

SH-SY5Y Cells | 300154

General information

Description

SH-SY5Y cells, a subclone derived from the neuroblastoma cancer cell line SK-N-SH, are a valuable cell model for neurodegenerative disorders such as Parkinson's and Alzheimer's disease. The SK-N-SH cell line was established in 1970 from a biopsy of a metastatic bone tumor from a 4-year-old cancer patient. The human SH-SY5Y cell line offers a unique cell source for functional studies in neurobiology and neurodegenerative disease research.

SH-SY5Y cells grow both adherently and in suspension, forming clusters during division that differ significantly from the morphology of differentiated cells. These undifferentiated cells, before undergoing neuronal differentiation, serve as an essential foundation for neuroscientific studies.

The neuronal differentiation of SH-SY5Y cells, which transforms them into neuronal cell models resembling various functional neurons, is achieved through biochemical interconversion processes involving gradual serum deprivation, retinoic acid, neurotrophic factors like brain-derived neurotrophic factor, and extracellular matrix proteins. This differentiation is crucial for studying neuronal markers and conducting neurotoxicology research, especially concerning the impact of organic pollutants on human neuron-like cells.

The neurobiology of SH-SY5Y neuroblastoma cells, primarily known for their dopaminergic characteristics, can be explored for cholinergic properties under specific differentiation conditions. While these cells may express acetylcholinesterase, indicative of some cholinergic activity, their utility in studying cholinergic neurotransmission is less pronounced compared to their role in dopaminergic system studies.

As a neurotoxicological model, the SH-SY5Y neuroblastoma cell line is instrumental in examining the effects of compounds on acetylcholinesterase and butyryl cholinesterase activities, essential for neurotoxicology studies. The sy5y line's contribution to understanding the biochemical pathways involved in neurodegenerative diseases, coupled with its role in the functional studies of dopaminergic and cholinergic systems, underscores its value in neuroscience research.

Organism Human

Tissue Bone Marrow

Disease Neuroblastoma

Metastatic site Bone marrow

Synonyms SH-Sy5y, SHSY5Y, SHSY-5Y, SK-SH-SY5Y, SY5Y, SH-SY5Y Parental

Characteristics

Age 4 years

Gender Female

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Morphology The cells grow as clusters of neuroblastic cells with multiple, short, fine cell processes (neurites). Cells will aggregate, form clumps and float. A confluent monolayer is not formed.

Cell type Neuroblast

Growth properties Loosely adherent and form clumps at high cell density

Identifiers / Biosafety / Citation

Citation SH-SY5Y (Cytion catalog number 300154)

Biosafety level 1

Depositor Biedler

Expression / Mutation

Tumorigenic Forms tumors in nude mice within approx. 3-4 weeks.

Karyotype The cytogenetic landscape of SH-SY5Y cells is marked by complex chromosomal aberrations, notably featuring a modal chromosome number of 47, including trisomy of 1q due to a distinctive insertion in chromosome 1. This genetic backdrop is crucial for understanding the cellular biology and oncogenic potential of SH-SY5Y cells, making them a versatile model in neuroscientific research, particularly in the realms of neurodevelopment, neurotoxicity, and neurodegenerative disease studies.

Handling

Culture Medium DMEM:Ham's F12, w: 3.1 g/L Glucose, w: 1.6 mM L-Glutamine, w: 15 mM HEPES, w: 1.0 mM Sodium pyruvate, w: 1.2 g/L NaHCO₃ (Cytion article number 820400a)

Medium supplements Supplement the medium with 10% FBS

Passaging solution Accutase

Subculturing These cells grow as a mixture of floating and adherent cells. Remove the medium with the floating cells, and recover the cells by centrifugation. Rinse the adherent cells using PBS without calcium and magnesium (3-5 ml PBS for T25, 5-10ml for T75 cell culture flasks). Add Accutase (1-2ml per T25, 2.5ml per T75 cell culture flask), the cell sheet must be covered completely. Incubate at 37 degree Celsius for 10 minutes. Combine with the floating cells recovered above. Carefully resuspend the cells, the addition of medium is optional but not necessary, and dispense into new flasks which contain fresh medium.

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Seeding density Seeding density after thawing 6×10^4 cells/cm², seed into 1x T25 cell culture flask. The cells will become 80-90% confluent within 1-2 weeks. Once the cells proliferate vigorously, seed out the cells at a density of $1 - 2 \times 10^4$ cells/cm².

Fluid renewal 1 to 2 times per week

Freeze medium CM-1 (Cytion catalog number 800100) or CM-ACF (Cytion catalog number 806100)

Handling of cryopreserved cultures SH-SY5Y cells are shipped in a deep-frozen state on dry ice. Upon receipt, confirm that the vial remains frozen. For storage, place the cryovial immediately at temperatures below -150 degrees. If you plan to culture the cells immediately, swiftly thaw the vial by shaking it in a 37 degrees water bath with clean water and an antimicrobial agent for 40-60 seconds. Remove the vial once a small ice clump persists, ensuring it remains cold. Proceed with all subsequent steps under aseptic conditions. In a sterile flow hood, disinfect the cryovial with 70% ethanol. Then, gently open the vial and transfer the cell suspension into a 15 ml centrifuge tube pre-filled with 8 ml of room temperature culture medium. Gently mix the cells. For cell separation, centrifuge at $300 \times g$ for 3 minutes and dispose of the supernatant. Skipping centrifugation is optional, although any residual freezing medium should be removed after 24 hours. Resuspend the pellet gently in 10 ml of fresh culture medium and divide between two T25 culture flasks. Follow the subculture protocol for subsequent steps.

Quality control / Genetic profile / HLA

Sterility Mycoplasma contamination is rigorously 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.

- STR profile**
- Amelogenin:** x,y
 - CSF1PO:** 11
 - D13S317:** 11
 - D16S539:** 8,13
 - D5S818:** 12
 - D7S820:** 7,10
 - TH01:** 7,10
 - TPOX:** 8,11
 - vWA:** 14,18
 - D3S1358:** 15,16
 - D21S11:** 31,31.2
 - D18S51:** 13,16
 - Penta E:** 7,11
 - Penta D:** 10,12
 - D8S1179:** 15
 - FGA:** 23.2,24
 - D6S1043:** 12,18
 - D2S1338:** 17,19
 - D12S391:** 18,22
 - D19S433:** 13,14

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HLA alleles

A*: 01:01:01, 24:02:01

B*: 18:01:01, 49:01:01

C*: 07:01:01

DRB1*: 11:04:01, 13:01:01

DQA1*: 01:03:01, 05:05:01

DQB1*: 03:01:01, 06:03:01

DPB1*: 02:01:02, 04:01:01

E: 01:01, 01:03