Flow Cytometry

StarBright Dyes

Build Bigger, Better Panels

StarBright Dyes

Visit bio-rad-antibodies.com/StarBright for more information.

BIO-RAD

Research without Limits

StarBright™ Dyes are unique fluorescent dyes conjugated to our highly validated immunology antibodies. Developed especially for flow cytometry.

See for yourself how StarBright Dyes can enhance your flow cytometry experiment.

The StarBright Dye Range

- 28 dyes
- Excited by 355, 405, 488, and 561 nm lasers

Improved Resolution

- Brighter than dyes with similar emission maxima
- Narrow excitation and emission spectra, creating less spillover

Easy Integration into Your Experiments

- No special buffer required
- Bead compatible
- Fixable
- Works with intracellular buffers

Reproducible Data

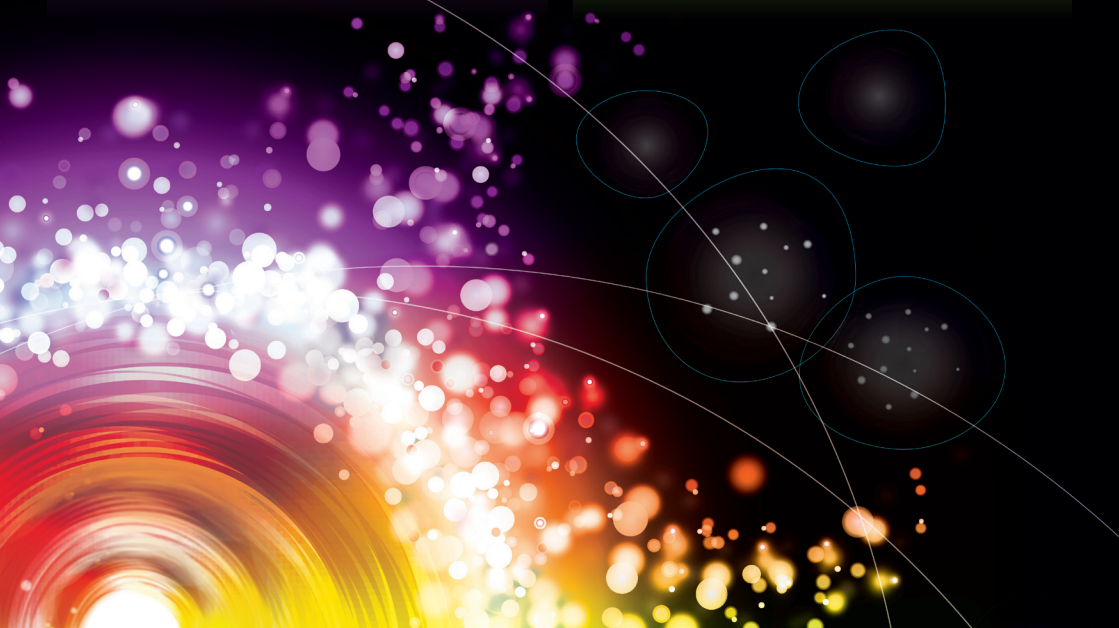
- Stable
- Consistent staining
- Premixable
- Less background

Effortless Multiplexing

- Conventional
- Full spectrum

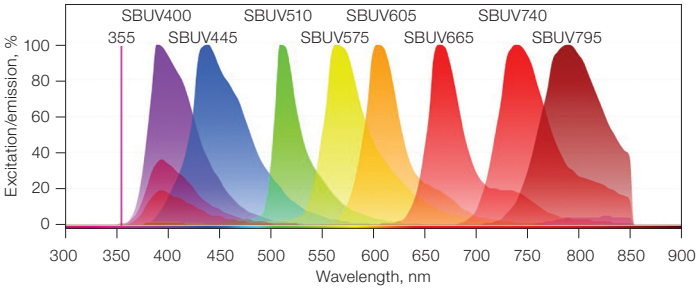
All-in-One Flow Cytometry

- Instruments
- Antibodies
- Reagents
- Expertise
- Advice

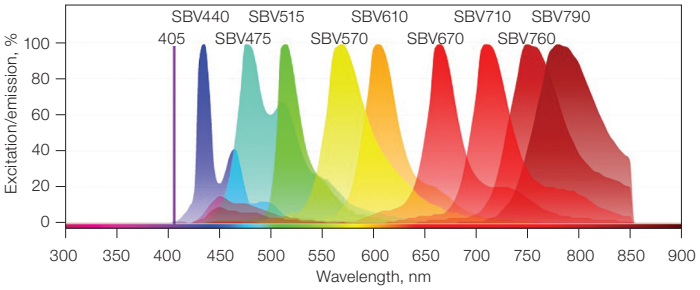


The StarBright Dye Range

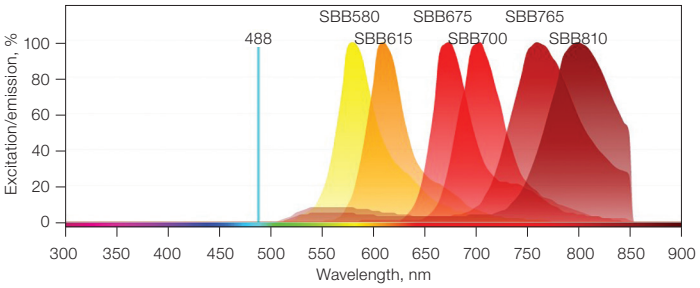
StarBright UltraViolet (SBUV) Dyes



StarBright Violet (SBV) Dyes



StarBright Blue (SBB) Dyes



StarBright Yellow (SBY) Dyes

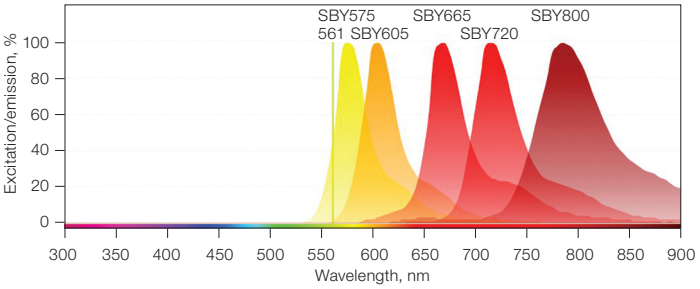


Fig. 1. Spectral traces of StarBright Dyes. Emission profiles determined by spectrophotometry for StarBright UltraViolet, Violet, Blue, and Yellow Dyes, which are excited by 355, 405, 488 and 561 nm lasers, respectively.

Improved Resolution

StarBright Dyes combine superior brightness with narrow excitation and emission spectra. These two features improve the resolution of specific cell populations and low-density antigens while minimizing signal spillover and spreading in multicolor panels. With StarBright Dyes, you can build bigger and better panels with ease.

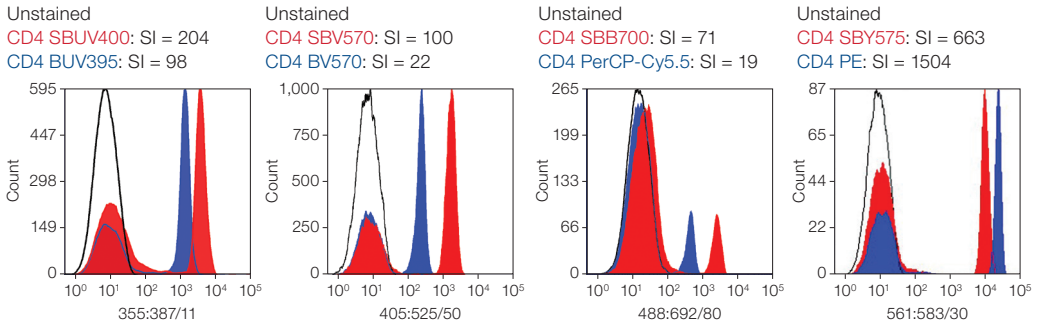


Fig. 2. StarBright Dyes are brighter than other dyes. Histograms comparing StarBright Dyes (■) and other dyes (■). BUV, Brilliant UltraViolet; BV, Brilliant Violet; Cy5.5, cyanine 5.5; PE, phycoerythrin; PerCP, peridinin chlorophyll protein; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; SBY, StarBright Yellow; SI, stain index.

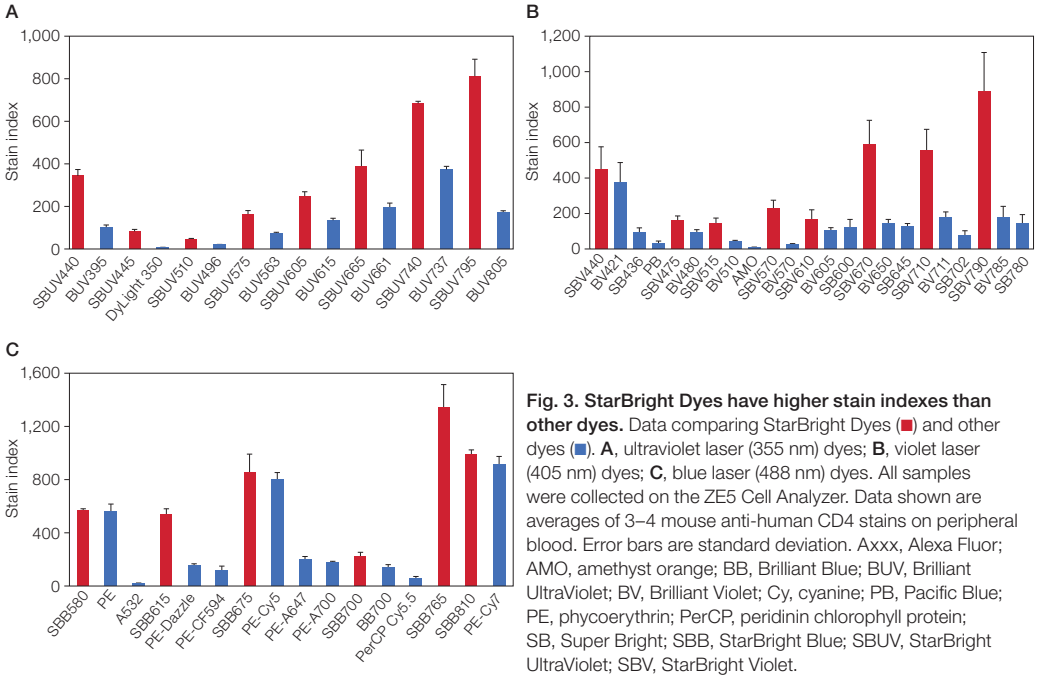


Fig. 3. StarBright Dyes have higher stain indexes than other dyes. Data comparing StarBright Dyes (■) and other dyes (■). **A**, ultraviolet laser (355 nm) dyes; **B**, violet laser (405 nm) dyes; **C**, blue laser (488 nm) dyes. All samples were collected on the ZE5 Cell Analyzer. Data shown are averages of 3–4 mouse anti-human CD4 stains on peripheral blood. Error bars are standard deviation. Axxx, Alexa Fluor; AMO, amethyst orange; BB, Brilliant Blue; BUV, Brilliant UltraViolet; BV, Brilliant Violet; Cy, cyanine; PB, Pacific Blue; PE, phycoerythrin; PerCP, peridinin chlorophyll protein; SB, Super Bright; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet.

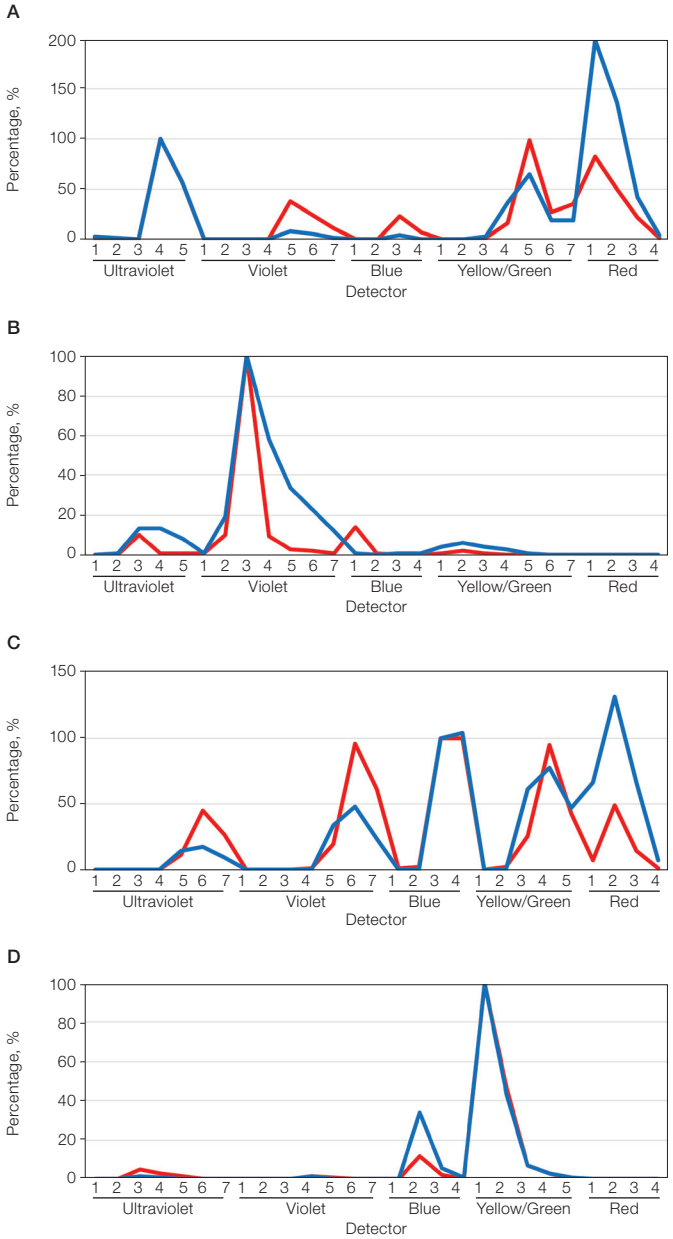


Fig. 4. StarBright Dyes have reduced cross-laser excitation and spillover compared to common dyes. These charts compare the normalized emission spectra of StarBright Dyes (—) with those of common dyes (—). **A**, SBUV665 vs. BUV661; **B**, SBV515 vs. BV510; **C**, SBB700 vs. PerCP Cy5.5; **D**, SBY575 vs. PE. In contrast to other reagents, StarBright Dyes display reduced cross-laser excitation off nonprimary lasers. Data created from CD4-stained human peripheral blood acquired on a ZE5 Cell Analyzer. BUV, Brilliant UltraViolet; BV, Brilliant Violet; Cy, cyanine; PE, phycoerythrin; PerCP, peridinin chlorophyll protein; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; SBY, StarBright Yellow.

Easy Integration into Your Experiments

StarBright Dyes fit effortlessly into your existing protocols and panels. They demonstrate similar performance with most staining protocols, fixatives, and buffers, including commercial polymer-dye–staining buffers and annexin V buffers. They are also compatible with all compensation beads.

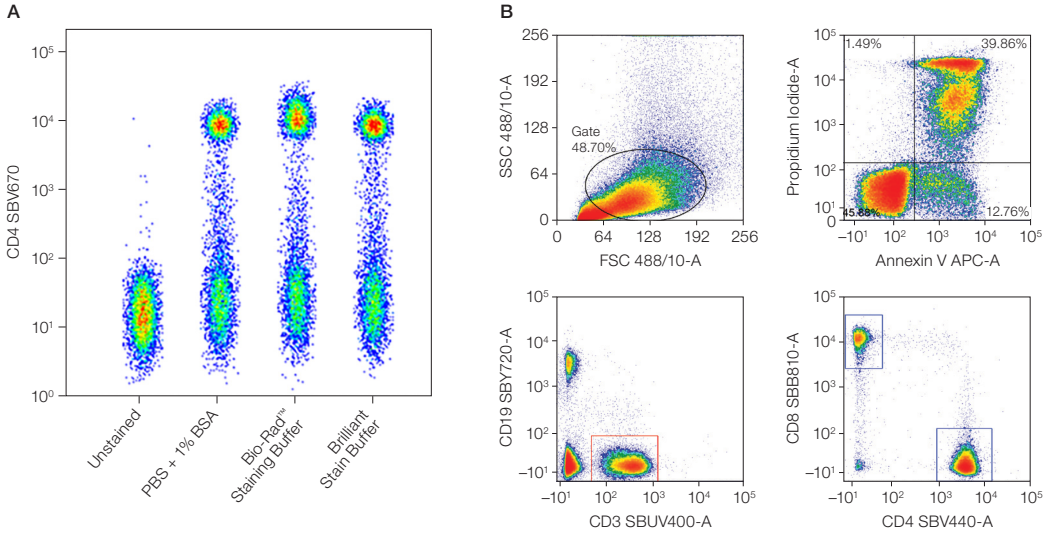


Fig. 5. StarBright Dyes retain their performance in common experiments. A, CD4SBV670 staining of human peripheral blood showing similar performance across buffers. **B**, apoptosis-induced human peripheral blood was stained with annexin APC and CD3, CD4, CD8, and CD19 antibodies. APC, allophycocyanin; BSA, bovine serum albumin; FSC, forward scatter; PBS, phosphate buffered saline; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; SBY, StarBright Yellow; SSC, side scatter.

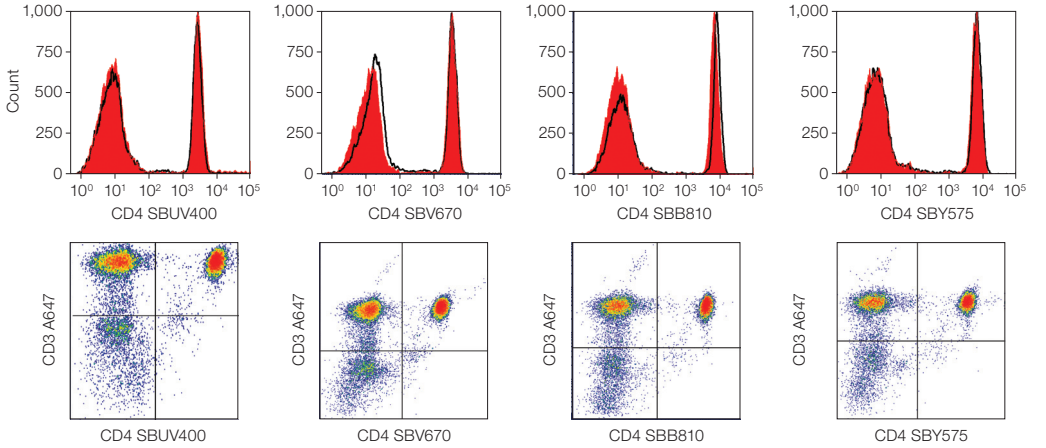


Fig. 6. Surface and intracellular staining using leucoperm buffer. Human peripheral blood stained for CD4 with or without leucoperm (histograms), and CD4 surface staining followed by intracellular CD3 staining using leucoperm as the fixation and permeabilization buffer (dot plots). All samples were collected on the ZE5 Cell Analyzer. A647, Alexa Fluor 647; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; SBY, StarBright Yellow.

VISIT BIO-RAD-ANTIBODIES.COM/STARBRIGHT FOR MORE INFORMATION.

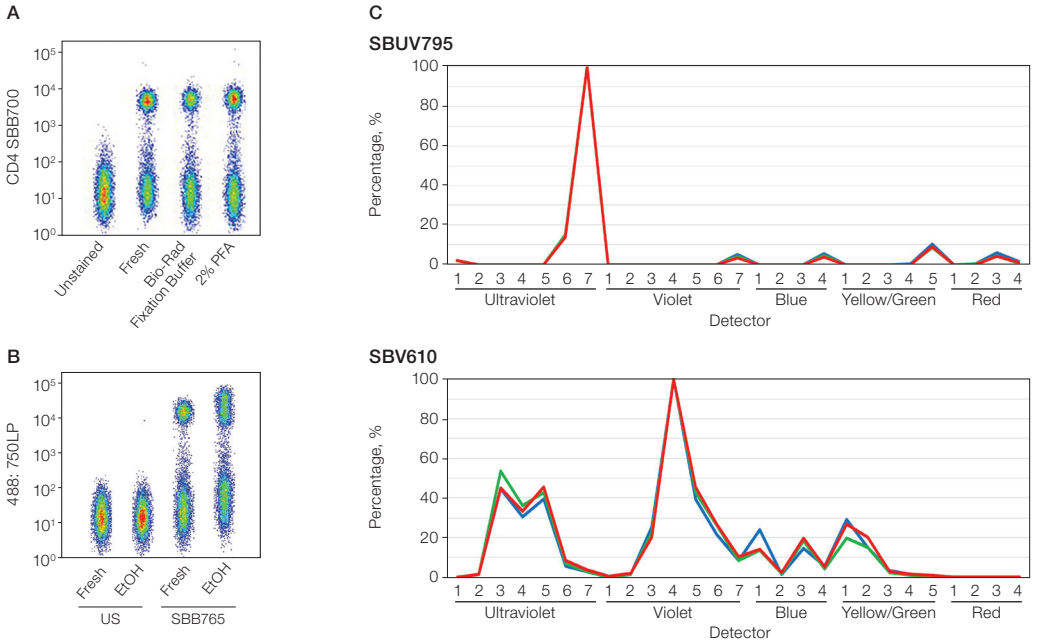


Fig. 7. StarBright Dyes retain their performance after fixation. No loss of performance was observed when samples were fixed with either **A**, PFA or **B**, alcohol-based fixatives prior to acquisition. **C**, example spectra for SBUV795 and SBV610 remained similar between fresh samples (—) and those fixed in 2 (—) or 4% PFA (—). All samples were collected on the ZE5 Cell Analyzer. EtOH, ethanol; PFA, paraformaldehyde; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; US, unstained.

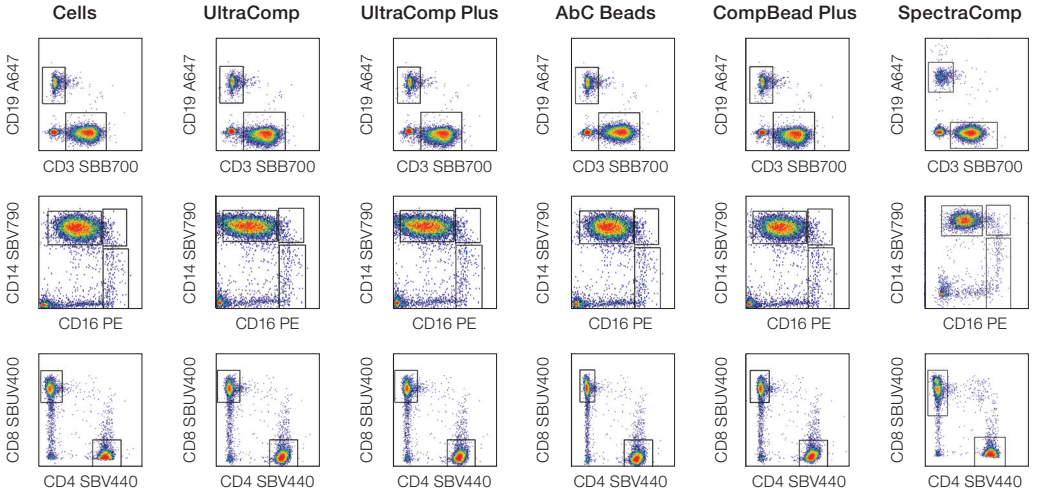


Fig. 8. StarBright Dyes are compatible with a variety of compensation beads. The choice of compensation beads used to generate the compensation matrix had little effect on the identification, population shapes, and cell numbers of T and B cells (top row), myeloid lineages (middle row), and T-cell subsets (bottom row) in an immunophenotyping panel. All samples were collected on the ZE5 Cell Analyzer. A647, Alexa Fluor 647; PE, phycoerythrin; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet.

Reproducible Data

Unlike some fluorescent dyes, StarBright Dyes are not traditional tandem dyes. This means they are stable and resistant to photobleaching with no change in spectra and can be manufactured with high lot-to-lot reproducibility. In addition, they can be premixed and have less background than some commonly used dyes.

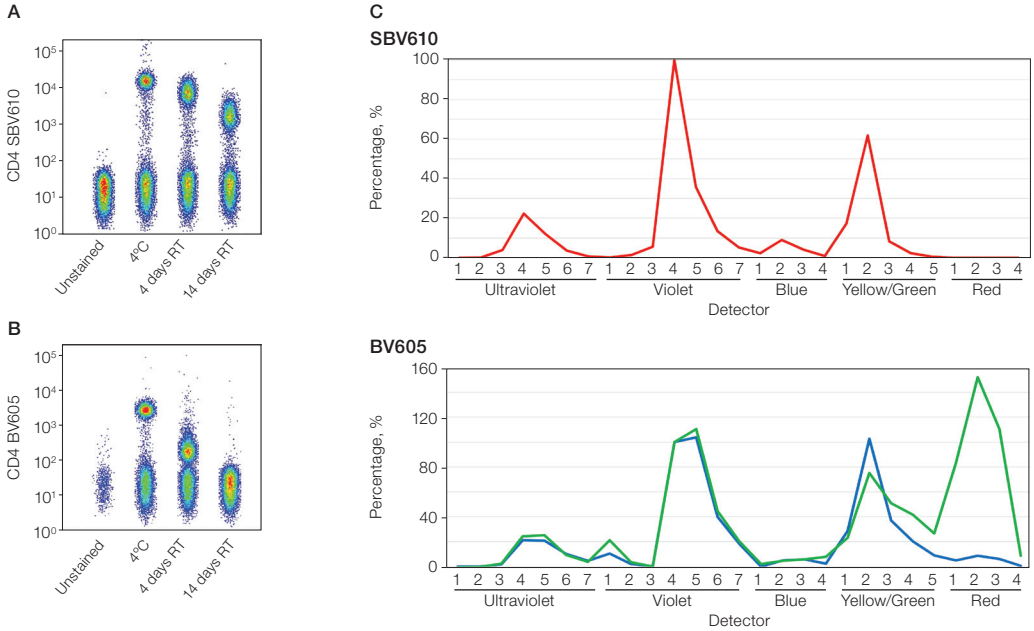


Fig. 9. StarBright Dyes are stable. 5 µl of CD4SBV610 or CD4BV605 were diluted in 50 µl staining buffer and were held for either 0, 4, or 14 days at room temperature (RT) in the light prior to staining of human peripheral blood. The reduction in brightness was less pronounced with the **A**, StarBright Dye than the **B**, comparison dye. **C**, the emission spectrum of the StarBright Dye remained unchanged between 0 (—), 4 (—), or 14 days (—) at room temperature, unlike that of the comparison dye. All samples were collected on the ZE5 Cell Analyzer. BV, Brilliant Violet; SBV, StarBright Violet.

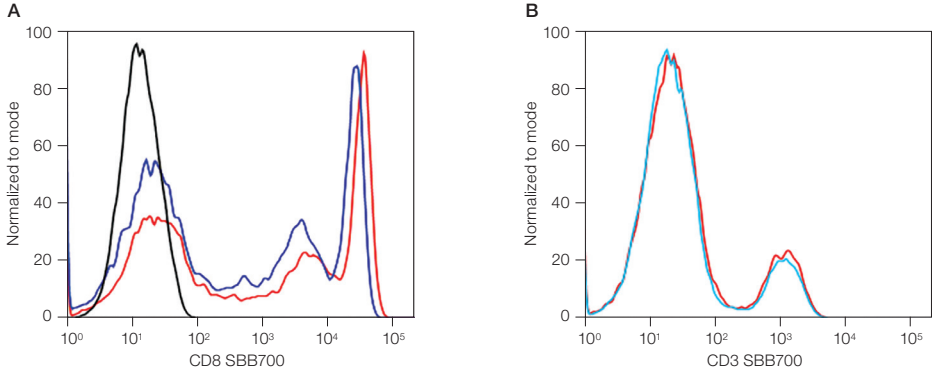


Fig. 10. StarBright Dye staining reproducible across and within lots. A, human peripheral blood stained with two different batches of CD8SBB700 (catalog #MCA1226SBB700) showing similar staining between the two batches. **B**, stability and within-lot reproducibility confirmed by staining murine peripheral blood with CD3SBB700 (#MCA500SBB700) from two different vials of the same lot, one of which was freshly opened and the other opened and stored for over 12 months at 4°C. All samples were collected on the ZE5 Cell Analyzer. SBB, StarBright Blue.

VISIT **BIO-RAD-ANTIBODIES.COM/STARBRIGHT** FOR MORE INFORMATION.

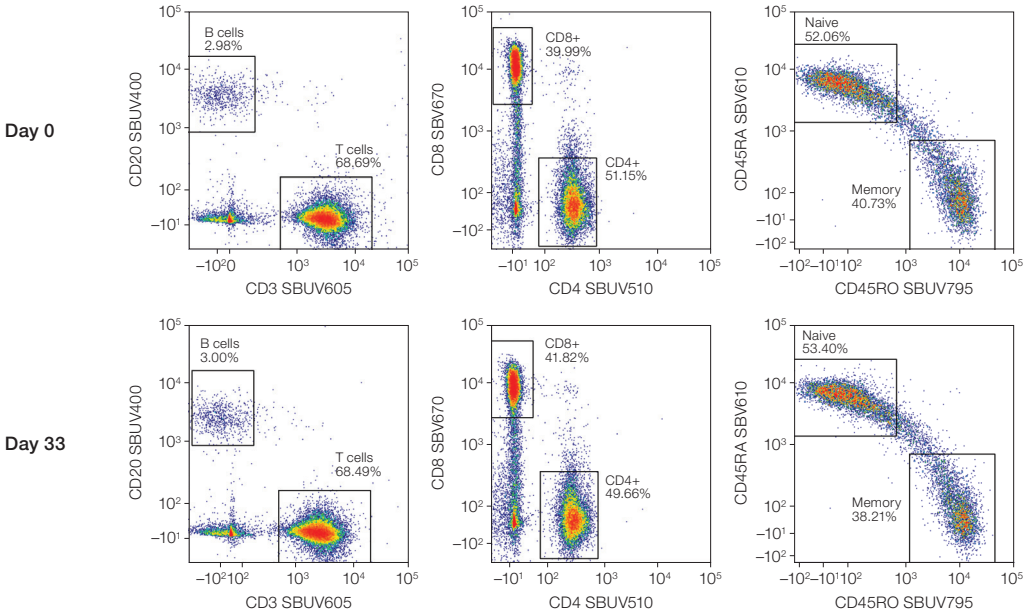


Fig. 11. Staining of human blood with a premixed StarBright Dye panel. Human peripheral blood was stained with an antibody mix consisting of StarBright UltraViolet and StarBright Violet Dyes in PBS with 1% BSA. DRAQ7 dye was added just prior to acquiring on the ZE5 Cell Analyzer. Cells were gated on live single lymphocytes and plots shown are after staining with an antibody master mix prepared fresh or kept at 4°C for 33 days. BSA, bovine serum albumin; PBS, phosphate buffered saline; SBUV, StarBright UltraViolet; SBV, StarBright Violet.

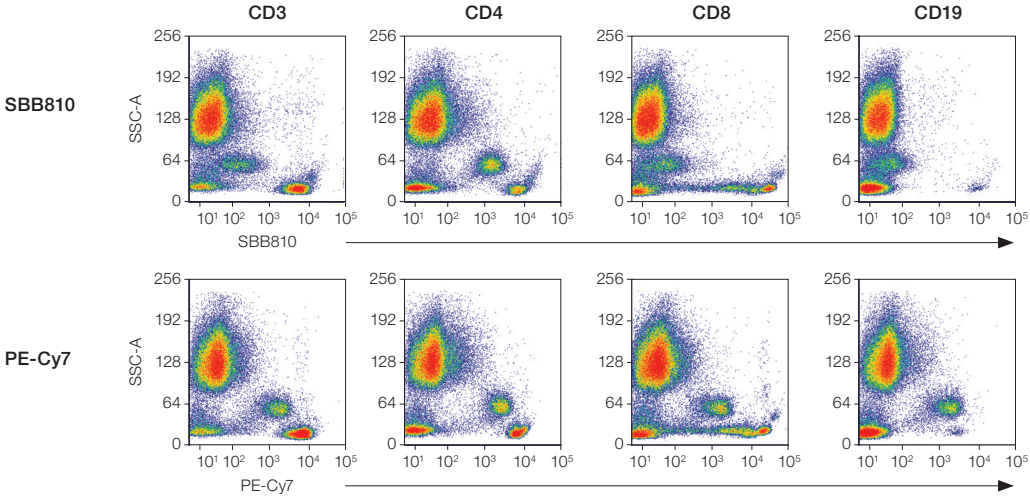


Fig. 12. StarBright Dyes produce lower background staining than PE-Cy7. Human whole blood was stained with CD3, CD4, CD8, or CD19 conjugated to SBB810 or PE-Cy7. All data obtained from the 488 nm laser, acquired on the ZE5 Cell Analyzer. Cy7, cyanine 7; PE, phycoerythrin; SBB, StarBright Blue; SSC, side scatter.

Effortless Multiplexing

StarBright Dyes were developed using the ZE5 Cell Analyzer but can be multiplexed in a panel with any dye on any instrument that has the right lasers and filters, including cell sorters. In addition, the dyes are equally compatible in full-spectrum flow cytometry, and they unlock new combinations due to their unique spectra. These features offer more flexibility when building larger panels while eliminating the need for a special buffer.

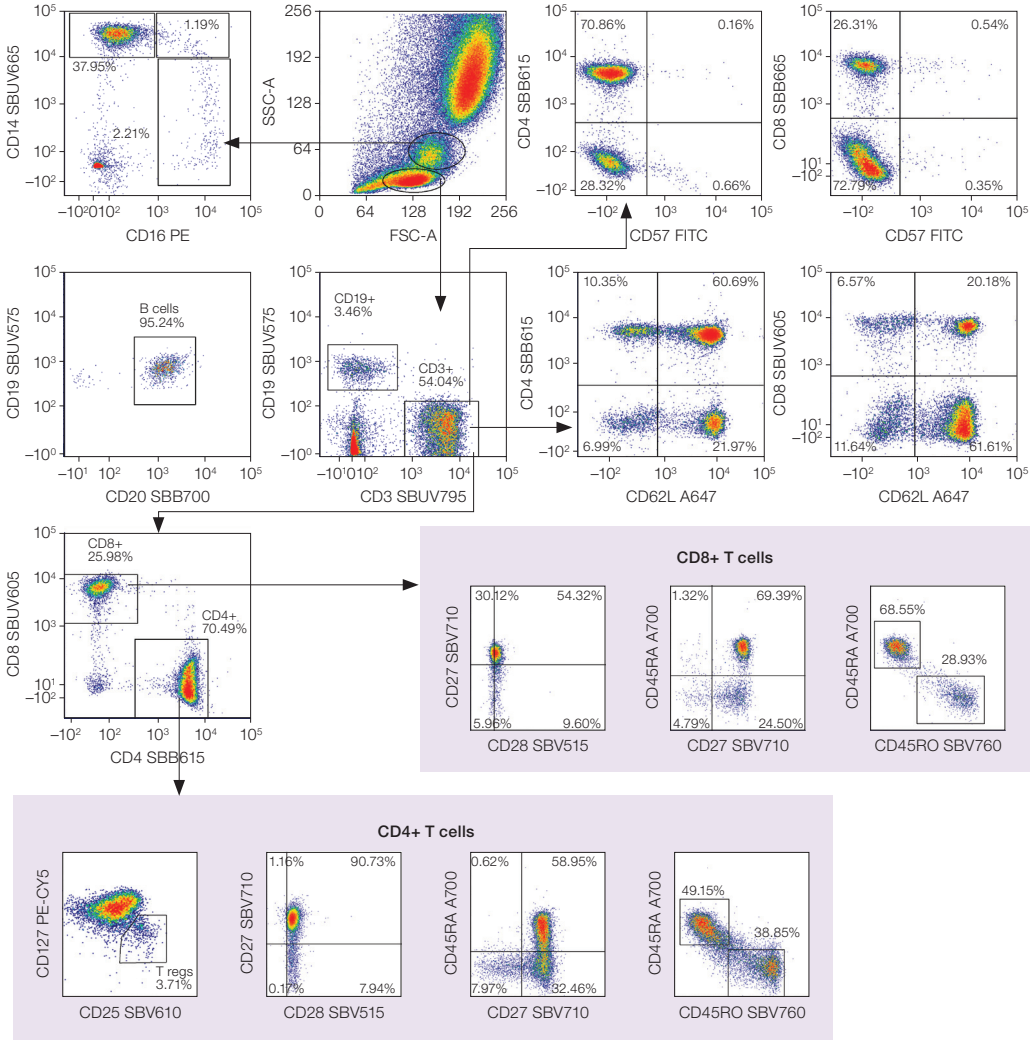
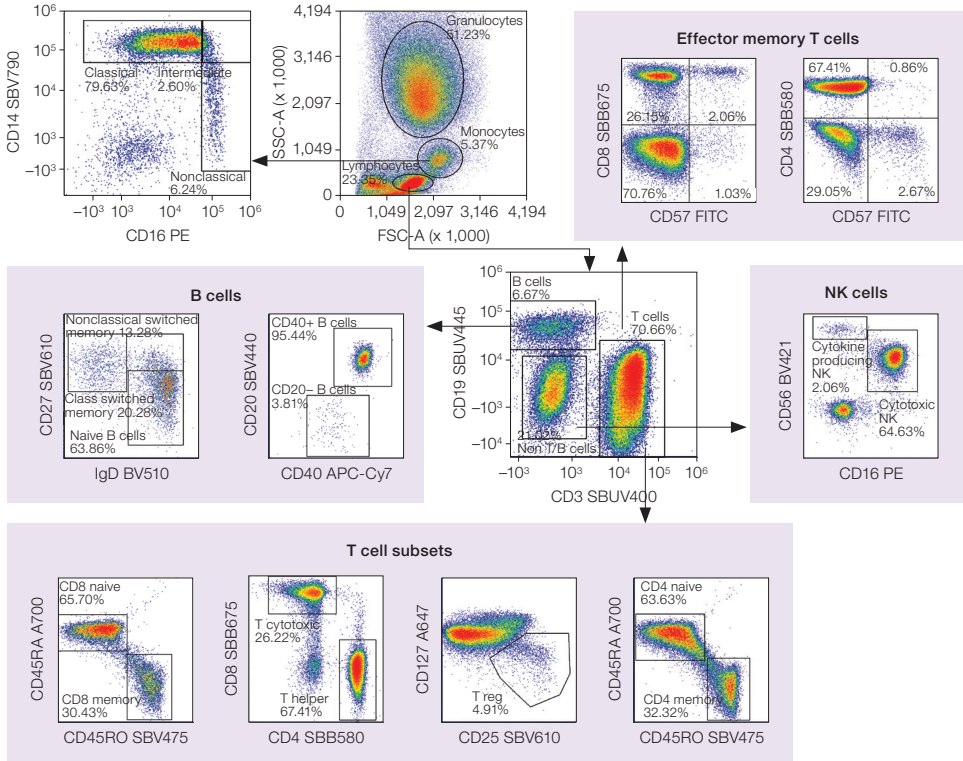


Fig. 13. StarBright Dyes allow multiplexing in conventional flow cytometers. Human peripheral blood stained with CD14SBUV665, CD16PE, CD57FITC, CD19SBUV575, CD20SBB700, CD3SBUV795, CD8SBUV605, CD4SBB615, CD62LA647, CD27SBV710, CD28SBV515, CD45RAA700, CD45ROSBV760, CD127PE-Cy5, and CD25SBV610 antibodies in PBS containing 1% BSA and acquired using a ZE5 Cell Analyzer allows identification of multiple common lineages and cell subsets. Axxx, Alexa Fluor; BSA, bovine serum albumin; Cy5, cyanine 5; FITC, fluorescein isothiocyanate; FSC, forward scatter; PBS, phosphate buffered saline; PE, phycoerythrin; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; SSC, side scatter.

VISIT **BIO-RAD-ANTIBODIES.COM/STARBRIGHT** FOR MORE INFORMATION.

A



B

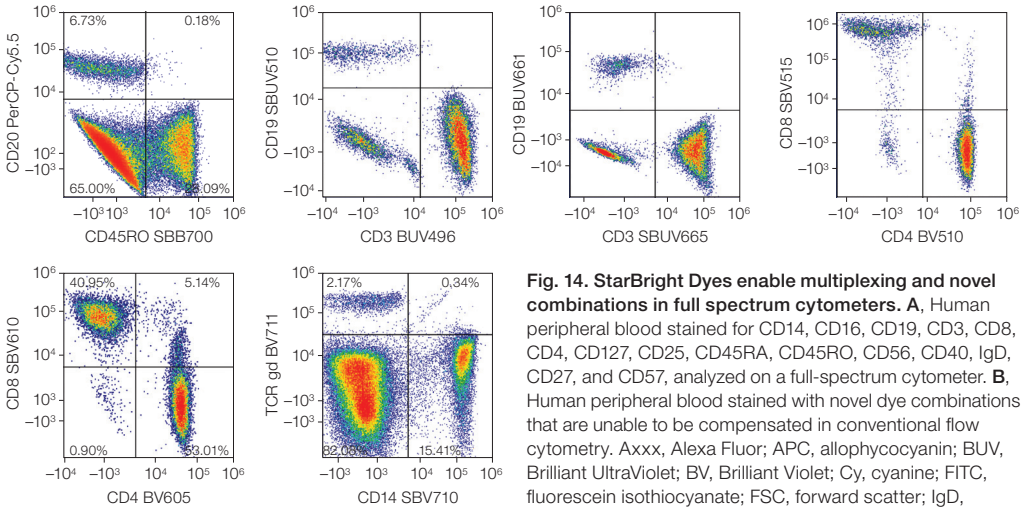
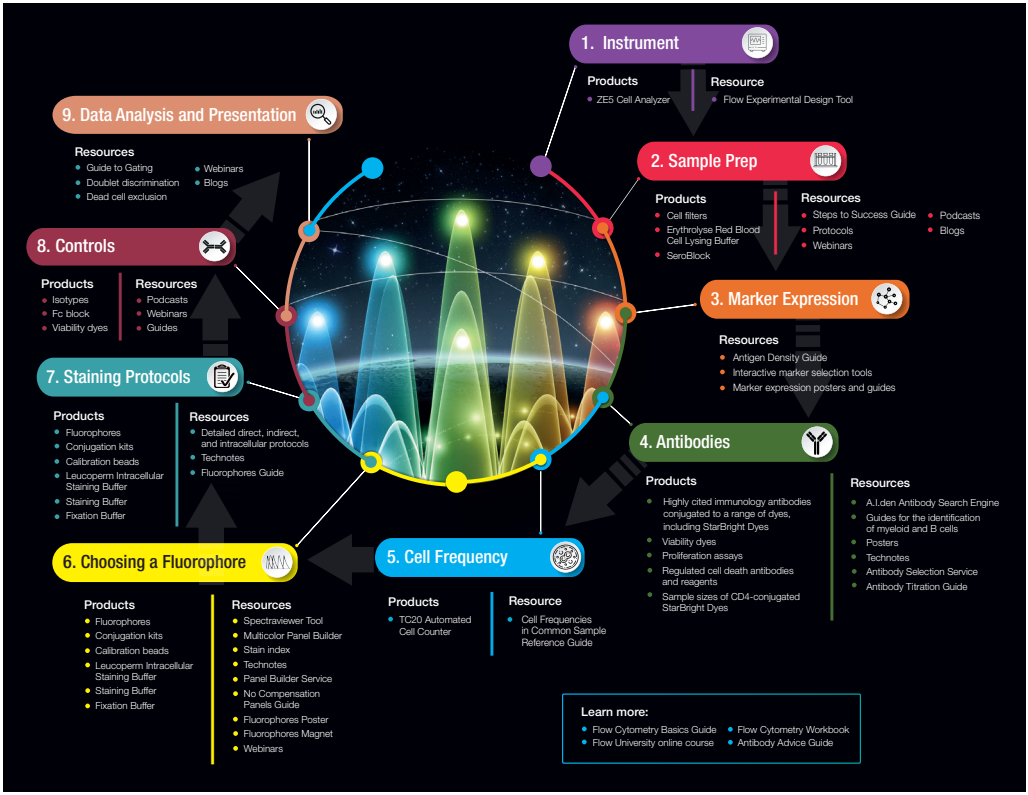


Fig. 14. StarBright Dyes enable multiplexing and novel combinations in full spectrum cytometers. A, Human peripheral blood stained for CD14, CD16, CD19, CD3, CD8, CD4, CD127, CD25, CD45RA, CD45RO, CD56, CD40, IgD, CD27, and CD57, analyzed on a full-spectrum cytometer. **B**, Human peripheral blood stained with novel dye combinations that are unable to be compensated in conventional flow cytometry. Axxx, Alexa Fluor; APC, allophycocyanin; BUV, Brilliant UltraViolet; BV, Brilliant Violet; Cy, cyanine; FITC, fluorescein isothiocyanate; FSC, forward scatter; IgD, immunoglobulin D; NK, natural killer; PE, phycoerythrin; PerCP, peridinin chlorophyll protein; SBB, StarBright Blue; SBUV, StarBright UltraViolet; SBV, StarBright Violet; SSC, side scatter.

All-in-One Flow Cytometry



Visit **bio-rad-antibodies.com/StarBright** for more information.

BIO-RAD and STARBRIGHT are trademarks of Bio-Rad Laboratories, Inc. in certain jurisdictions. All trademarks used herein are the property of their respective owner. © 2023 Bio-Rad Laboratories, Inc.

Bio-Rad Laboratories, Inc.

Life Science Group

Website *bio-rad.com* ***USA*** *1 800 424 6723* ***Australia*** *61 2 9914 2800* ***Austria*** *00 800 00 24 67 23*
Belgium *00 800 00 24 67 23* ***Brazil*** *4003 0399* ***Canada*** *1 905 364 3435* ***China*** *86 21 6169 8500*
Czech Republic *00 800 00 24 67 23* ***Denmark*** *00 800 00 24 67 23* ***Finland*** *00 800 00 24 67 23*
France *00 800 00 24 67 23* ***Germany*** *00 800 00 24 67 23* ***Hong Kong*** *852 2789 3300*
Hungary *00 800 00 24 67 23* ***India*** *91 124 4029300* ***Israel*** *0 3 9636050* ***Italy*** *00 800 00 24 67 23*
Japan *81 3 6361 7000* ***Korea*** *82 080 007 7373* ***Luxembourg*** *00 800 00 24 67 23* ***Mexico*** *52 555 488 7670*
The Netherlands *00 800 00 24 67 23* ***New Zealand*** *64 9 415 2280* ***Norway*** *00 800 00 24 67 23*
Poland *00 800 00 24 67 23* ***Portugal*** *00 800 00 24 67 23* ***Russian Federation*** *00 800 00 24 67 23*
Singapore *65 6415 3188* ***South Africa*** *00 800 00 24 67 23* ***Spain*** *00 800 00 24 67 23*
Sweden *00 800 00 24 67 23* ***Switzerland*** *00 800 00 24 67 23* ***Taiwan*** *886 2 2578 7189*
Thailand *66 2 651 8311* ***United Arab Emirates*** *36 1 459 6150* ***United Kingdom*** *00 800 00 24 67 23*

Bulletin 7394 Ver C US/EG *23-0275 0523 Sig 0123*