Description

RFP/GFP Safe-Harbor HEK293 Cell Line is a stable HEK293 cell line constitutively expressing RFP (Red Fluorescent Protein) and CopGFP (*Pontellina plumata* green fluorescent protein), which have been stably integrated into the AAVS1 safe harbor locus on chromosome 19.

Expression of RFP is driven by a CMV promoter, whereas CopGFP is driven by an EF1A promoter. The combined DNA fragment (CMV-RFP-bGH Poly A-EF1A-CopGFP-T2A-Puro-SV40 Poly A) (Figure 1) was integrated at the AAVS1 safe harbor locus using CRISPR/Cas9 technology. A monoclonal population was obtained by limiting dilution. This cell line is expected to behave like the parental HEK293 cell line.

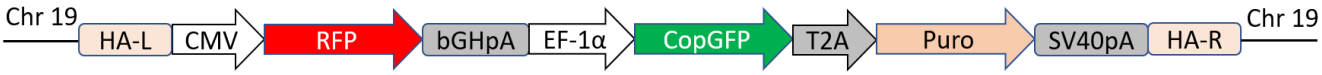


Figure 1: Transgene integration at the AAVS1 locus.

Background

AAVS1 (also known as the PPP1R12C locus) on human chromosome 19 is a well-validated "safe harbor" site for hosting DNA transgenes. AAVS1 has an open chromatin structure and is transcription competent. Most importantly, disrupting the AAVS1 locus by inserting DNA transgenes has no known adverse effects on the cells. Specifically targeting the AAVS1 locus is a major advantage compared to the random integration obtained using other approaches such as lentivirus infection or cell transfection, which may cause insertional mutagenesis or disrupt important genes or cellular processes. RFP (red fluorescent protein) is a red-orange derivative from Dsred, originally isolated from *Discosoma*, while GFP (green fluorescent protein) presents green fluorescence, and it was first identified in *Aequorea Victoria*. *Pontellina plumata* GFP (CopGFP) was later identified and is a superbright and fast maturation rate. The presence of fluorescent proteins allows for cell identification and quantification by flow cytometry or fluorescence microscopy, and localization studies *in vivo*, providing easy assay readouts.

Application

- Use as a control in cell-based assays.
- Use to introduce further modifications of interest.

Materials Provided

Components	Format
2 vials of frozen cells	Each vial contains >1 x 10^6 cells in 1 ml of Cell Freezing Medium (BPS Bioscience #79796)

Parental Cell Line

HEK293, Human Embryonic Kidney, epithelial-like cells, adherent

Mycoplasma Testing

The cell line has been screened to confirm the absence of Mycoplasma species.

Materials Required but Not Supplied

These materials are not supplied with the cell line but are necessary for cell culture and cellular assays. BPS Bioscience's reagents are validated and optimized for use with this cell line and are highly recommended for best results. Media components are provided in the Media Formulations section below.

Media Required for Cell Culture

Name	Ordering Information
Thaw Medium 6	BPS Bioscience #60183

Storage Conditions

Cells are shipped in dry ice and should immediately be thawed or stored in liquid nitrogen upon receipt. Do not use a -80°C freezer for long term storage. Contact technical support at support@bpsbioscience.com if the cells are not frozen in dry ice upon arrival.

Media Formulations

For best results, the use of validated and optimized media from BPS Bioscience is *highly recommended*. Other preparations or formulations of media may result in suboptimal performance.

Note: Thaw Media do *not* contain selective antibiotics.
Cells should be grown at 37°C with 5% CO_2. BPS Bioscience's cell lines are stable for at least 10 passages when grown under proper conditions.

Media Required for Cell Culture

Thaw Medium 6 (BPS Bioscience #60183):
DMEM medium supplemented with 10% FBS and 1% Penicillin/Streptomycin.

Cell Culture Protocol

Note: HEK293 cells are derived from human material and thus the use of adequate safety precautions is recommended.

Cell Thawing

1. Retrieve a cell vial from liquid nitrogen storage. Keep on dry ice until ready to thaw.

2. When ready to thaw, swirl the vial of frozen cells for approximately 60 seconds in a 37°C water bath. Once cells are thawed (it may be slightly faster or slower than 60 seconds), quickly transfer the entire content of the vial to an empty 50 ml conical tube.

   Note: Leaving the cells in the water bath at 37°C for too long will result in rapid loss of viability.

3. Using a 10 ml serological pipette, slowly add 10 ml of pre-warmed Thaw Medium 6 to the conical tube containing the cells. Thaw Medium 6 should be added dropwise while gently rocking the conical tube to permit gentle mixing and avoid osmotic shock.

4. Immediately spin down the cells at 300 *x g* for 5 minutes, remove the medium and resuspend the cells in 5 ml of pre-warmed Thaw Medium 6.

5. Transfer the resuspended cells to a T25 or T75 flask and incubate at 37°C in a 5% CO_2 incubator.

6. After 24 hours of culture, check for cell attachment and viability. Change medium to fresh Thaw Medium 6 and continue growing in a 5% CO_2 incubator at 37°C until the cells are ready to passage.

7. Cells should be passaged before they are fully confluent.

Cell Passage

1. Aspirate the medium, wash the cells with phosphate buffered saline (PBS) without Ca^{2+}/Mg^{2+}, and detach the cells from the culture vessel with 0.05% Trypsin/EDTA.
2. Once the cells have detached, add Thaw Medium 6 and transfer to a tube.
3. Spin down cells at 300 *x g* for 5 minutes, remove the medium and resuspend the cells in Thaw Medium 6.
4. Seed into new culture vessels at the recommended sub-cultivation ratio of 1:6 to 1:8 weekly or twice per week.

Cell Freezing

1. Aspirate the medium, wash the cells with phosphate buffered saline (PBS) without Ca^{2+}/Mg^{2+}, and detach the cells from the culture vessel with 0.05% Trypsin/EDTA.
2. Once the cells have detached, add Thaw Medium 6 and count the cells.
3. Spin down the cells at 300 *x g* for 5 minutes, remove the medium and resuspend the cells in 4°C Cell Freezing Medium (BPS Bioscience #79796) at ~2 x 10^6 cells/ml.
4. Dispense 1 ml of cell suspension into each cryogenic vial. Place the vials in an insulated container for slow cooling and store at -80°C overnight.
5. Transfer the vials to liquid nitrogen the next day for long term storage.

Note: It is recommended to expand the cells and freeze at least 10 vials at an early passage for future use.

Validation Data

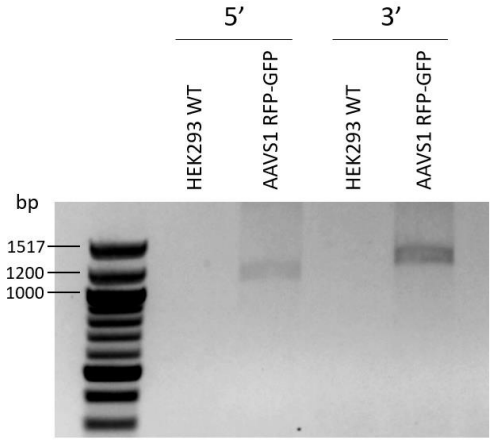
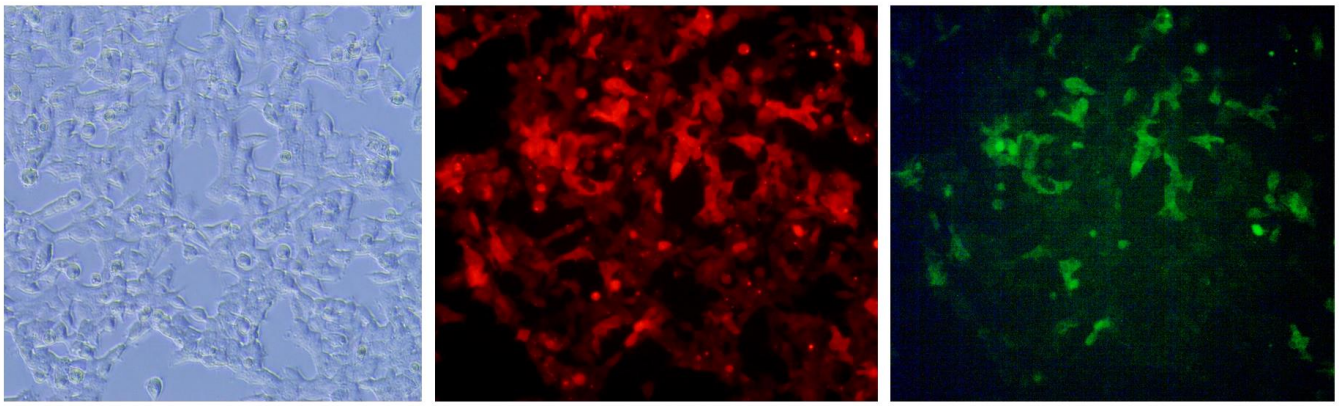


Figure 2: Stable integration into the AAVS1 safe harbor locus by PCR (polymerase chain reaction). On the 5' end of the integration, the region spanning the chromosome 19 AAVS1 locus and the beginning of the CMV RFP integration was amplified by PCR, with a predicted size of 1.1 kb. On the 3' end of the integration, the region spanning the EF1α GFP-Puro integration and the chromosome 19 AAVS1 locus was amplified by PCR, with a predicted size of 1.2 kb. Parental HEK293 cells were used as control.



White light RFP GFP

Figure 3: Expression of RFP and CopGFP in the RFP/GFP AAVS1 Safe Harbor HEK293 Cell Line by fluorescence microscopy.
RFP/GFP AAVS1 Safe Harbor HEK293 cells were observed under a 10x fluorescence microscope.

Data are representative. For lot-specific information, please contact BPS Bioscience, Inc. at info@bpsbioscience.com.

License Disclosure
Visit bpsbioscience.com/license for the label license and other key information about this product.

Notes
The CRISPR/CAS9 technology is covered under numerous patents, including U.S. Patent Nos. 8,697,359 and 8,771,945, as well as corresponding foreign patents applications, and patent rights.

Troubleshooting Guide
Visit bpsbioscience.com/cell-line-faq for detailed troubleshooting instructions. For all further questions, please email support@bpsbioscience.com.

Related Products

Products	*Catalog #*	*Size*
AP-1 Reporter – HEK293 Recombinant Cell Line (JNK signaling pathway)	60405	2 vials
PD-1 / NFAT Reporter - Jurkat Recombinant Cell Line	60535	2 vials
RFP Lentivirus	78347	500 µl x 2
Enhanced GFP Lentivirus (G418, Hygromycin and Puromycin)	78639	500 µl x 2

Version 020124