)

Strainers and filters

Removal of larger particles, cell clumps, or tissue fragments from complex cell suspensions

Tissue storage and dissociation

Start smart from fresh tumor tissue or formalin-fixed paraffin-embedded (FFPE) samples.

Optimized tissue storage

Gain flexibility in your schedule with the MACS® Tissue Storage Solution. Your tumor samples are stored safely on their journey from collaboration sites or while you are busy processing other samples.

- tissue storage for up to 48 hours at 4 °C
- optimal cell viability (fig. 1)
- no unwanted effects like cell activation or apoptosis

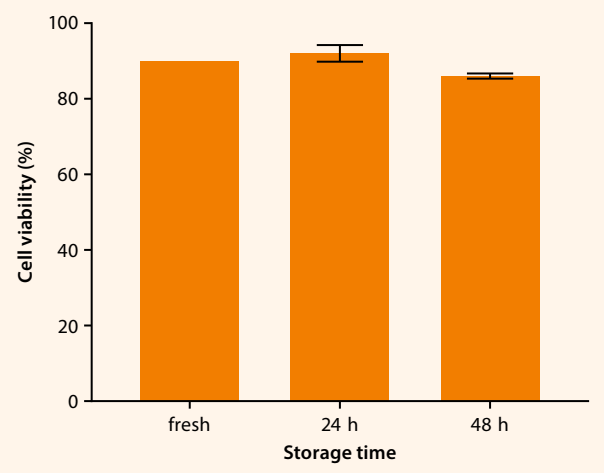


Figure 1: The MACS Tissue Storage Solution preserves cell viability. Cell viability of fresh tissue versus tissue stored in MACS Tissue Storage Solution for 24 h and 48 h.

Gentle dissociation of solid tumor tissues

Using the gentleMACS™ Dissociators with the gentleMACS C Tubes and Tissue Dissociation Kits, mechanical and enzymatic dissociation are combined to enable gentle, automated tumor dissociation for standardized and reproducible results. Select your Tumor Dissociation Kit based on the origin of the tumor.

Dissociation of fresh tumors

Our Tumor Dissociation Kits combined with the suitable gentleMACS Program are optimized for dissociation of solid tumors of different entities. Our protocols result in high yields of viable single-cell suspensions even from very small biopsy samples (fig. 2) and enable the recovery of target cells, including key tumor-infiltrating leukocytes (TILs), which would otherwise remain embedded in the tumor tissue (fig. 3).

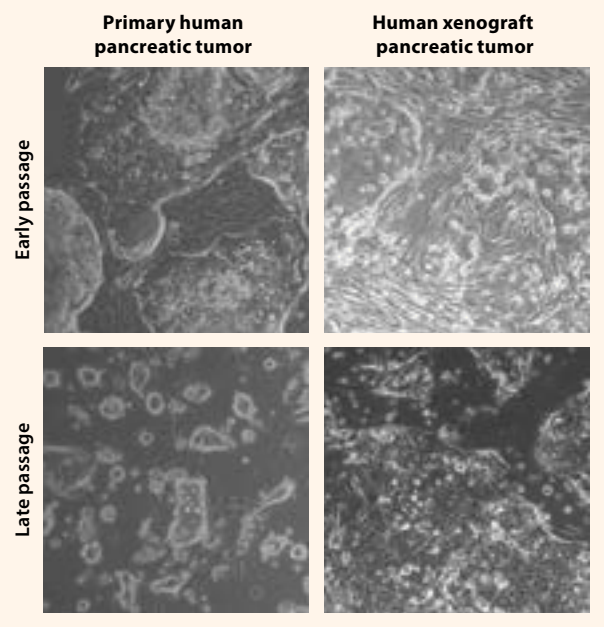


Figure 2: Cell viability after tumor dissociation with the Tumor Dissociation Kit. Viable cells of primary human and xenograft pancreatic tumors after dissociation with the gentleMACS Dissociator and Tumor Dissociation Kit, human. Pancreatic tumor cells were cultured in Pancreas TumorMACS™ Medium.

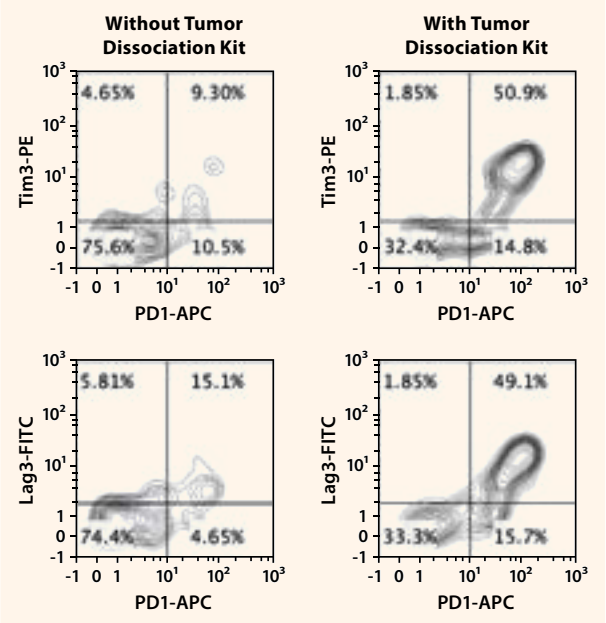


Figure 3: Recovery of CD8⁺ TILs from B16-F10 tumors. B16-F10 mouse tumors were collected and dissociated using the gentleMACS Octo Dissociator with Heaters in the presence or absence of Tumor Dissociation Kit, mouse enzymes. Cells were subsequently labeled with REAfinity™ Antibodies and analyzed by flow cytometry.

Preservation of epitopes facilitates downstream experiments

- preservation of sensitive epitopes
- more than 200 epitopes tested, both in human and mouse
- high lot-to-lot consistency for reproducible results

LEARN MORE

Learn more about tumor tissue dissociation and find our surface epitope preservation list at

▸ **miltenyibiotec.com/tumordissociation**

Effective dissociation of FFPE samples

The formalin-fixed paraffin-embedded (FFPE) Tissue Dissociation Kit is optimized for the dissociation of human carcinoma sections (fig. 4). High yields of single cells can be obtained, while preserving important epitopes to identify carcinoma cells.

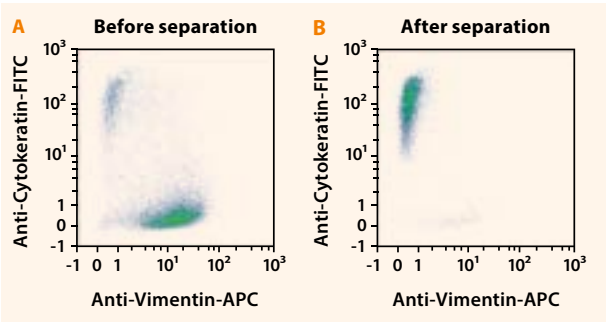


Figure 4: Flow cytometry analysis of cytokeratin-positive and vimentin-positive cells after dissociation with the FFPE Tissue Dissociation Kit and cell isolation with Anti-Cytokeratin MicroBeads, human. Cells were labeled with fluorochrome-conjugated antibodies as indicated and analyzed before (A) and after cell isolation (B). Cell separation resulted in two populations of cytokeratin-positive cells and vimentin-positive cells (B). Cells were analyzed using the MACSQuant® Analyzer 10.

LEARN MORE

Learn how our FFPE workflow can increase the sensitivity of NGS mutation analysis. Download our application note at

▸ **miltenyibiotec.com/FFPE-dissociation-NGS**

MACS® Cell Separation Instruments

Automated and high-throughput solutions for efficient cell isolation from tumor samples and body fluids

MACS Separator

Manual MACS Cell Separation with fast and simple protocols for reliable results, every time

MACS MicroBeads and Isolation Kits

Optimized for separation of target cells, isolation of exosomes, or depletion of non-tumor cells in tumor samples

MACS Columns

Developed for high viability and recovery, from small to large tumor samples

Cell and exosome isolation

Select the best technology for your isolation needs. MACS Technology allows efficient isolation of different target cell populations and exosomes based on magnetic separation.

Enrichment of heterogeneous tumor cells via untouched isolation

During untouched isolation, non-target cells are magnetically labeled and depleted (fig. 5). This strategy allows for the isolation of all tumor cells, which often lack specific markers. With our Tumor Cell Isolation Kits, human or mouse, and the Mouse Cell Depletion Kit, you can remove all non-tumor cells from the sample. The isolated, highly pure, and label-free tumor cells enable further sequential cell isolation and downstream phenotyping.

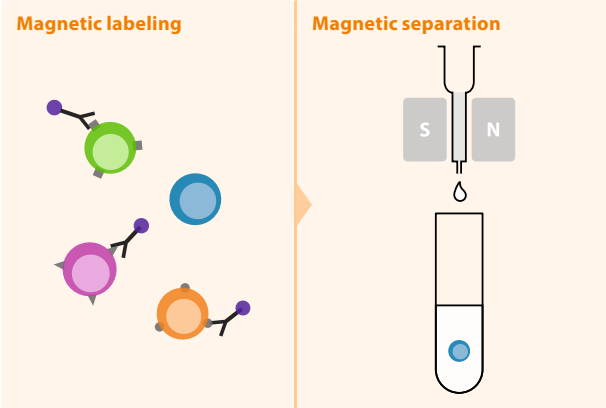


Figure 5: Untouched tumor cell isolation with MACS® Technology. Non-tumor cells are magnetically labeled. During separation, the unlabeled target cells are collected in the flow-through fraction, while non-tumor cells are retained within the column. Optionally, the retained cells can be eluted after removal of the column from the separator (not shown).

Depletion of non-tumor cells of human origin

During the growth phase, tumor tissue is vascularized and infiltrated by cells of non-tumor origin, including heterogeneous lymphocyte subpopulations, fibroblasts, and endothelial cells. These contaminating non-tumor cells lead to inaccurate molecular downstream analysis and frequently hamper the culture of human tumor cells particularly due to fibroblast overgrowth. These non-tumor cells of human origin can be depleted with the Tumor Cell Isolation Kit (fig. 6).

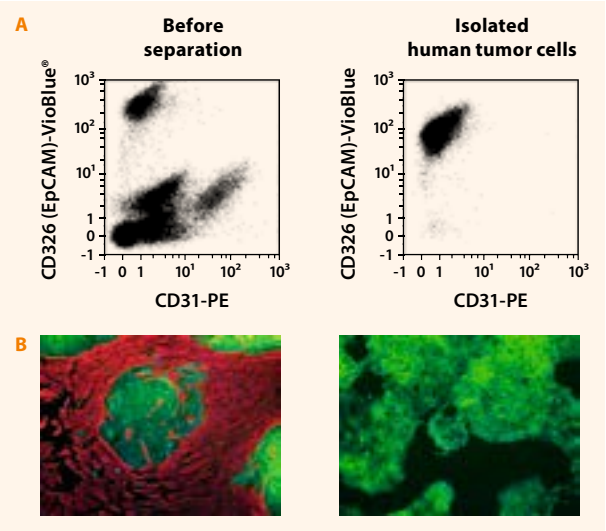


Figure 6: Isolation of human breast cancer cells independent of marker expression with the Tumor Cell Isolation Kit, human. (A) Dot plots of original and isolated cell fraction and (B) corresponding microscopic pictures with vimentin staining for fibroblasts (red), EpCAM for tumor cells (green), and DAPI for cell nuclei (blue).

VISIT

Discover how Tumor Cell Isolation Kits improve cell cultivation and NGS accuracy at

▸ **miltenyibiotec.com/tumor-isolation-NGS**

Depletion of mouse cells from xenograft samples

Infiltration of xenograft tissues by murine cells is highly dependent on, e.g., tumor subtype, growth rate, and transplantation site. The variable amount and composition of infiltrating mouse cells hamper accurate molecular downstream analyses. The Mouse Cell Depletion Kit uses a combination of antibodies to recognize and deplete all cells of mouse origin within xenograft tumors, regardless of tissue origin, resulting in a highly pure population of human cells (fig. 7).

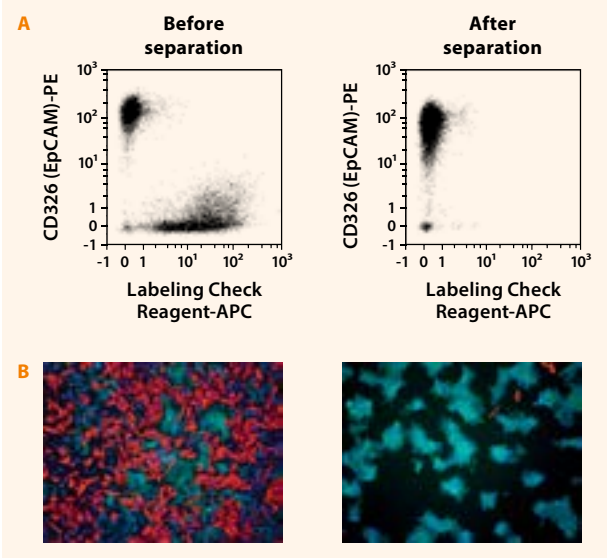
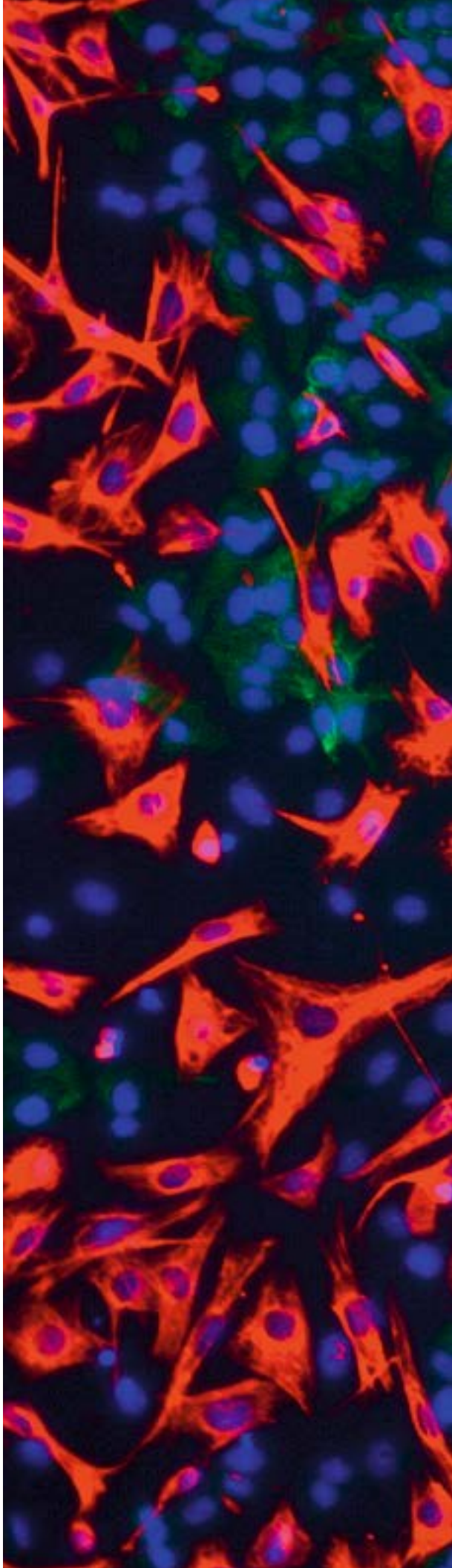


Figure 7: Isolation of human colon cancer cells from a mouse xenograft independent of marker expression with the Mouse Cell Depletion Kit. (A) Dot plots of original and isolated cell fractions. Labeling Check Reagent-APC was used to analyze mouse cells. (B) Corresponding microscopic pictures with vimentin staining for fibroblasts (red), EpCAM for tumor cells (green), and DAPI for cell nuclei (blue).

VISIT

Learn how the Mouse Cell Depletion Kit reduces bias in NGS analysis at

▸ **miltenyibiotec.com/mouse-depletion-NGS**



Pure target populations allow high-quality downstream analysis

- Cultivate tumor cells free of fibroblasts and other non-tumor cells.
- Increase NGS accuracy and remove unspecified reads or cross-reactive probes.
- Drastically reduce time of flow cytometry analysis.
- Efficiently profile isolated exosomes.

Cultivated mouse cells and human tumor cells. Nuclei are stained with DAPI (blue), mouse cells are stained with anti-vimentin (red; mainly fibroblasts), and human tumor cells are stained with anti-EpCAM (green).

Enrichment of rare target cells and exosomes with positive selection

If you are interested in a specific marker, positive selection is the right choice for you to isolate your target population from heterogeneous tumor material. The sensitivity of MACS® Technology allows the positive isolation of target cells and exosomes from solid tumor tissue as well as from liquid biopsies (i.e. whole blood, plasma, or urine) based on one or multiple markers (fig. 8).

- Gentle separation results in highly viable and functionally enriched cells.
- Specific separation columns for high recovery.
- MicroBeads and protocols optimized for tumor-derived samples lead to high purity.

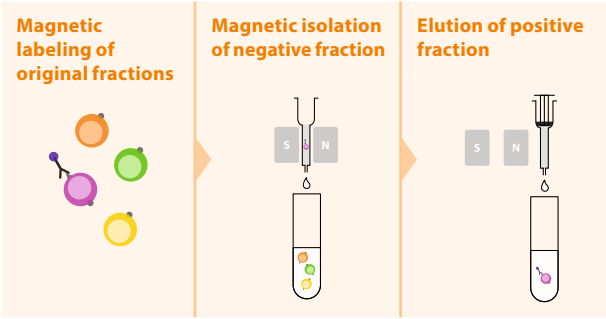


Figure 8: Positive selection with MACS Technology. Target cells or exosomes are magnetically labeled. During separation, the magnetically labeled fractions are retained within the column, while unlabeled cells or exosomes flow through. After a washing step, the column is removed from the magnetic field of the separator and target fractions are eluted from the column.

Cell enrichment decreases time needed for analysis

The percentage of specific cell populations can be very low in a tumor sample. Pre-enrichment of these cell populations, including tumor-infiltrating leukocytes (TILs), can significantly save time and increase the quality of your flow analysis or flow sorting.

Cell type	Cells to analyze	Events to collect	Flow cytometry time/ sample*	Total flow cytometry time**
$CD4^+$ T cells				
Bulk	5,000	7.96×10^6	66.3 min	>10 h
Isolated***	5,000	5.41×10^4	0.5 min	~11 min
$CD8^+$ T cells				
Bulk	5,000	2.80×10^6	23.3 min	>3.5 h
Isolated***	5,000	4.37×10^4	0.4 min	~10 min
T cells				
Bulk	10,000	8.13×10^5	6.8 min	>1 h
Isolated***	10,000	3.24×10^4	0.3 min	<10 min

* Flow rate: 2,000 events/s
** Considering 9 samples (3 experimental groups × 3 replicas/group). Includes 45 s automated mixing and rinsing between samples on the MACSQuant® Instrument
*** Isolation using CD8 (TIL), CD4 (TIL), or CD4/CD8 (TIL) MicroBeads, respectively

Table 1: Isolation of $CD4^+$, $CD8^+$, and pan T cells from different mouse tumor models using mouse CD4 (TIL) MicroBeads, CD8 (TIL) MicroBeads, and CD4/CD8 (TIL) MicroBeads dramatically decreases time of analysis.

Plenty solutions are available for positive selection

Target	Marker or suggested product
Carcinoma cells	Cytokeratin*, CD326 (EpCAM)
Circulating tumor cells	StraightFrom® Whole Blood CD326 (EpCAM) MicroBeads
Breast cancer cells	ErbB-2
Melanoma cells	Melanoma (MCSP)
Cancer stem cells	LGR5, CD133, CD44, CD24
Tumor-associated fibroblasts	Tumor-Associated Fibroblast Isolation Kit, mouse CD90 MicroBeads, human
Endothelial cells	CD31, CD146
Mouse TILs	CD3 (TIL), CD4 (TIL), CD4/8 (TIL), CD8 (TIL), or CD45 (TIL) MicroBeads, mouse
Human TILs**	CD45 (TIL) MicroBeads, human
Exosomes	CD9, CD63, CD81, or Exosome Isolation Kit Pan

*Developed for FFPE samples only
**For the isolation of human TIL subpopulations, refer to reversible cell labeling

Table 2: Overview of selected target cells or exosomes, which can be isolated based on specific markers with positive selection. For full flexibility, indirect MicroBeads are available for customized conjugations for own novel neoantigens.

Isolation of tumor-associated fibroblasts

Tumor-associated fibroblasts play an important role in tumor development and progression. However, they may only account for about 0.5–5% of the total number of cells found in tumors. Applying a two-step strategy, tumor-associated fibroblasts are first pre-enriched by removing non-target cells, followed by isolation using the general fibroblast marker CD90.2 (fig. 9). This allows reliable isolation from different syngeneic mouse tumor models.

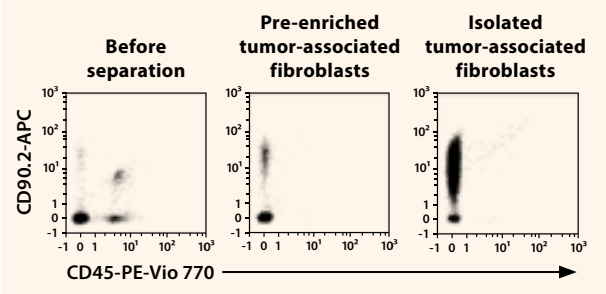


Figure 9: Isolation of tumor-associated fibroblasts from a mouse B16-F10 tumor (melanoma) using the Tumor-Associated Fibroblast Isolation Kit, mouse. Data show the two-step isolation protocol, including pre-enrichment by depletion of non-target cells and isolation of CD90.2+ fibroblasts.

Isolation of exosomes

Exosomes can be easily isolated with MACS Technology; suitable Exosome Isolation Kits are available in our MACSmolecular portfolio. Skip time-consuming ultracentrifugation and directly isolate exosomes from, e.g., cell culture supernatants or liquid biopsies. By targeting tetraspanin CD9, CD63, CD81, or all three markers combined, the kits allow for a precise isolation of your population of interest. Moreover, the use of µ Columns and the µMACS™ Separator enables the isolation of exosomes from sample volumes as little as 0.5–2 mL. For application data, refer to figure 14.

LEARN MORE

Learn how the Exosome Isolation Kits can support your cargo RNA analysis in our application note available at

▸ **miltenyibiotec.com/exosome-RNA-cargo**

Reversible cell labeling for maximal flexibility

With REAlease® Immunomagnetic Separation Technology, target cells are positively selected using an indirect magnetic cell labeling method (fig. 10). Following cell separation, MicroBeads and REAlease Biotin Complex are gently removed, leaving the cells bead- and label free.

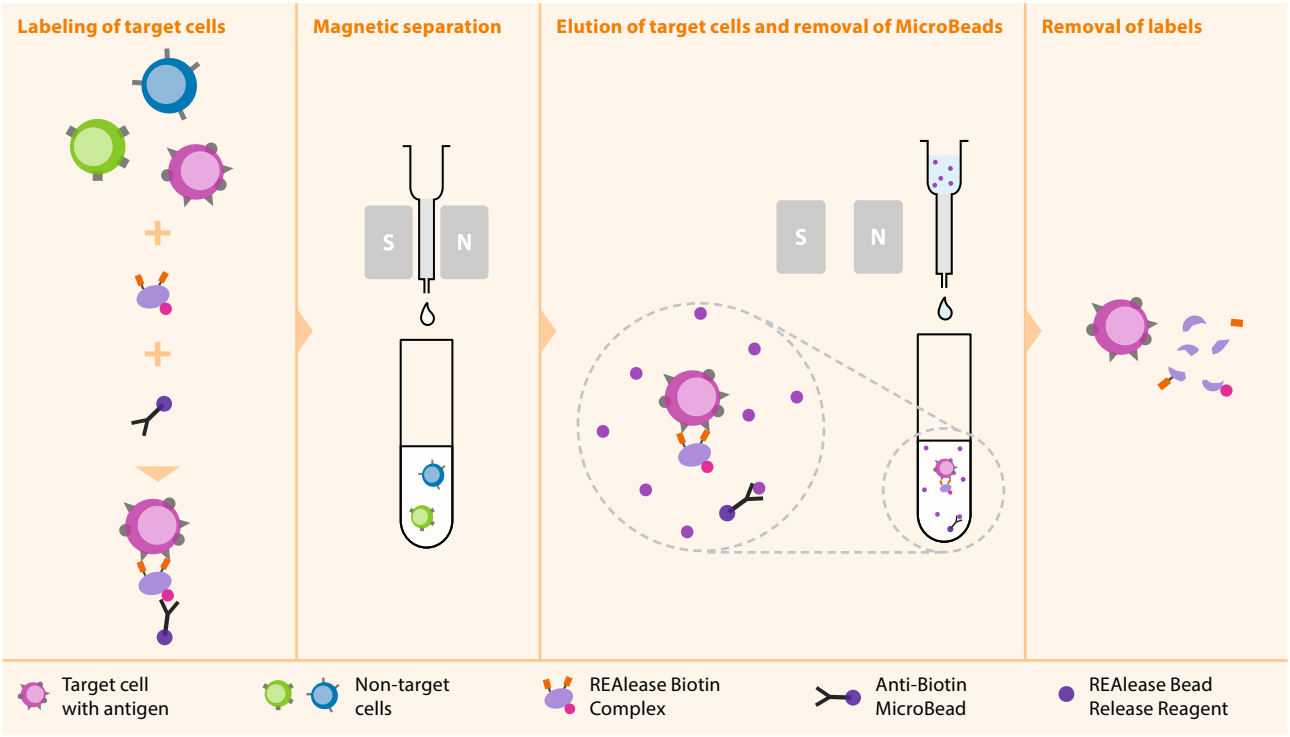


Figure 10: REAlease Immunomagnetic Separation Technology. During the separation, target cells are magnetically labeled and retained within the column, while unlabeled cells flow through. After a washing step, the column is removed from the magnetic field of the separator and target cells are eluted from the column. MicroBeads are then removed through a short incubation with the REAlease Bead Release Reagent. Optionally, the REAlease Biotin Complex can then be removed through a short incubation with the REAlease Release Reagent.

Isolation of bead- and label-free human TILs

Enrichment of human tumor-infiltrating leukocytes (TILs) using the CD45 (TIL), CD3 (TIL), CD4 (TIL), CD8 (TIL), CD4/CD8 (TIL) REAlease® MicroBead Kits results in high purities of TIL populations , comparable to our proven and trusted MACS® MicroBeads (fig. 11). Furthermore, REAlease Technology guarantees maximal flexibility for your downstream analysis, thanks to efficient removal of beads and labels above 95%, for example for:

- sequential magnetic isolation of TIL subpopulations such as
  - CD25$^+$ Treg cells after CD4$^+$ cell isolation
  - CD69$^+$ tissue-resident memory T cells after CD4$^+$/CD8$^+$ cell isolation
  - TCRγ/δ$^+$ T cells via depletion of TCRα/β$^+$ T cells after CD3$^+$ cell isolation
- consecutive MicroBead-based applications, such as dead cell removal to increase cell viability rate
- downstream phenotyping of isolated TILs

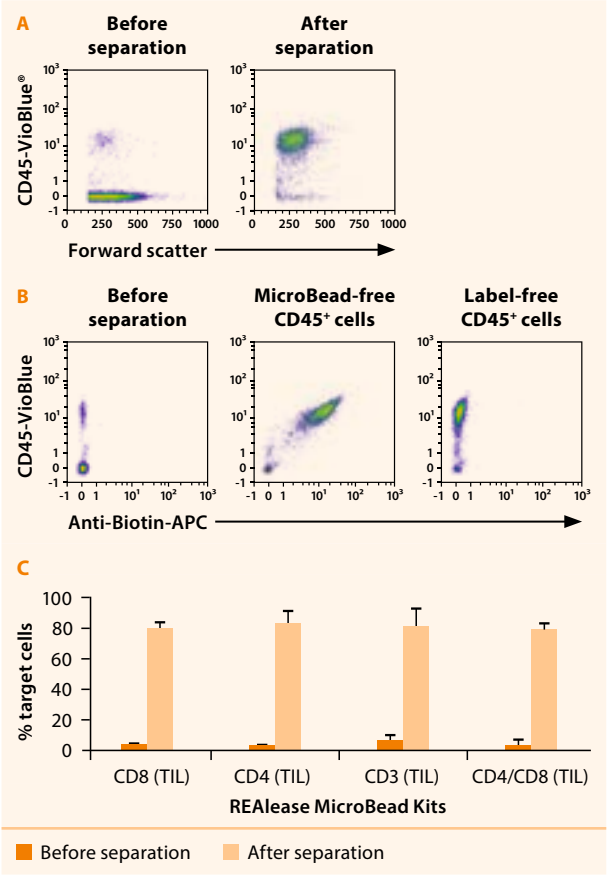
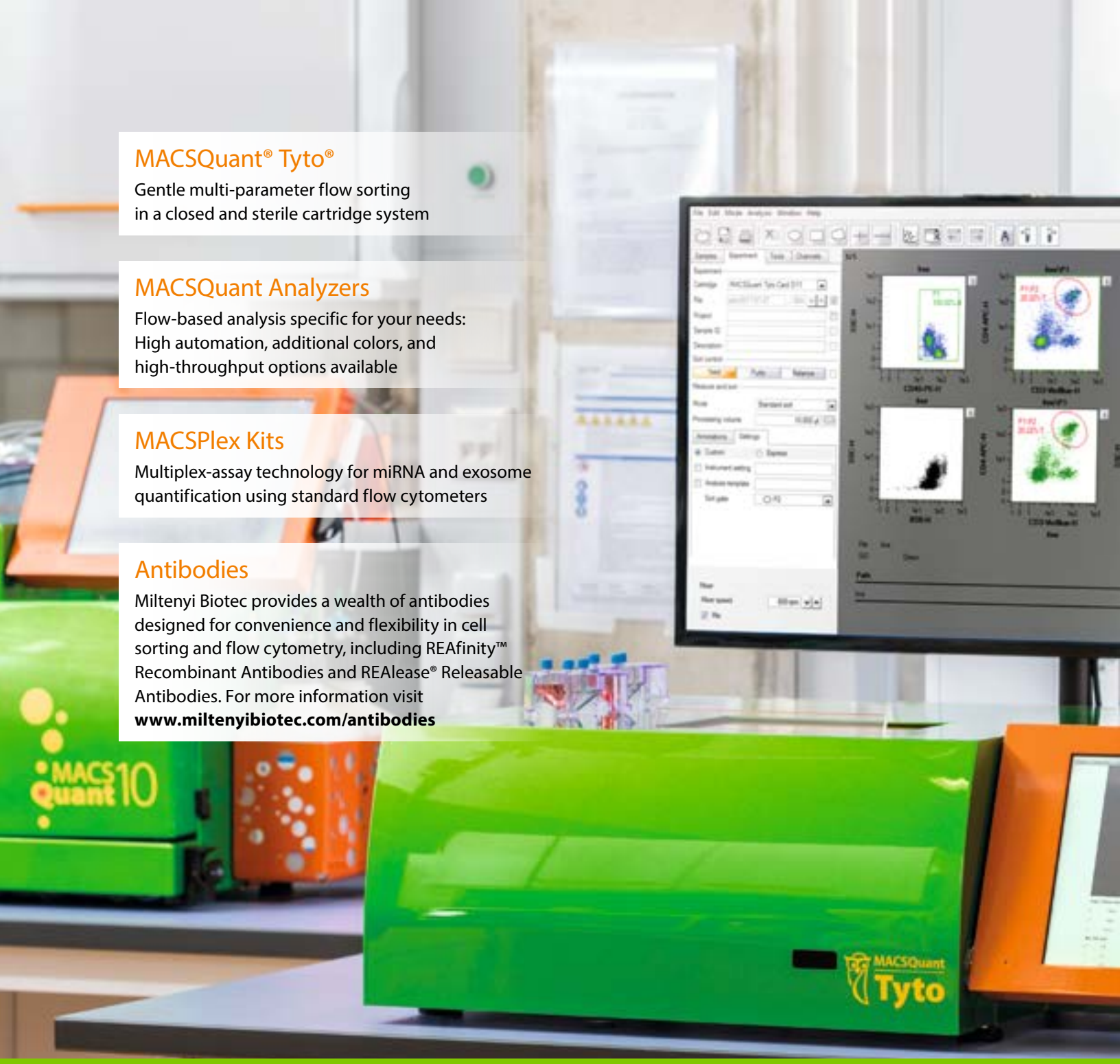


Figure 11: Effective isolation of human TILs using REAlease MicroBead Kits. Magnetic isolation of human CD45$^+$ TILs from ovarian carcinoma using REAlease CD45 (TIL) MicroBead Kit, human resulted in 89% cell purity (A). Isolated TILs were free from MicroBeads and REAlease Biotin Complexes (B). Isolation of CD8$^+$, CD4$^+$, CD3$^+$, and CD4$^+$/CD8$^+$ cells from human colorectal carcinoma using the respective REAlease (TIL) MicroBead Kits resulted in purities above 80% (C).

VISIT

Learn more about possible applications of MicroBead- and label-free TILs on our application page at

▸ **miltenyibiotec.com/til-applications**



MACSQuant® Tyto®

Gentle multi-parameter flow sorting in a closed and sterile cartridge system

MACSQuant Analyzers

Flow-based analysis specific for your needs: High automation, additional colors, and high-throughput options available

MACSPlex Kits

Multiplex-assay technology for miRNA and exosome quantification using standard flow cytometers

Antibodies

Miltenyi Biotec provides a wealth of antibodies designed for convenience and flexibility in cell sorting and flow cytometry, including REAfinity™ Recombinant Antibodies and REAlease® Releasable Antibodies. For more information visit **www.miltenyibiotec.com/antibodies**

Cell sorting and flow cytometry phenotyping

Join the flow revolution with our cell analysis solutions, offering advanced flow cytometry, flow sorting, and antibody technologies.

Gentle and sterile sequential cell sorting

The MACSQuant® Tyto® is a microchip-based benchtop sorter equipped with 3 lasers allowing for cell sorting based on up to 10 parameters. The heart of the system is the disposable MACSQuant Tyto Cartridge. This cartridge provides a fully closed and sterile sorting environment, eliminating the risk of sample contamination, carryover, or the generation of biohazardous aerosols. The gentle sorting process takes place at a very low air pressure of <3 psi, without decompression or charge applied to the cells, thereby resulting in highly viable and functional cells.

- Sort and even re-sort cells under low pressure without compromising cell viability and functionality.
- Samples are kept contamination-free within the disposable, fully closed cartridge.
- Operator-free sorting for minimal hands-on time.

- **the next step of flexibility in cell sorting**
- **label-free cells for specific downstream applications**
- **recombinantly engineered for reproducible results**

REA lease
Releasable Antibodies

Sequential sorting of TILs

The MACSQuant Tyto enables sequential and gentle sorting of TIL populations, leading to high target cell purity and viability (table 3 and fig. 12).

First sort: NK cells	%	Second sort: B cells	%
Purity	96.61	Purity	97.05
Viability	98	Viability	99.4

Table 3: Cell purities and viabilities after sequential sorting of tumor-infiltrating NK and B cells.

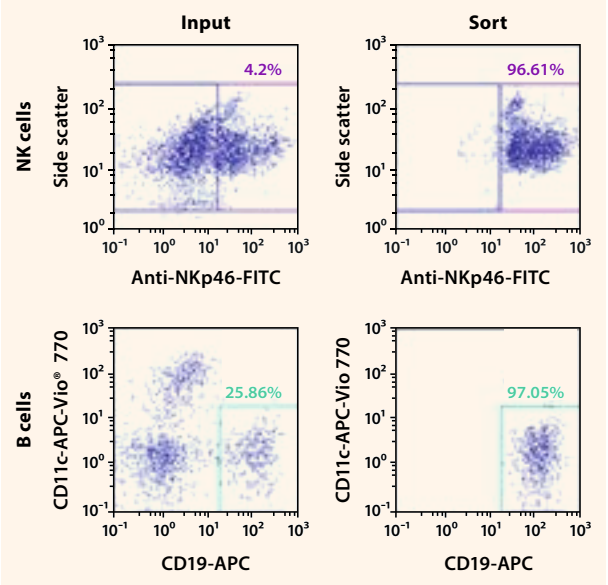


Figure 12: Sequential sorting of tumor-infiltrating NK and B cells. CT26 mouse tumor (1 g) was dissociated with the gentleMACS™ Octo Dissociator with Heaters and the Tumor Dissociation Kit, mouse and CD45⁺ TILs were pre-enriched using CD45 (TIL) MicroBeads, mouse. NK cells (CD45⁺, CD11b⁻, and anti-NKP46⁺) were sorted with the MACSQuant Tyto. The negative fraction was further sorted in a new cartridge for B cells (CD45⁺, CD11b⁻, anti-NKP46⁻, and CD19⁺). TILs were analyzed using the MACSQuant Analyzer 10.

VIDEO

Learn how microchip-based cell sorting on the MACSQuant Tyto works in our video available at

▸ **miltenyibiotec.com/tyto-cartridge**

Background-free flow cytometry analysis

REAfinity™ Antibodies are recombinant antibodies that provide superior lot-to-lot consistency and purity compared to mouse or rat hybridoma-derived monoclonal antibodies, thereby guaranteeing reproducible results. Moreover, their mutated human IgG1 Fc region eliminates tedious and costly Fc receptor blocking steps (fig. 13) and allows for one universal isotype control, thus saving costs and providing maximal convenience.

- **superior lot-to-lot consistency and purity**
- **highly specific recombinant antibodies**
- **no need for FcR blocking**
- **universal IgG1 isotype, requiring only one isotype control**

REAfinity Recombinant Antibodies

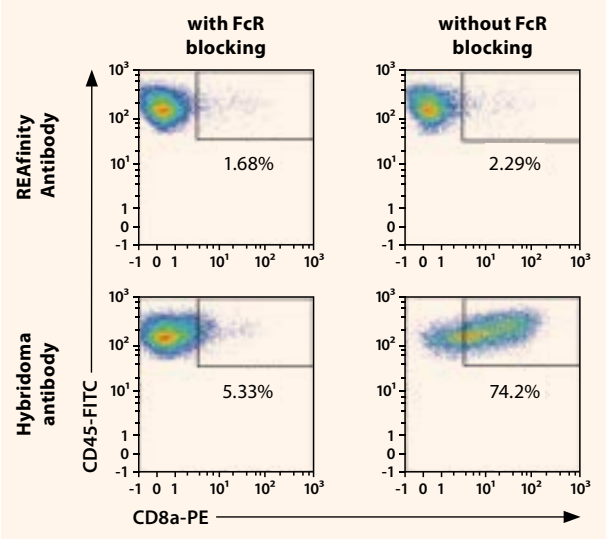


Figure 13: Background-free flow cytometry analysis of tumor cells. Tumor cells were isolated from BALB/c mice harboring H8N8 breast cancer tumors. Cells were subsequently labeled with Viobility™ 405/520 Fixable Dye, REA clones CD45-FITC, and CD3-APC, and either REA clone CD8α-PE or hybridoma clone CD8α-PE. Staining was performed in either presence or absence of FcR blocking reagent and viable $CD45^+CD3^-$ cells are shown.

LEARN MORE

Download an application note on background-free TIL analysis at

▸ **miltenyibiotec.com/til-analysis-REAfinity**

Fast screening of exosomes by flow cytometry

The MACSPlex Exosome Kit enables easy and fast screening of potential extracellular vesicle (EV) surface proteins (table 4). Isolated exosomes are incubated with 39 differently labeled MACSPlex Exosome Capture Beads each coupled to a different antibody. Exosomes bound to the beads are detected with MACSPlex Exosome Detection Reagents by flow cytometry.

- Unique multiplex bead platform allows for protein profiling of EVs by flow cytometry.
- Saves precious sample material by screening 37 surface markers simultaneously.
- Analysis of isolated EVs or EVs contained in cell culture supernatant or liquid biopsies, like plasma, urine, or ascites.

Antibody panel of the MACSPlex Exosome Kit		
Anti-HLA-ABC	CD19	CD62P
Anti-HLA-DR, DP, DQ	CD20	CD63
Anti-MCSP	CD24	CD69
Anti-ROR1	CD25	CD81
Anti-SSEA-4	CD29	CD86
CD1c	CD31	CD105
CD2	CD40	CD133/1
CD3	CD41b	CD142
CD4	CD42a	CD146
CD8	CD44	CD209
CD9	CD45	CD326
CD11c	CD49e	Mouse IgG1 Control
CD14	CD56	REA Control

Table 4: Overview of surface markers and control antibodies used for EV analysis by the MACSplex Exosome Kit.

Protein profiling of plasma EVs

Traditionally, EVs are prepared by ultracentrifugation, which is time consuming and can lead to inconclusive results in protein profiling experiments. For example, EVs isolated by ultracentrifugation show only weak fluorescence signals when analyzed with the MACSPlex Exosome Kit. In contrast, optimal results are obtained after isolating EVs with Exosome Isolation Kits prior to analysis with the MACSPlex Exosome Kit (fig. 14).

GET A POSTER

For more information download our scientific posters and application notes at

▸ **miltenyibiotec.com/exosome**

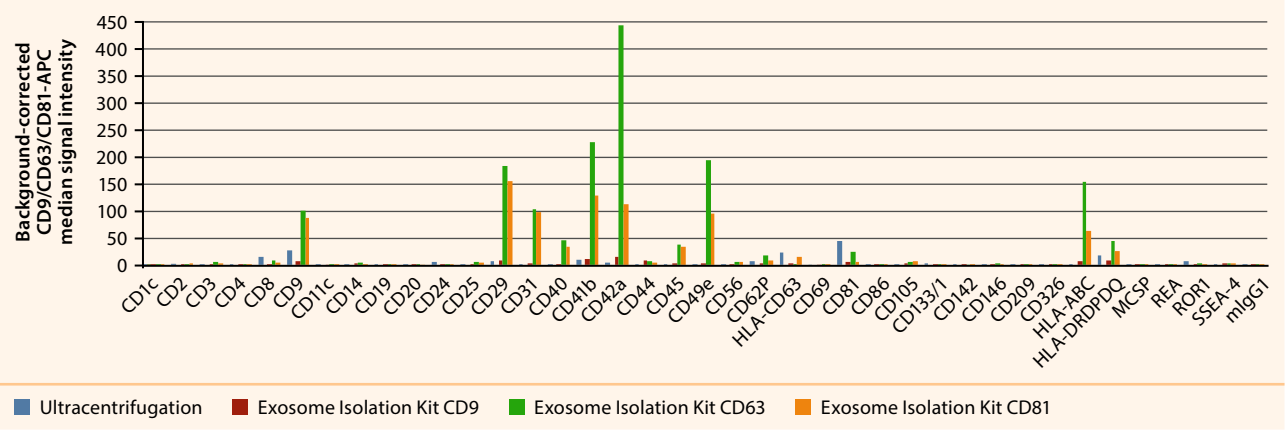


Figure 14: Surface marker profiles of EVs isolated from plasma by ultracentrifugation or immunomagnetic isolation using the Exosome Isolation Kits CD9, CD63, or CD81. EVs from 2 mL of plasma were isolated using one of the kits or by ultracentrifugation. Amounts were adjusted to a plasma volume of 2 mL and exosomes were analyzed using the MACSPlex Exosome Kit. Data indicate median APC signal intensities of isolated EVs incubated with the 39 MACSPlex Exosome Capture Beads and stained with a cocktail of CD9-, CD63-, and CD81-APC antibodies. REA and mIgG1 indicate isotype control beads. Please note: The MACSPlex Exosome Kit, human cannot be used in combination with the Exosome Isolation Kit Pan, human.

MACSima™ Imaging System

Fully automated imaging system capable of staining hundreds of markers in one sample

UltraMicroscope Blaze

Fully automated 3D fluorescence imaging of multiple or large samples

MACSwell™ Sample Carriers

Provided in three different variants to analyze any kind of fixed sample, including tissue sections, adherent, and suspension cells

MACS Clearing Kit

Fast, non-toxic, and cost-effective clearing of whole organs, like brains and tumor tissues and even entire mouse models

REAscreen™ MAX

Antibody plates that contain the latest portfolio of antibodies validated for a specific application in a ready-to-use format for effortless experiment preparation

Antibodies

Miltenyi Biotec provides a wealth of antibodies validated for imaging, including REAfinity™ Recombinant Antibodies, REAlease® Releasable Antibodies, and REAdye_lease Releasable Fluorochromes, which ensure specific staining and highly reproducible results. For more information visit **www.miltenyibiotec.com/antibodies**

Imaging of multiple markers and 3D visualizations

Visualize cancer's inner workings with MACS® Imaging and Microscopy, our innovative and cutting-edge imaging solutions to support cancer research.

Ultrahigh-content imaging of the tumor microenvironment

The MACSima™ Imaging System is a fully automated instrument based on fluorescence microscopy. Its MICS (multiparameter imaging cell screen) technology enables staining of hundreds of markers on a single sample, thanks to the principle of iterative staining, a process comprising three main steps: (i) fluorescent staining, (ii) image acquisition, and (iii) erasure of the fluorescence signal.

The MACSima Imaging Platform is therefore suitable for:

- deep phenotyping of cell populations in the tumor microenvironment
- biomarker discovery for patient stratification, companion diagnostics, or disease monitoring (fig. 15)
- drug target discovery for tissue sections, adherent cells, and cell suspensions

- **releasable fluorochromes for detection of numerous markers on a single sample**
- **functionally validated on FFPE or PFA-fixed samples**
- **recombinantly engineered for reproducible results**

REA dye lease
Releasable Fluorochromes

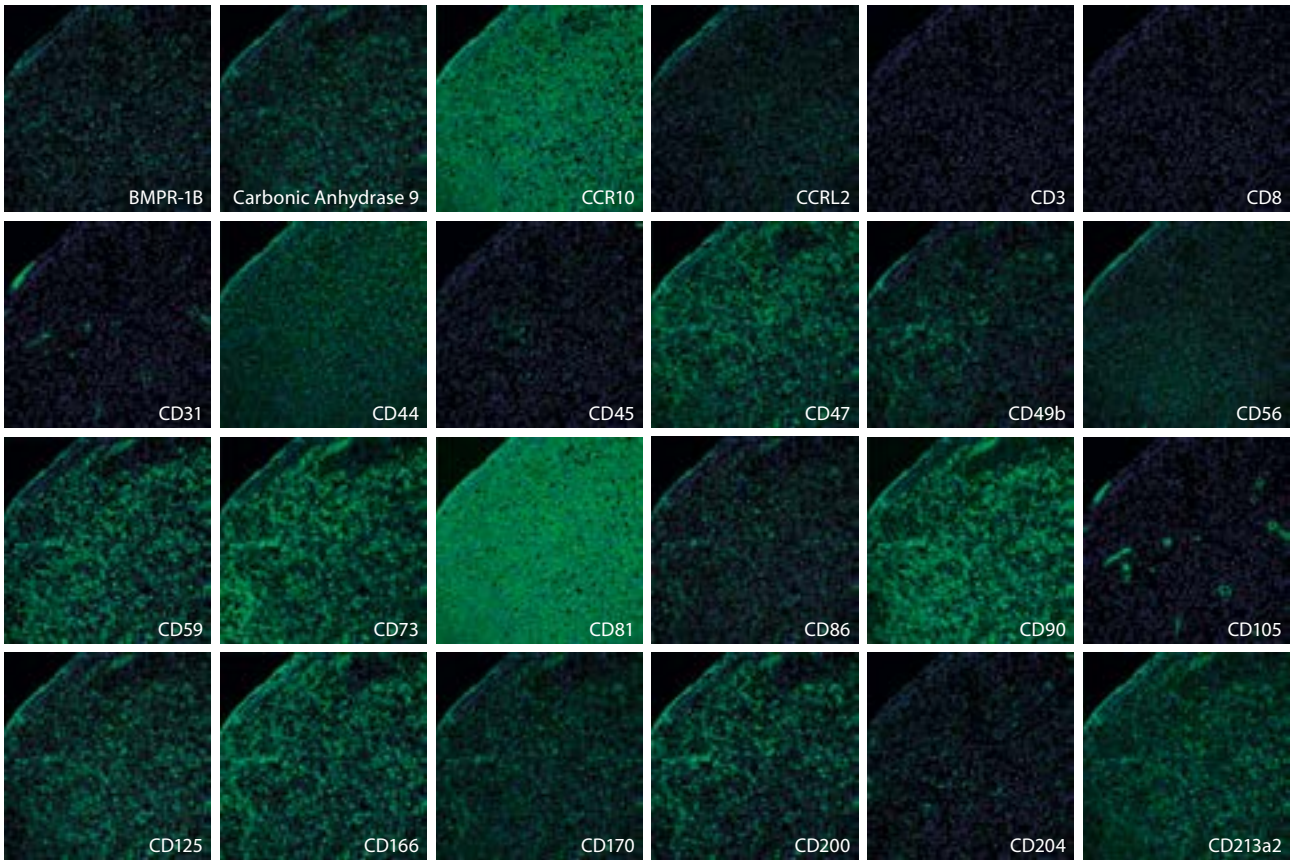


Figure 15: Identification of novel glioblastoma marker candidates. Selection of immunofluorescence images of 96 antibodies that were analyzed with the MACSima Imaging System. Clustering and correlation analysis were performed to identify novel glioblastoma-specific markers.

Visualization of whole animal models and organs

The UltraMicroscope Blaze is an automated light sheet microscope for the visualization of whole biological systems with subcellular resolution.

Image multiple tumor samples and organs, or even whole mouse models regardless of your clearing protocol and imaging solution. The fully automated system images multiple samples in one session. Simply choose the pre-set overnight program and your high-quality 3D data will be ready the next morning.

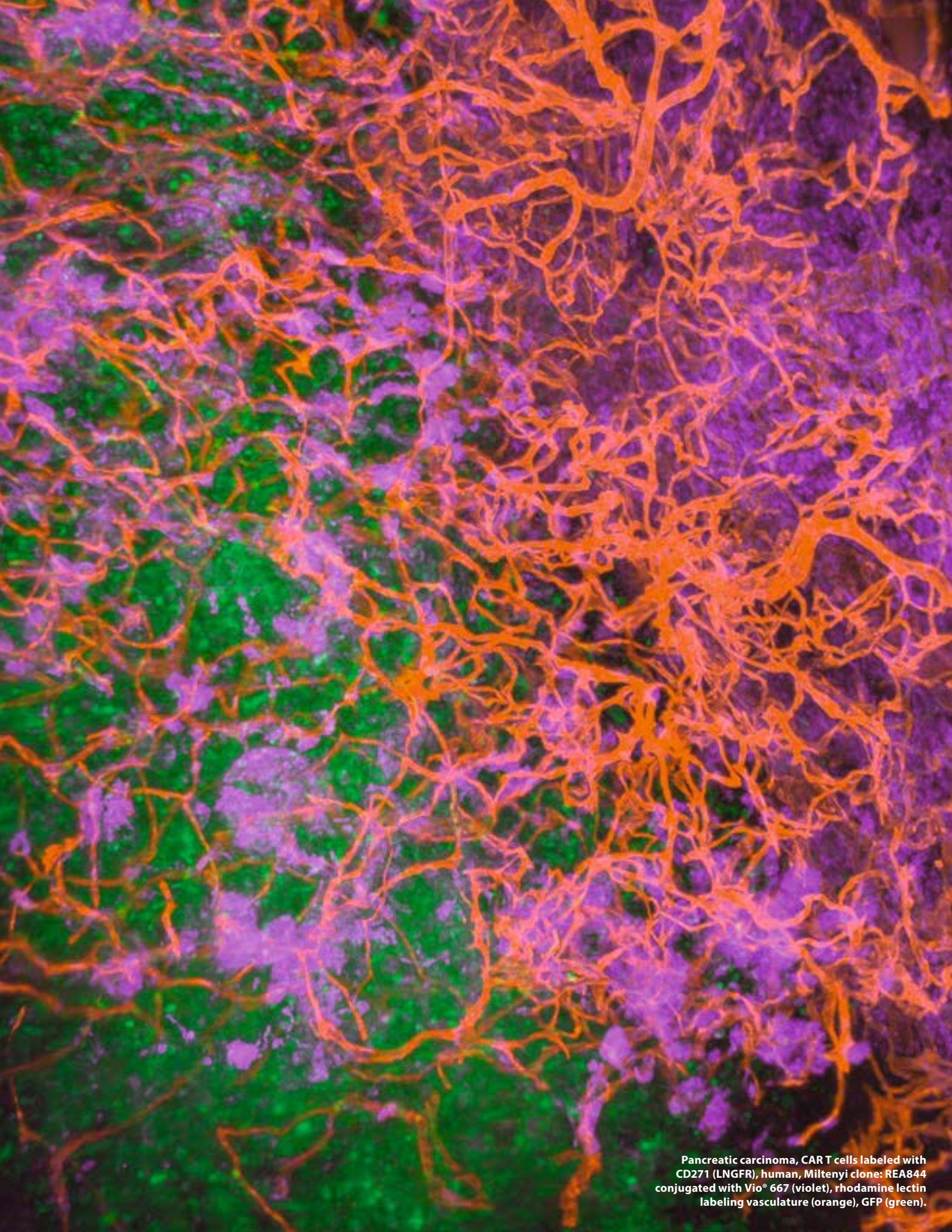
The UltraMicroscope Blaze has limitless applications in cancer research, such as:

- visualization and quantification of single-cell metastases in whole animal models and large samples
- drug target identification for cancer treatment within large tissue samples
- section-free 3D histological analysis

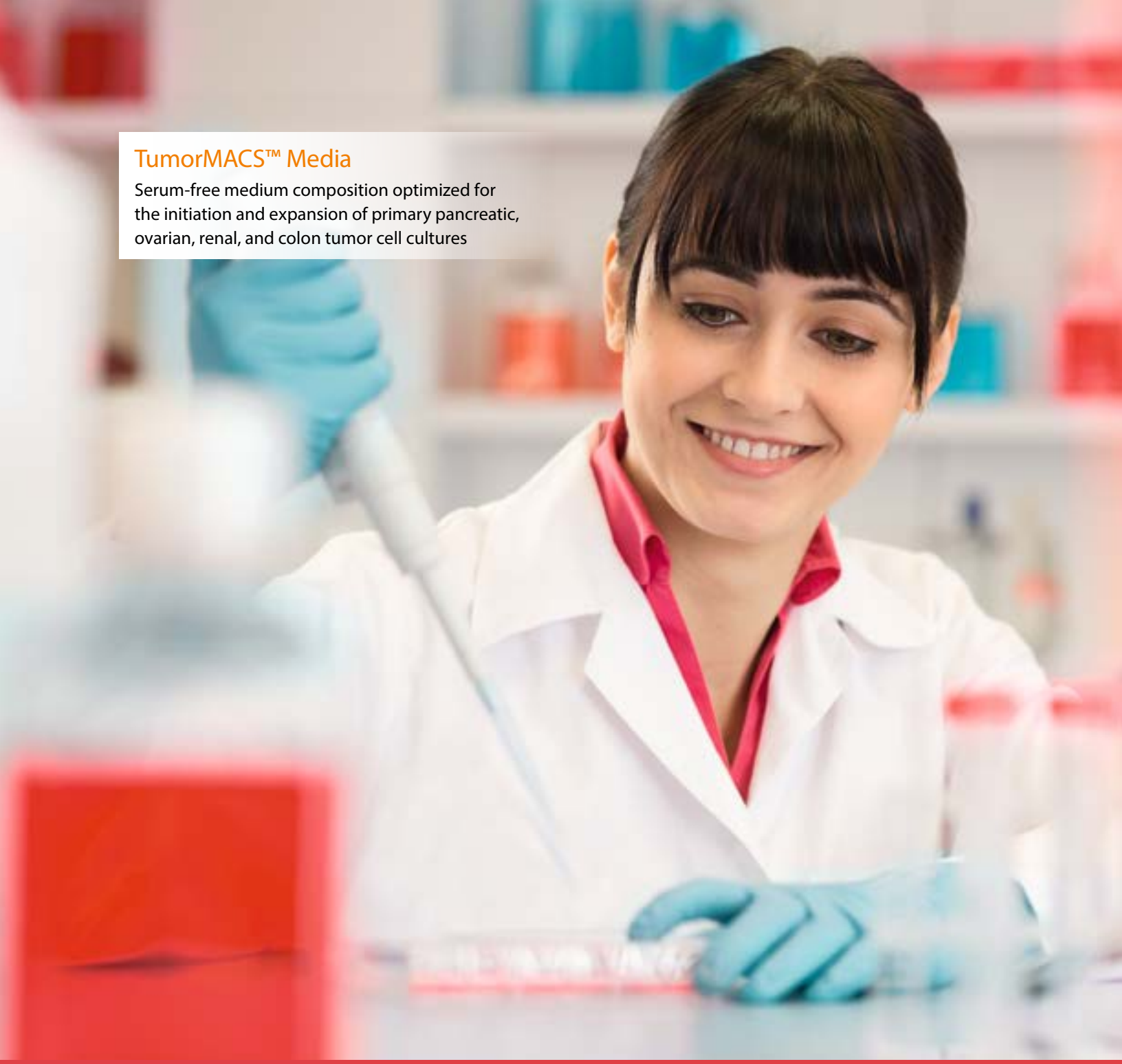
VIDEO

Learn about single-cell metastases detection and quantification in whole mice in the video abstract by Ertürk A. *et al.* from Helmholtz Zentrum München, available at

▸ **miltenyibiotec.com/metastases-imaging**



Pancreatic carcinoma, CAR T cells labeled with CD271 (LNGFR), human, Miltenyi clone: REA844 conjugated with Vio® 667 (violet), rhodamine lectin labeling vasculature (orange), GFP (green).



TumorMACS™ Media

Serum-free medium composition optimized for the initiation and expansion of primary pancreatic, ovarian, renal, and colon tumor cell cultures

Tumor cell cultivation

Cell culture is key, which is why we optimized culture conditions for tumor cells with our TumorMACS™ Media.

Cultivating primary and xenotransplanted tumor cells

Tumors derived from established cancer cell lines fail to reflect the histological and functional features of primary human tumors, making the direct comparison to primary tissue challenging.

The serum-free TumorMACS™ Media help you to generate and expand primary cell cultures from pancreatic, ovarian, renal, and colon tumors.

- Primary cell cultures retain parental tumor heterogeneity (fig. 16), tumor-initiating capacity, and genetic stability (fig. 17), thereby improving *in vitro* models for cancer research, biomarker discovery, and drug screening.
- Primary cell lines can be generated from many primary and xenotransplanted tumors.
- The stability and tumorigenicity of the primary cell lines is maintained for multiple passages.

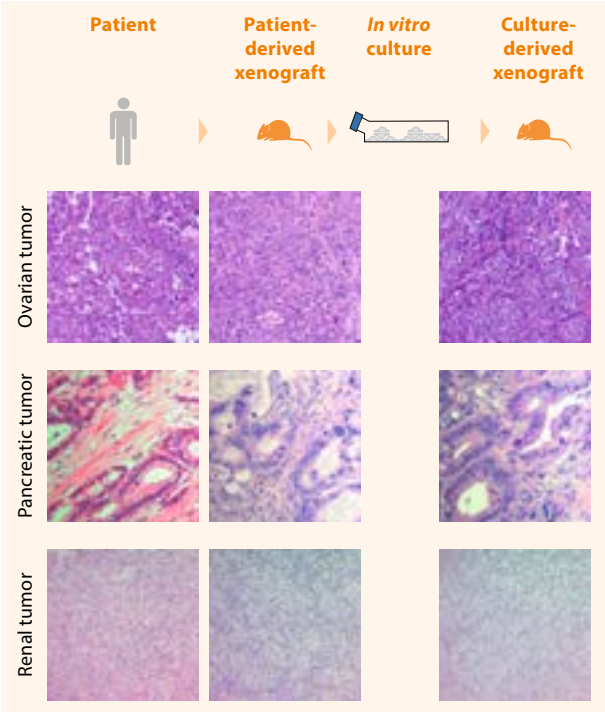


Figure 16: Primary cell cultures propagated in our TumorMACS Media closely resemble the parental tumor without the need for *in vivo* expansion. Patient-derived tumor cells were injected into mice for *in vivo* expansion. Tumor tissue was extracted from the xenograft, cultured in tumor entity–specific TumorMACS Medium over multiple passages, and reinjected into mice for the validation of tumorigenicity and comparison to the patient tumor and the patient-derived xenograft tumor.

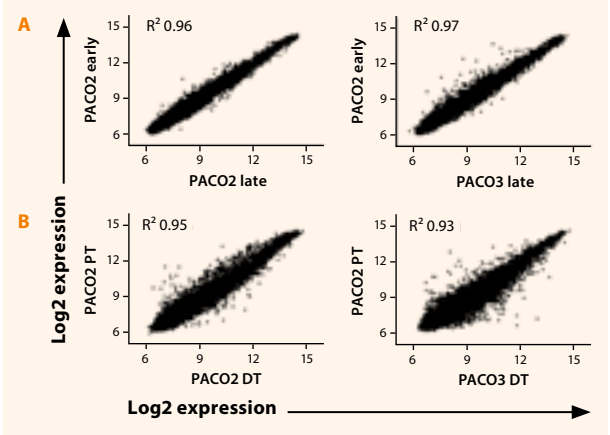


Figure 17: Cell lines generated with our TumorMACS Media are stable upon *in vitro* propagation and xenotransplantation and show preserved parental genetic features. Gene expression profiles of early (passage 5) and late (passage 15) passages of respective pancreatic cell lines were analyzed. High correlation coefficients clearly demonstrate that the global gene expression profile is maintained upon long-term cultivation in Pancreas TumorMACS Medium (A). Likewise, the high level of correlation of cell line–derived xenotransplanted tumors (DT) to the initial patient tumors (PT) shows the preservation of genetic features (B).

VISIT

Discover our guideline for the initiation of primary tumor cell cultures at

▸ **miltenyibiotec.com/tumorculture**

Product information

Tissue storage

Product	Order no.
MACS® Tissue Storage Solution	130-100-008

Tissue dissociation

Product	Order no.
Brain Tumor Dissociation Kit (P)*	130-095-942
FFPE Tissue Dissociation Kit	130-118-052
Tumor Dissociation Kit, human**	130-095-929
Tumor Dissociation Kit, mouse	130-096-730

* For the analysis of immune cells in brain tumors, use the Tumor Dissociation Kit, human or mouse.
** For human or xenograft tumors.

Enrichment of cells and exosomes

Product	Order no.
Human	
Anti-Cytokeratin MicroBeads, human	130-123-094
Anti-ErbB-2 MicroBeads, human	130-090-482
Anti-LGR5 MicroBeads, human	130-104-072
Anti-Melanoma (MCSP) MicroBeads, human	130-090-452
CD31 MicroBead Kit, human	130-091-935
CD44 MicroBeads, human	130-095-194
CD45 (TIL) MicroBeads, human	130-118-780
CD90 MicroBeads, human	130-096-253
CD133 MicroBead Kit – Tumor Tissue, human	130-100-857
CD326 (EpCAM) MicroBeads, human	130-061-101
Dead Cell Removal Kit	130-090-101
EPC Enrichment and Enumeration Kit, human	130-093-477
Exosome Isolation Kit CD9, human	130-110-913
Exosome Isolation Kit CD63, human	130-110-918
Exosome Isolation Kit CD81, human	130-110-914
Exosome Isolation Kit Pan, human	130-110-912
Mouse Cell Depletion Kit	130-104-694
REAlease® CD3 (TIL) MicroBead Kit, human	130-121-562
REAlease CD4 (TIL) MicroBead Kit, human	130-121-559
REAlease CD8 (TIL) MicroBead Kit, human	130-121-560
REAlease CD4/CD8 (TIL) MicroBead Kit, human	130-121-561
REAlease CD45 (TIL) MicroBead Kit, human	130-121-563
StraightFrom® Whole Blood CD326 (EpCAM) MicroBeads, human	130-109-827
Tumor Cell Isolation Kit, human	130-108-339

Product	Order no.
Mouse	
CD4 (TIL) MicroBeads, mouse	130-116-475
CD8 (TIL) MicroBeads, mouse	130-116-478
CD4/CD8 (TIL) MicroBeads, mouse	130-116-480
CD31 MicroBeads, mouse	130-097-418
CD45 (TIL) MicroBeads, mouse	130-110-618
CD326 (EpCAM) MicroBeads, mouse	130-105-958
Exosome Isolation Kit CD9, mouse	130-117-042
Exosome Isolation Kit CD63, mouse	130-117-041
Exosome Isolation Kit CD81, mouse	130-117-040
Exosome Isolation Kit Pan, mouse	130-117-039
Tumor-Associated Fibroblast Isolation Kit, mouse	130-116-474
Tumor Cell Isolation Kit, mouse	130-110-187

Downstream analysis

Product	Order no.
MACSPlex miRNA Kit - Cancer, human	130-106-194
MACSPlex Exosome Kit, human	130-108-813

For a complete list of antibodies and conjugates visit www.miltenyibiotec.com/antibodies

Cell culture

Product	Order no.
Ovarian TumorMACS™ Medium	130-119-483
Pancreas TumorMACS Medium	130-119-484
Renal TumorMACS Medium	130-119-482
Colon TumorMACS Medium	130-127-169

Visit our webpage for our complete cancer product portfolio and scientific resources

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