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by Thermo Fisher Scientific

Sf21 Cells Adapted in Sf-900™ II SFM
Sf21 Cells Adapted in Sf-900™ III SFM

Description

Sf21 cells are clonal isolates derived from the parental *Spodoptera frugiperda* cell line IPLB-Sf-21-AE and adapted to grow in Sf -900™ II SFM and Sf-900™ III SFM. Sf- 900™ II SFM and Sf-900™ III SFM are serum-free, protein-free insect cell culture media optimized for the growth and maintenance of *Spodoptera frugiperda* cells and for large-scale production of recombinant proteins expressed using the baculovirus expression vector system (BEVS).

Product	Catalog No.	Amount	Storage
Sf21 Cells Adapted to Sf-900™ II SFM	11497-013	1 vial*	–200°C to –125°C, Liquid nitrogen
Sf21 Cells Adapted to Sf-900™ III SFM	12682-019	1 vial*	–200°C to –125°C, Liquid nitrogen

* 1 vial contains ≥1.5 × 10^7 cells in Sf-900™ II or Sf-900™ III SFM with 7.5% DMSO.

Important information

- Sf21 cells are prepared from low passage Master Cell Bank cultures (100–110 total passages, 10–20 serum free for Cat. no. 11497-013, and 120–130 total passages, 25–40 serum free for Cat. no. 12682-019).
- Sf-900™ II SFM and Sf-900™ III SFM are complete 1X liquid media containing L glutamine. Supplementation with L-glutamine or a surfactant is not required.

Safety information

Read the Safety Data Sheets (SDSs) and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

Prepare medium

Antibiotics are not recommended; however 2.5–5 mL/L of 5000U/5000 µg Penicillin-Streptomycin may be used when required.

Culture conditions

Media: Sf-900™ II SFM or Sf-900™ III SFM

Cell lines: Sf21 cells

Culture type: Suspension or adherent

Culture vessels: Shake flasks, spinner flasks, or T-flasks

Temperature range: 26°C to 28°C

Incubator atmosphere: Non-humidified, air regulated, non-CO_2 atmosphere. Ensure proper gas exchange and minimize exposure of cultures to light.

Recover frozen Sf21 cells in Sf-900™ II or Sf-900™ III SFM

1. Obtain a sterile, disposable, non-vented 125-mL polycarbonate Erlenmeyer shake flask.

   Note: Do not thaw cells in a flask larger than 125 mL, as the cell density and aeration will not be ideal.
2. Aseptically transfer 25 mL of Sf-900™ II or Sf-900™ III SFM to the 125-mL shake flask. Place the flask in an incubator at 26°C to 28°C, or allow the medium in the flask to come to room temperature. Protect the medium from light exposure at all times.
3. Quickly thaw a frozen vial of Sf21 cells in a 37°C water bath until only a small frozen piece remains in the vial (~ 1–2 minutes). Do not submerge the entire vial under water.
4. Just before the cells have completely thawed, spray the vial with 70% isopropanol or 70% ethanol to decontaminate.
5. Gently triturate and aseptically transfer the entire contents of the vial to the flask containing 25 mL medium.
6. Place the 125-mL shake flask in an incubator (set at 26°C to 28°C, without CO_2 and without humidification) on an orbital shaker platform (set at 125–150 RPM). Loosen the shake flask cap to enable gas exchange. Protect the culture from light exposure.
7. Leave the Sf21 flask undisturbed for 3–4 days. Beginning on day 3 after thawing the cells, follow the guidelines in tables 1 and 2 below to passage the suspended Sf21 cell cultures.

Table 1 Day 3 after thawing cells

If cell viability is ...	And viable cell density is ...	Take this action ...	Culture conditions
≥ 80%	≥ 2 × 10^6 cells/mL	Passage cells.	Seed a new 125-mL shake flask at 4 × 10^5 viable cells/mL in a 30–50 mL volume.
	< 2 × 10^6 cells/mL	Culture for one more day. Count again on day 4 (see Table 2 below).	—
< 80%	≥ 2 × 10^6 cells/mL	Pellet cells at 130 × *g* for 3 minutes.	Resuspend cells at 4 × 10^5 viable cells/mL in a 30–50 mL volume. Transfer to a new 125-mL shake flask.

Table 2 Day 4 after thawing cells *if* cells were not passaged on day 3

If cell viability is ...	And viable cell density is ...	Take this action ...	Culture conditions
≥ 80%	≥ 2 × 10^6 cells/mL	Passage cells.	Seed a new 125-mL shake flask at 4 × 10^5 viable cells/mL in a 30–50 mL volume.
	< 2 × 10^6 cells/mL	Pellet cells at 130 × *g* for 3 minutes.	Resuspend cells in 25 mL of Sf-900™ II or Sf-900™ III medium, then transfer to a new shake flask. Passage the cells when the cell density is ≥2 × 10^6 viable cells/mL (1–2 days).
< 80%	≥ 2 × 10^6 cells/mL	Pellet cells at 130 × *g* for 3 minutes.	Resuspend cells at 4 × 10^5 viable cells/mL, in a 30–50 mL volume. Transfer to a new 125-mL shake flask.
	< 2 × 10^6 cells/mL	Follow steps 1–7 above to thaw a new vial of cells, or contact Technical Support.	As described in protocol above.

Guidelines and procedures for suspension cultures

Note: Cells can be cryopreserved once the culture maintains >90% viability, achieves ≥2 × 10^6 viable cells/mL at subculture, and has gone through a minimum of 3 post-thaw passages. See Cryopreserve Sf21 cells on page 3.

Guidelines for seeding density

Important! Allow cells to achieve a minimum of 2 × 10^6 viable cells/mL before passaging to maintain cells in mid-log growth.

We recommend that you maintain stock cell counts at 2 × 10^6–4 × 10^6 viable cells/mL at passage. Over time, cell doubling times may decrease and you may need to adjust seeding densities in order to maintain cells in mid-log growth. To maintain stock cultures within the 2 × 10^6–4 × 10^6 viable cells/mL range, adjust the seeding densities according to the long-term guidelines in Table 3 below.

Table 3 Recommended seeding densities for initial and long-term suspension stock maintenance

Passage schedule	Sf21 seeding density	
	Initial	Long-term
3-day passage (for example, on Monday for a Monday/Thursday schedule)	4.0 × 10^5 viable cells/mL	3.0× 10^5–4.0 × 10^5 viable cells/mL
4-day passage (for example, on Thursday for a Monday/Thursday schedule)	3.0 × 10^5 viable cells/mL	2.5× 10^5–3.0 × 10^5 viable cells/mL

Guidelines for culture volumes

We recommend that you use the following culture volumes to help provide proper aeration for cells in order to maintain robust cell growth with doubling times in the range of 24–30 hours:

- 30–50 mL in a non-vented 125-mL shake flask
- 75–100 mL in a non-vented 250-mL shake flask
- 125–160 mL in a non-vented 500-mL shake flask

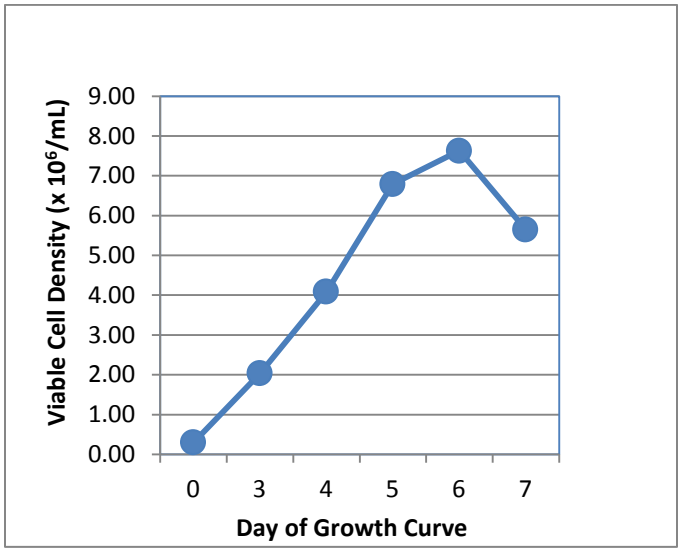
Generate a growth curve to determine ideal cell density

We recommend that you generate a growth curve using your standard culture conditions to determine the ideal cell density range for routine maintenance. Generally, cell stocks should be subcultured when they have achieved 2 × 10^6–4 × 10^6 viable cells/mL in order to maintain mid-log growth. Subculturing stocks when they are <2 × 10^6 viable cells/mL, or >4.5 × 10^6 viable cells/mL, may cause cells to lag. The information gathered from generating a growth curve can also be used to determine cell doubling times and/or growth phase under the specific culture conditions.

The following protocol is designed for insect cells grown in suspension culture using shake flasks or spinner flasks. The protocol requires performing daily viable cell counts for 7–9 consecutive days. *Before you generate a growth curve, the stock culture should be >90% viable and achieve a density ≥2 × 10^6 viable cells/mL at subculture.*

1. Remove stock culture from the incubator, and then determine cell density and viability using an automated cell counter or a hemocytometer.
2. Passage stock cells into three separate flasks at a seeding density of 3 × 10^5 viable cells/mL. Two of the flasks are used to generate growth curve data, and the third is used to continue culturing stock cells. Label each flask appropriately.
3. Incubate cells in a 26°C to 28°C, non-CO_2, non-humidified incubator on a shaker apparatus (125–150 RPM) or spinner platform. Loosen caps to enable appropriate aeration. Record the time when the cells are placed into the incubator.
4. 24 hours after placing the cells in the incubator (±1 hour), remove the two growth curve flasks from the incubator.
5. Remove a small volume of cell suspension from each flask to determine the cell density and viability. Promptly return the flasks to the 26°C to 28°C incubator. Perform a viable cell count using an automated cell counter or hemocytometer.
6. Continue performing daily viable cell counts (see steps 4 and 5) for 7–9 days or until the cells have achieved the peak (highest) cell density and viability has fallen below 85%.
7. Graph the mean daily viable cell count data as shown in Figure 1 below, then determine the day that the peak cell density was achieved.
8. Routinely passage cell stocks 2–3 days before the peak day determined using this method in order to maintain mid-log growth.

Figure 1 Example growth curve



Guidelines for scaling up Sf21 cells into spinner culture

Determine and optimize the appropriate spinner or impeller speed and seeding density for your system. For spinners >500 mL, use a vessel that provides for gas sparging.

- **Spinner culture volume**: The total culture volume should not exceed 60% of the indicated volume on the spinner flask for proper aeration (for example, a 250-mL spinner flask should not contain >150 mL of culture).
- **Spinner or impeller speed**: Determine the optimum impeller speed for your spinner flask depending on your needs. To reduce loss of viability due to cell-shearing, make sure that the impeller blade rotates freely and does not contact flask walls or base.

Guidelines and procedures for adherent cultures

Thaw adherent Sf21 cells

1. Pre-warm 40 mL Sf-900™ II or Sf-900™ III SFM to room temperature in a 50-mL centrifuge tube. Protect medium from light exposure at all times.
2. Quickly thaw a frozen vial of Sf21 cells in a 37°C water bath until only a small frozen piece remains in the vial (~1–2 minutes). Do not submerge the entire vial under water.
3. Just before the cells have completely thawed, spray the vial with 70% isopropanol or 70% ethanol to decontaminate.
4. Gently resuspend cells in 10 mL of pre-warmed medium.
5. Remove a small volume of cell suspension to perform a viable cell count using an automated cell counter or hemocytometer.
6. Determine cell density and viability. Seed cells at 6 × 10^4 viable cells/cm^2 in appropriate tissue culture vessels based on determined viable cell density. Cells can be thawed into three T-75 flasks or ten T-25 flasks. If thawing into T-75 flasks, the total volume of medium and cell suspension should be 15–20 mL/flask. If thawing into T-25 flasks, the total volume of medium and cell suspension should be 8–10 mL/flask.
7. Place flasks into a 26°C to 28°C, non-CO_2, non-humidified incubator. Gently swirl flasks in a figure 8 pattern to evenly distribute cells.

8. Observe cells for 48–72 hours post-thaw. Passage cells when confluency is ~90%.
9. Continue passaging cells following the guidelines in Table 4 below. Once cells have been in culture for approximately 30 passages (approximately 3 months), discard the stock culture and thaw a fresh vial of cells.

Note: Passage cells into multiple, same- size flasks, or larger flasks if you are cryopreserving low-passage cells. We recommend that cells go through at least 3 passages post-thaw before cryopreservation.

Maintain and passage adherent Sf21 cultures

Note: Passage cells when they are in mid-log phase of growth (usually this is when cells have reached ~90% confluency).

Table 4 Seeding densities for long-term adherent stock maintenance

Passage schedule	Sf21 stock seeding density
1–2 days	8×10^4–10×10^4 cells/cm^2
2–3 days	7×10^4–8×10^4 cells/cm^2
3–4 days	6×10^4–7×10^4 cells/cm^2

Passage adherent Sf21 cells (sloughing method)

1. Pre-warm the appropriate volume of medium to room temperature. Protect medium from light at all times.
2. Remove the flask from the incubator.
3. Gently pipette the medium in the flask over the surface of the cells to dislodge the cells from the flask.
4. Remove a small volume of cell suspension from each flask to determine the cell density and viability.
5. Seed cells in Sf-900™ II or Sf-900™ III SFM into desired culture vessel size as recommended in Table 4 above.

Note: Cells may tightly adhere to the flask in serum-free media and require additional efforts to detach. To dislodge tightly adhering cells, shake the flask vigorously two to three times using a wrist-snapping motion.

Cryopreserve Sf21 cells

Note: Do not discontinue Sf21 stock at the time of cryopreservation. Maintain a live stock culture until a vial of the cryopreserved cells has been thawed, confirmed negative for bacterial, fungal, and mycoplasma contamination, and evaluated for proper growth and morphology.

Before cryopreserving, confirm that Sf21 stock cells cultured in Sf-900™ II or Sf-900™ III SFM are >90% viable and in mid-logarithmic growth phase (2×10^6–4×10^6 viable cells/mL or at determined densities generated from the growth curve).

1. Determine the appropriate cell density for freezing using Table 5 below.

Table 5 Recommended cell densities for cryopreservation

Cell densities	Volume of cells	Cryovial size	Culture conditions
1×10^7–2×10^7 viable cells/mL	1–1.5 mL	2 mL	Suspension
2×10^6–5×10^6 viable cells/mL	1–1.5 mL	2 mL	Adherent

2. Prepare the required volume of freeze medium using Table 6 below, then sterile filter.

Table 6 Freeze medium components and concentration

Component	Final concentration
Sf-900™ II or Sf-900™ III conditioned medium	46.25%
Fresh Sf-900™ II or Sf-900™ III SFM without antibiotics	46.25%
Dimethyl Sulfoxide (DMSO) cryoprotectant	7.5%

3. For best results, cryopreserve Sf21 cells using a controlled rate freezing device (for example, CryoMed™ Freezer or Mr. Frosty Nalgene Cryo 1°C Freezing Container) following the manufacturer's directions.
4. Store frozen Sf21 cryovials in the vapor phase of a liquid nitrogen freezer (–200°C to –125°C) the next day for long term storage.

Important! Do not store cryovials at –80°C for long-term storage; cell viability will be compromised.

Transfection

For optimal results, we recommend using Cellfectin™ II Reagent for transfection. Refer to the user guide accompanying the product for instructions. If you use Cellfectin™ II Reagent, you can transfect cells directly in Sf-900™ II SFM. Other transfection reagents are suitable.

Related products

Product	Cat. no.
Sf-900™ II SFM	10902
Sf-900™ III SFM	12658
Sf9 Cells Adapted in Sf-900™ II SFM	11496
Sf9 Cells Adapted in Sf-900™ III SFM	12659
Grace's Insect Medium, Supplemented (1X)	11605
Certified FBS, Heat Inactivated, US	10082
Penicillin-Streptomycin, Liquid	15070
Cellfectin™ II Reagent	10362
BaculoDirect™ N-Term Expression Kit	12562-054
BaculoDirect™ N-Term Transfection Kit	12562-062
BaculoDirect™ C-Term Expression Kit	12562-013
BaculoDirect™ C-Term Transfection Kit	12562-039
Bac-N-Blue™ Transfection Kit	K855-01
Bac-to-Bac™ Baculovirus Expression System	10359
Bac-to-Bac™ Vector Kit	10360
Trypan Blue Stain	15250
Countess™ Automated Cell Counter	C10227

Explanation of Symbols and Warnings

The symbols present on the product label are explained below:

		
Temperature limitation	Batch code	Catalog number
		
Manufacturer	Consult instructions for use	Caution, consult accompanying documents

Limited Product Warranty

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