HEK293

300192

GENERAL INFORMATION

Description

The HEK293 cell line, an immortalized epithelial cell line derived from human embryonic kidney cells in the 1970s by Alex van der Eb at the University of Utrecht, has become a pivotal experimental model in molecular biology and biotechnological applications due to its remarkable versatility and ease of genetic manipulation.
The transformation of the HEK293 cell line involved the integration of a specific segment from Adenovirus 5 DNA, embedding the adenoviral E1A and E1B genes within the cellular genome. The adenoviral DNA modification enabled the cell lines' ability to uptake foreign DNA efficiently, a feature known as high transfection efficiency. The integration of viral DNA into the HEK293 cell genome resulted in cellular immortalization and significantly enhanced the utility of these cells in biotechnological applications by facilitating the stable incorporation and expression of exogenous DNA, a process termed stable transfection. This capability allows for the persistent presence and function of foreign genes within the cells, making HEK293 an invaluable tool for genetic studies and biotechnology.
As a result, HEK293 cells have become a fundamental resource in biotechnology for the production of recombinant proteins, including vital therapeutic proteins, and serving as robust host cells for the generation of viral vectors, particularly adenoviral and lentiviral vectors. HEK 293 cells are pivotal in the pharmaceutical industry for high-throughput screening assays, the manufacture of gene therapies targeting specific genes related to single gene disorders, and adenoviral infection studies.
In industrial biotechnology, the utility of the human cell line HEK293 extends to recombinant enzyme production, viral vector production, such as adenoviral vectors, protein production and the development of biosensors. Toxicology research benefits from the application of the HEK cell line in assessing the impacts of chemicals on cell biology, including the effects on typical kidney cells and the potential for gene therapies. The ability of the immortal cell line HEK293 to efficiently produce native proteins highlights their essential role in medical research, including cancer research and exploring the foundations of gene therapy.
HEK293 cells offer a unique platform for studying cell biology and proteins of interest, surpassing other cell lines in versatility and utility in both research and industrial applications. In comparison, HEK293T cells, a variant of HEK293, are modified to enhance transfection efficiency, HEK293F cells are adapted for suspension culture to facilitate large-scale protein production, and other mammalian cell lines such as Vero cells, derived from monkey kidney tissue, are primarily utilized in vaccine development and viral studies.

Tissue	Kidney

Applications

Transfection host

Synonyms

- Hek293
- HEK-293
- HEK/293
- HEK 293
- HEK
- 293
- 293
- 293 HEK
- 293 Ad5
- Human Embryonic Kidney 293

CLASSIFICATION

Organism	Human
Sex	Female
Growth properties	Adherent

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GMO status	GMO-S1

GMO status details

GMO-S1: This HEK293 embryonic kidney-derived cell line contains adenovirus-5 E1A/E1B sequences due to transformation but does not release infectious virus, enabling high proliferative capacity. The modification is stably present in embryonal kidney cells. This classification applies only within Germany and may differ elsewhere.

Biosafety level	1

CHARACTERISTICS

Morphology	Epithelial-like
Tumourigenic	In nude mice
Ploidy status	30% of HEK293 cells have hypotriploid karyotypes with 64 modal chromosomes. Higher ploidies were found in 4.2% of cells.
Doubling time	30 hours

IDENTIFIERS

Citation

HEK293 (Cytion catalog number 300192)

NCBI TaxID	9606
Cellosaurus	CVCL_0045

EXPRESSION AND SUSCEPTIBILITY

Receptors expressed

Vitronectin

Protein expression

CEA negative, p53 positive

Virus susceptibility

Transformed with adenovirus 5 DNA
adenovirus 5 DNA

HANDLING AND CULTURE

Culture medium

EMEM (MEM Eagle), w: 2 mM L-Glutamine, w: 2.2 g/L NaHCO3, w: EBSS (Cytion article number 820100a)

Incubation atmosphere	37°C, 5% CO_2, humidified atmosphere.

Supplements

Supplement the medium with 10% FBS and 1% NEAA

Dissociation reagent	Accutase

Subculturing

Remove the old medium from the adherent cells and wash them with PBS that lacks calcium and magnesium. For T25 flasks, use 3-5 ml of PBS, and for T75 flasks, use 5-10 ml. Then, cover the cells completely with Accutase, using 1-2 ml for T25 flasks and 2.5 ml for T75 flasks. Let the cells incubate at room temperature for 8-10 minutes to detach them. After incubation, gently mix the cells with 10 ml of medium to resuspend them, then centrifuge at 300xg for 3 minutes. Discard the supernatant, resuspend the cells in fresh medium, and transfer them into new flasks that already contain fresh medium.

Seeding density	1 x 10^4 cells/cm^2 will yield in a confluent layer in about 4 days.
Fluid renewal	2 times per week
Post-thaw recovery	After thawing, plate the cells at 5 x 10^4 cells/cm^2 and allow the cells to recover from the freezing process and to adhere for at least 24 hours.

Thawing and culturing

Confirm that the vial remains deeply frozen upon delivery, as cells are shipped on dry ice to maintain optimal temperatures during transit.
Upon receipt, either store the cryovial immediately at temperatures below -150°C to ensure the preservation of cellular integrity, or proceed to step 3 if immediate culturing is required.
For immediate culturing, swiftly thaw the vial by immersing it in a 37°C water bath with clean water and an antimicrobial agent, agitating gently for 40-60 seconds until a small ice clump remains.
Perform all subsequent steps under sterile conditions in a flow hood, disinfecting the cryovial with 70% ethanol before opening.
Carefully open the disinfected vial and transfer the cell suspension into a 15 ml centrifuge tube containing 8 ml of room-temperature culture medium, mixing gently.
Centrifuge the mixture at 300 x g for 3 minutes to separate the cells and carefully discard the supernatant containing residual freezing medium.
Gently resuspend the cell pellet in 10 ml of fresh culture medium. For adherent cells, divide the suspension between two T25 culture flasks; for suspension cultures, transfer all the medium into one T25 flask to promote effective cell interaction and growth.
Adhere to established subculture protocols for continued growth and maintenance of the cell line, ensuring reliable experimental outcomes.

QUALITY CONTROL AND CRYOPRESERVATION

Sterility

Mycoplasma contamination is excluded using both PCR-based assays and luminescence-based mycoplasma detection methods.
To ensure there is no bacterial, fungal, or yeast contamination, cell cultures are subjected to daily visual inspections.

Freeze medium	As a cryopreservation medium, we use complete growth medium (including FBS) + 10% DMSO for adequate post-thaw viability, or CM-1 (Cytion catalog number 800100), which includes optimized osmoprotectants and metabolic stabilizers to enhance recovery and reduce cryo-induced stress.

Storage conditions

For long-term preservation, place vials in vapor-phase liquid nitrogen at about −150 to −196 °C. Storage at −80 °C is acceptable only as a short interim step before transfer to liquid nitrogen.

Shipping conditions

Cryopreserved cell lines are shipped on dry ice in validated, insulated packaging with sufficient refrigerant to maintain approximately −78 °C throughout transit. On receipt, inspect the container immediately and transfer vials without delay to appropriate storage.

DONOR

Donor age	Fetus

LEGAL AND SAFETY

Safety precautions

When planning to store a cryovial in liquid nitrogen for future thawing, it is mandatory to adhere to stringent safety measures. Appropriate protective gloves and clothing are essential, and the use of a face mask or safety goggles is required during the transfer of frozen samples to or from the liquid nitrogen tank. This is to mitigate the risk of injury from potential cryovial explosions upon removal, which can result in the projection of sharp fragments.

Warranty

At Cytion, we stand behind the quality and viability of our products.
We guarantee that our cells will be viable at the start of culture for
60 days after shipment from our facilities.
We assure that all materials conform to the specifications described in the
Certificate of Analysis and/or Product Sheet.
For full details, please refer to our
Warranty Statement.

Material Transfer Agreement required	Yes

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