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Available Lepidopteran Insect Cell Lines

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Summary

This chapter lists the known cell lines from Lepidoptera, largely based on previous compilations of insect cell lines published by W. Fred Hink. The official designation is given for each cell line as well as the species, tissue source, and, when known, the susceptibilities to baculoviruses.

Key Words: Lepidoptera; continuous cell lines; insect cells; virus susceptibility.

1. Introduction

Early in the history of insect cell culturing, researchers in the field began meeting at 3- to 4-yr intervals at International Conferences on Invertebrate Tissue Culture. The first of these was held in Montpellier, France in 1962, which, perhaps not coincidentally, was the year that the first continuous insect cell lines were described in the literature ***(1)***. In the 1970s and 1980s, W. Frederick Hink prepared compilations of insect cell lines ***(2–6)*** that were included in the proceedings from several of the subsequent International Conferences. His lists form the backbone of the listing included in this chapter **(Table 1)**. Unfortunately, the last of his compilations was published 15 yr ago, so a literature search has been performed for publications since that time. As seen in **Fig. 1**, the availability of lepidopteran cell lines has steadily increased at about 50 new lines per decade. In addition to details on the insect species, designation of the resulting cell lines, and tissue source used, details on the susceptibility to baculoviruses have also been provided where they are known. Finally, the baculoviruses that have been grown in insect cell culture are summarized in **Table 2**. Note that a given baculovirus is named based on the insect species from which it was first isolated.

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Table 1
Lepidopteran Cell Lines E

Species	Designation	Tissue source	Baculovirus infectivity[a]	Ref.[b]
Adoxophyes orana	Ao/I	Adult ovaries	AcMNPV, AdorMNPV, MbMNPV, SfMNPV	NP-1
Adoxophyes orana fasciata	FTRS-AoL1	Neonate larvae	AdorMNPV, PlxyMNPV	***8***
	FTRS-AoL2	Neonate larvae	AdorMNPV, PlxyMNPV	***8***
Adoxophyes sp.	FTRS-AfL	Neonate larvae	AdorMNPV, PlxyMNPV	***8***
Agrotis ipsilon	BCIRL/AMCY-AiOV-CLG	Adult ovaries and fat body	PlxyMNPV	***9***
	BCIRL/AMCY-AiTS-CLG	Adult testes and fat body		***9***
Amyelois transitella	HCRL-ATO10	Pupal ovaries	AcMNPV	***10***
	HCRL-ATO20	Pupal ovaries	AcMNPV	***10***
Anagrapha falcifera	BCIRL/AMCY-AfOV-CLG	Adult ovaries and fat body	AcMNPV	***9***
	BCIRL/AMCY-AfTS-CLG	Adult testes and fat body		***9***
Antheraea eucalypti	RML-2 subline of Grace's	Pupal ovaries	BmNPV	***1***
	A. eucalypti cells	Pupal ovaries		***1***
Antheraea pernyi		Pupal ovaries		NP-2
	NISES-AnPe-426	Embryos		***11***
Antheraea yamamai	NISES-Anya-0611	Pupal ovaries	AnyaNPV	***12***
Anticarsia gemmatalis	BCIRL/AMCY-AgE-CLG	Embryos	AcMNPV	***9***
	BCIRL/AMCY-AgOV-CLG1	Adult ovaries and fat body	AgMNPV	***9***
	BCIRL/AMCY-AgOV-CLG2	Adult ovaries and fat body	AcMNPV, AgMNPV	***9***
	BCIRL/AMCY-AgOV-CLG3	Adult ovaries and fat body	AcMNPV, AgMNPV	***9***
	UFL-AG-286	Embryos	AcMNPV, AgMNPV, AnfaMNPV, GmMNPV, HearMNPV, PlxyMNPV, RoMNPV	***13***

Archippus breviplicanus	FTRS-AbL81	Neonate larvae		***8***
Bombyx mandarina	SES-Bma-O1A	Mature embryos		***14***
	SES-Bma-O1R	Mature embryos		***14***
Bombyx mori	Bm-N		BmNPV	NP-3
		Larval midguts		***15***
	Bm5	Larval ovaries		***16***
	Bm-21E-HNU5	Embryos	AcMNPV, ArNPV, HearMNPV, PlxyGV	***17***
	NIV-BM-1296	Larval ovaries	AcMNPV, BmNPV	***18***
	NIV-BM-197	Pupal ovaries	AcMNPV, BmNPV	***18***
	SES-Bm-1 30A	Mature embryos		***14***
	SES-Bm-1 30R	Mature embryos		***14***
	SES-Bm-e 21A	Mature embryos		***14***
	SES-Bm-e 21B	Mature embryos		***14***
	SES-Bm-e 21R	Mature embryos		***14***
	SES-BoMo-15A	Embryos	BmNPV	***19***
	SES-BoMo-C129	Embryos	BmNPV	***20***
	SES-BoMo-JI25	Embryos		***20***
	SPC-Bm36	Pupal ovaries		NP-4
	SPC-Bm40	Pupal ovaries		NP-4
Buzura suppressaria	WIV-BS-481	Larval hemocytes		NP-5
	WIV-BS-484	Imaginal ovaries	BusuNPV	NP-5
Chilo suppressalis		Larval hemocytes		***21***
Choristoneura fumiferana	FPMI-CF-1	Midguts		***22***
	FPMI-CF-2	Midguts		***22***
	FPMI-CF-3	Midguts		***22***
	FPMI-CF-203	Midguts		***22***

(continued)

Table 1 (Continued)

Species	Designation	Tissue source	Baculovirus infectivity[a]	Ref.[b]
	FPMI-CF-50	Pupal ovaries	AcMNPV, CfMNPV	NP-6
	FPMI-CF-60	Pupal ovaries	AcMNPV, CfMNPV	NP-6
	FPMI-CF-70	Pupal ovaries	AcMNPV, CfMNPV	NP-6
	IPRI-CF-1	Neonate larvae	CfMNPV	NP-6
	IPRI-CF-10	Neonate larvae	CfMNPV	NP-6
	IPRI-CF-12	Neonate larvae	CfMNPV	NP-6
	IPRI-Cf124	Larvae	CfMNPV	***23***
	IPRI-CF-16	Neonate larvae	CfMNPV	NP-6
	IPRI-CF-16T	Neonate larvae		NP-6
	IPRI-CF-5	Neonate larvae	CfMNPV	NP-6
	IPRI-CF-6	Neonate larvae	CfMNPV	NP-6
	IPRI-CF-8	Neonate larvae	CfMNPV	NP-6
Choristoneura occidentalis		Embryos, neonate larvae and ovaries	CfMNPV	NP-6
Cydia pomonella	CP-1268	Embryos		***24***
	CP-169	Embryos		***24***
	CpDW1	Embryos		***25***
	CpDW2	Embryos		***25***
	CpDW3	Embryos		***25***
	CpDW4	Embryos		***25***
	CpDW5	Embryos		***25***
	CpDW6	Embryos		***25***
	CpDW9	Embryos		***25***
	CpDW10	Embryos		***25***
	CpDW11	Embryos		***25***
	CpDW12	Embryos		***25***

	CpDW13	Embryos		***25***
	CpDW14	Embryos	CpGV	***25***
	CpDW15	Embryos	CpGV	***25***
	200 “primary” cell lines	Embryos and larval hemocytes	ChmuNPV, CpGV	***26***
	IZD-Cp 4/13			***27***
	IZD-CP1508	Larval hemocytes		NP-7
	IZD-CP2202	Larval hemocytes		NP-7
	IZD-CP2507	Larval hemocytes		NP-7
	IZD-CP0508	Larval hemocytes		NP-7
Ectropus obliqua	SIE-EO-801	Pupal ovaries		***28***
	SIE-EO-803	Pupal ovaries		***28***
Ephestia kuehniella	IPLB-Ekx4T	Embryos	AcMNPV, AgMNPV, AnfaMNPV, GmMNPV, HearMNPV, PlxyMNPV, RoMNPV	***29***
	IPLB-Ekx4V	Embryos	AcMNPV, AgMNPV, AnfaMNPV, GmMNPV, HearMNPV, PlxyMNPV, RoMNPV	***29***
Estigmene acrea	EA1174A (=BTI-EAA)	Larval hemocytes	AcMNPV	***30***
	EA1174H	Larval hemocytes	AcMNPV	***30***
Euxoa scandens	IAFEs-1	Ovaries	AcMNPV, BmNPV, GmMNPV, DiwaNPV	***31***
Galleria mellonella		Ovaries		***32***
Gnorimoschema operculella	G01-874	Embryos		***33***
	PTM	Embryos		NP-8

(continued)

Table 1 (Continued)

Species	Designation	Tissue source	Baculovirus infectivity[a]	Ref.[b]
Helicoverpa armigera	BCIRL-HA-AM1	Pupal ovaries	AgMNPV	***34***
	CSIRO-BCIRL-HA1	Ovaries	AcMNPV, HzSNPV	***35***
	CSIRO-BCIRL-HA2	Ovaries	HzSNPV	***35***
	CSIRO-BCIRL-HA3	Ovaries	HzSNPV	***35***
	NIV-HA-197	Embryo	AcMNPV, HearSNPV, SpltMNPV	***36***
Helicoverpa punctigera	CSIRO-BCIRL-HP1	Embryos	AcMNPV, HzSNPV	***35***
	CSIRO-BCIRL-HP2	Embryos	AcMNPV, HzSNPV	***35***
	CSIRO-BCIRL-HP3	Embryos	AcMNPV, HzSNPV	***35***
	CSIRO-BCIRL-HP4	Ovaries	AcMNPV, HzSNPV	***35***
	CSIRO-BCIRL-HP5	Ovaries	AcMNPV, HzSNPV	***35***
Helicoverpa zea	BCIRL/AMCY-HzE-CLG1	Embryos	AcMNPV	***9***
	BCIRL/AMCY-HzE-CLG2	Embryos	AcMNPV	***9***
	BCIRL/AMCY-HzE-CLG3	Embryos	AcMNPV	***9***
	BCIRL/AMCY-HzE-CLG5	Embryos	AcMNPV	***9***
	BCIRL/AMCY-HzE-CLG6	Embryos	AcMNPV	***9***
	BCIRL/AMCY-HzE-CLG7	Embryos	AcMNPV	***9***
	BCIRL/AMCY-HzE-CLG8	Embryos		***9***
	BCIRL/AMCY-HzE-CLG9	Embryos		***9***
	BCIRL-HZ-AM1	Pupal ovaries	HzSNPV, HearSNPV	***34***
	BCIRL-HZ-AM2	Pupal ovaries	HzSNPV	***34***
	BCIRL-HZ-AM3	Pupal ovaries	HzSNPV	***34***
	IMC-HZ-1	Adult ovaries	HzSNPV	***37***
	IPLB-HZ-1074	Pupal ovaries	HzMNPV	***38***
	IPLB-HZ-1075	Pupal ovaries and fat body	HzMNPV	***38***
	IPLB-HZ-1079	Fat body	HzMNPV	***38***

	IPLB-HZ-110	Pupal ovaries	HzMNPV	***38***
	IPLB-HZ-124Q	Pupal ovaries	HzMNPV	***38***
Heliothis virescens	BCIRL/AMCY-HvE-CLG1	Embryos	AcMNPV, AgMNPV, PlxyMNPV	***9***
	BCIRL/AMCY-HvE-CLG2	Embryos	AcMNPV, AgMNPV PlxyMNPV	***9***
	BCIRL/AMCY-HvE-CLG3	Embryos	AcMNPV, AgMNPV	***9***
	BCIRL/AMCY-HvOV-CLG	Adult ovaries	AcMNPV, AgMNPV, PlxyMNPV	***9***
	BCIRL/AMCY-Hv-TS-GES	Larval testes	AcMNPV	***9***
	BCIRL-HV-AM1	Pupal ovaries	AcMNPV, AgMNPV, HzSNPV	***39***
	BCIRL-HV-AM2	Pupal ovaries	AcMNPV, HzSNPV	***39***
	IPLB-HvE1a	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, PlxyMNPV, RoMNPV	***40***
	IPLB-HvE1-lt	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, OpMNPV, RoMNPV	***40***
	IPLB-HvE1s	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, PlxyMNPV, RoMNPV	***40***
	IPLB-HvE6a	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, PlxyMNPV, RoMNPV	***40***
	IPLB-HvE6a-lt	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, OpMNPV, PlxyMNPV, RoMNPV	***40***

(continued)

Table 1 (Continued)

Species	Designation	Tissue source	Baculovirus infectivity[a]	Ref.[b]
	IPLB-HvE6s	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, PlxyMNPV, RoMNPV	***40***
	IPLB-HvE6s-lt	Embryos	AcMNPV, AnfaMNPV, AgMNPV, HzSNPV, RoMNPV	***40***
	IPLB-HvT1	Larval testicular sheath	AcMNPV, HzSNPV	***41***
Homona magnanima	FTRS-HmL45	Neonate larvae	PlxyMNPV	***8***
Hoshinoa longicellana	FTRS-HlL1	Neonate larvae		***8***
	FTRS-HlL2	Neonate larvae		***8***
Latoia viridissima		Larval hemolymph	LaviNPV	***42***
Leucania separata	NIAS-LeSe-11	Larval fat body (female)	AcMNPV	***43***
Lymantria dispar	IPLB-LD-64	Pupal ovaries	AcMNPV	***44***
	IPLB-LD-65	Pupal ovaries	LdMNPV	***44***
	IPLB-LD-66	Pupal ovaries		***44***
	IPLB-LD-67	Pupal ovaries	LdMNPV	***44***
	IPLB-LdEG	Embryos	AcMNPV, LdMNPV	***41***
	IPLB-LdEI	Embryos	AcMNPV, LdMNPV	***41***
	IPLB-LdEIt	Embryos	AcMNPV, LdMNPV	***41***
	IPLB-LdEp	Embryos	AcMNPV, LdMNPV	***41***
	IPLB-LdFB	Larval fat bodies	LdMNPV	***41***
	IZD-LD1307	Larval testes		NP-9
	IZD-LD1407	Larval testes	AcMNPV	NP-9
	SCLd 135	Ovaries	BmNPV, GmMNPV	NP-9
Malacosoma disstria	IPRI 108	Larval hemocytes	AcMNPV, CfMNPV, LafisoNPV	***45***

	UMN-MDH-1.	Hemocytes of fifth-instar larvae	MadiNPV	NP-10
Mamestra brassicae	HPB-MB	Adult ovaries	AcMNPV, TnSNPV	NP-11
	IZD-MB0503	Larval hemocytes	AcMNPV, MbMNPV	***46***
	IZD-MB0504	Larval hemocytes	AcMNPV	***46***
	IZD-MB1203	Larval ovary and dorsal vessel	AcMNPV	***46***
	IZD-MB2006	Larval hemocytes		***46***
	IZD-MB2007	Larval hemocytes		***46***
	IZD-MB2506	Larval hemocytes	AcMNPV, MbMNPV	***46***
	MB-H 260	Hemocytes	MbMNPV	***47***
	MB-H 260	Hemocytes	MbMNPV	***47***
	MbL-3	Neonate larvae	MbMNPV	***48***
	MbL-3	Neonate larvae	MbMNPV	***48***
	NIAS-MaBr-85	Larval fat body (male)	AcMNPV	***49***
	NIAS-MaBr-92	Larval hemocytes	AcMNPV	***50***
	NIAS-MaBr-93	Larval hemocytes	AcMNPV	***50***
	NIAS-MB-19	Pupal ovaries		***51***
	NIAS-MB-25	Pupal ovaries		***51***
	NIAS-MB-32	Pupal ovaries		***51***
	SES-MaBr-1	Larval fat body	AcMNPV	***52***
	SES-MaBr-2	Larval fat body	AcMNPV	***52***
	SES-MaBr-3	Larval fat body	AcMNPV	***52***
	SES-MaBr-4	Larval fat body	AcMNPV	***52***
	SES-MaBr-5	Larval fat body	AcMNPV	***52***
Manduca sexta	FPMI-MS-12	Neonate larvae	AcMNPV	NP-6
	FPMI-MS-4	Neonate larvae	AcMNPV	NP-6
	FPMI-MS-5	Neonate larvae	AcMNPV	NP-6
	FPMI-MS-7	Neonate larvae	AcMNPV	NP-6
	MRRL-CH-1	Embryos		***53***
	MRRL-CH-2	Embryos		***53***

(continued)

Table 1 (Continued)

Species	Designation	Tissue source	Baculovirus infectivity[a]	Ref.[b]
Mythimna convecta	BPMNU-MyCo-1	Fat body		***54***
Orgyia leucostigma	IPLB-OlE505A	Embryos	AcMNPV, AnfaMNPV, OpMNPV, OrleNPV, RoMNPV	***55***
	IPLB-OlE505s	Embryos	OpMNPV, OrleNPV	***55***
	IPLB-OlE7	Embryos	OpMNPV, OrleNPV	***55***
	IPRI-OL-12	Neonate larvae	OpMNPV, OpSNPV	***56***
	IPRI-OL-13	Neonate larvae	OpMNPV, OpSNPV	***56***
	IPRI-OL-4	Neonate larvae	OpMNPV, OpSNPV	***56***
	IPRI-OL-9	Neonate larvae	OpMNPV, OpSNPV	***56***
Ostrinia nubilalis	BCIRL/AMCY-OnFB-GES1	Larval fat body		***9***
	BCIRL/AMCY-OnFB-GES2	Larval fat body		***9***
	UMC-OnE	Embryos	AcMNPV, PlxyMNPV	***57***
Pandemis heparana	FTRS-PhL	Neonate larvae	PlxyMNPV	***8***
Papilio xuthus	Px-58	Pupal ovaries		***58***
	Px-64	Pupal ovaries		***58***
Phthorimaea operculella	ORS-Pop-93	Embryos	AcMNPV, SpliNPV	***59***
	ORS-Pop-95	Embryos	PhopGV, SpliGV	***59***
Pieris rapae	BTI-PR10B	Embryos		***60***
	BTI-PR8A1	Embryos		***60***
	BTI-PR8A2	Embryos		***60***
	BTI-PR9A	Embryos		***60***
	NIAS-PRC-819A	Ovaries		***61***
	NIAS-PRC-819B	Ovaries		***61***
	NIAS-PRC-819C	Ovaries		***61***

	NYAES-PR4A	Embryos		***60***
Plodia interpunctella	IAL-PID2	Imaginal wing discs	AgMNPV	***62***
	IPLB-PiE	Embryos		NP-12
	UMN-PIE-1181	Embryos of a malathion-resistant strain		***63***
Plutella xylostella	BCIRL/AMCY-PxE-CLG	Embryos	AcMNPV, PlxyMNPV	***7***
	BCIRL/AMCY-PxLP-CLG	Larvae/pupae (whole insects)	AcMNPV, PlxyMNPV	***7***
	IPLB-PxE1	Embryos	AcMNPV, AnfaMNPV, RoMNPV	NP-12
	IPLB-PxE2	Embryos	AcMNPV, AnfaMNPV, RoMNPV	NP-12
	PX-1187	Embryos		***63***
	BCIRL-PX2-HNU3		AcMNPV, ArGV, ArNPV, HearMNPV	***65***
Pseudaletia unipuncta	BTI-Pu-2	Embryos	AcMNPV	***66***
	BTI-Pu-A7	Embryos	AcMNPV	***66***
	BTI-Pu-A7S	Embryos	AcMNPV	***66***
	BTI-Pu-B9	Embryos	AcMNPV	***66***
	BTI-Pu-M	Embryos	AcMNPV	***66***
	BTI-Pu-M1B	Embryos	AcMNPV	***66***
Samia cynthia	Several lines	Pupal hemocytes		***67***
Spilarctia seriatopunctata	NIAS-SpSe-1	Larval fat body (male)		***68***
Spilosoma imparilis	FRI-SpIm-1229	Larval fat bodies	HycuNPV, SpimNPV	***69***
Spodoptera exigua	BCIRL/AMCY-SeE-CLG1	Embryos		***9***
	BCIRL/AMCY-SeE-CLG4	Embryos		
	BCIRL/AMCY-SeE-CLG5	Embryos		***9***
	Se3FH	Neonate larvae	SeMNPV	***70***

(continued)

Table 1 (Continued)

Species	Designation	Tissue source	Baculovirus infectivity[a]	Ref.[b]
	Se4FH	Neonate larvae	SeMNPV	***70***
	Se5FH	Neonate larvae	SeMNPV	***70***
	Se6FHA	Neonate larvae	SeMNPV	***70***
	Se6FHB	Neonate larvae	SeMNPV	***70***
	SeHe920-1a	Hemocytes		***71***
	UCR-SE-1	Neonate larvae	AcMNPV, SeMNPV	***72***
Spodoptera frugiperda	BCIRL/AMCY-SfTS-GES	Larval testes	AcMNPV, PlxyMNPV	***9***
	IAL-SFD1	Imaginal wing discs	AcMNPV, AgMNPV, TnSNPV,	***62***
	IPLB-Sf1254	Pupal ovary	AcMNPV, TnSNPV, SfMNPV	***73***
	IPLB-Sf21, IPLB-Sf21AE, Sf-9	Pupal ovary	AcMNPV, PlxyMNPV, SfMNPV, SpliNPV, ThorNPV	***73***
Spodoptera littoralis	HPB-SL	Larvae	AcMNPV, TnSNPV	NP-11
	SPC-Sl-48	Pupal ovaries	AcMNPV	***74***
	SPC-Sl-52	Pupal ovaries	AcMNPV	***74***
	UIV-SL-373	Pupal ovaries	AcMNPV, SeMNPV, SpliNPV, TnSNPV	***75***
	UIV-SL-573	Pupal ovaries	AcMNPV, SeMNPV, SpliNPV, TnSNPV	***75***
	UIV-SL-673	Pupal ovaries	AcMNPV, SeMNPV, SpliNPV, TnSNPV	***75***
Spodoptera litura	IBL-SL1A	Pupal ovaries	SpltNPV	***76***
	NIV-SU-893	Pupal ovaries		***77***
	NIV-SU-992	Larval ovaries		***78***
Spodoptera ornithogalli	BCIRL-503-HNU1	Adult ovaries		***79***
	BCIRL-504-HNU4	Adult ovaries		***79***

Trichoplusia ni	BCIRL/AMCY-TnE-CLG1	Embryos	AcMNPV	***9***
	BCIRL/AMCY-TnE-CLG1MK	Embryos	AcMNPV	***9***
	BCIRL/AMCY-TnE-CLG2	Embryos	AcMNPV	***9***
	BCIRL/AMCY-TnE-CLG2MK	Embryos	AcMNPV, PlxyMNPV	***9***
	BCIRL/AMCY-TnE-CLG3	Embryos	AcMNPV	***9***
	BCIRL/AMCY-TnTS-GES1	Larval testes	AcMNPV, PlxyMNPV	***9***
	BCIRL/AMCY-TnTS-GES3	Larval testes	PlxyMNPV	***9***
	BTI-TN5B1-4 (High Five®)	Embryos	AcMNPV, PlxyMNPV, ThorNPV, TnSNPV	***80***
	BTI-TN5C1	Embryos		***80***
	BTI-TN5F2	Embryos		***80***
	BTI-TN5G2A1	Embryos		***80***
	BTI-TN5G3	Embryos		***80***
	BTI-TN5G33	Embryos		***80***
	IAL-TND1	Imaginal wing discs	AcMNPV, AnfaMNPV, AgMNPV, PlxyMNPV	***81***
	IPLB-TN-R[2]	3-d-old embryos	AcMNPV, AnfaMNPV, AgMNPV, PlxyMNPV	***82***
	Several lines	Pupal ovary and fat body	TnSNPV	***83***
	TN-368	Adult ovaries	AcMNPV, TnSNPV, GmMNPV, AgMNPV, PlxyMNPV	***84***

[a]In most cases, the virus susceptibilities were reported in the original publication of the cell lines. In some cases, they are from the Hink compilations ***(2–6)*** or the Granados and Hashimoto review ***(7)*** (*see* **Note 1**).

[b]NP, not published. Most of these cell lines were reported in the Hink compilations ***(2–6)***. The researcher(s) that communicated the cell line to Hink were as follows: NP-1: D. Peters, NP-2: H. Lee, NP-4: J.M. Quiot, NP-5: Xie Tianen, Wang Luming, and Liu Songhus, NP-6: S. S. Sohi, NP-7: U. Mahr and H. G. Miltenburger, NP-8: T. D. C. Grace, NP-9: H.G. Miltenburger, NP-10: K. R. Tsang, NP-11: I. Hilwig and F. Alapatt, NP-12: D. E. Lynn. NP-3: the *B. mori* Bm-N line is widely distributed and used with BmMNPV but I have been unable to discern the original source (investigator or tissue of origin) of this line (*see* **Note 2**).

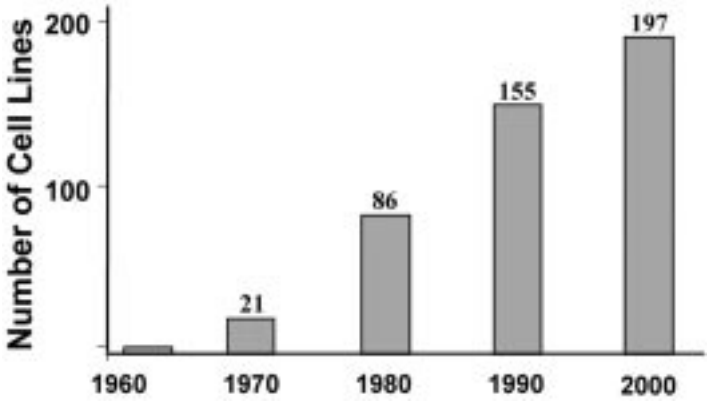

Fig. 1. Number of cell lines reported from Lepidoptera based on the information in **Table 1**, accumulative by decade.

2. Notes

1. **Table 1** includes more than 260 cell lines from various lepidopteran species providing a vast supply of material for research on baculoviruses. Although I have not made an extensive literature search on virus susceptibilities of these cell lines (most of the details on viruses included in **Table 1** were reported in the original publication describing the specific cell line or in one of Hink's compilations ***[2–6]*** or the Granados and Hashimoto review ***[7]***), approx 60% of these cell lines are known to replicate one or more baculovirus. The designations used in **Table 1** are based on the original source of the virus as defined in **Table 2**. Over 100 lines are known to replicate the *Autographa californica* multiple nucleopolyhedrovirus, which may surprise the majority of researchers using Sf-9, High Five, or Sf21AE cells with this virus as an expression vector.
2. The availability of some of these cell lines is unknown. Although a few insect cell lines are available through repositories (such as the American Type Culture Collection [ATCC], Manassas, VA, or the European Collection of Cell Cultures [ECACC], Health Protection Agency, Porton Down, Salisbury, Wiltshire), researchers interested in the use of most of these cell lines will need to obtain them from other laboratories. If at all possible, this should be from the original source of the cells. Unfortunately, many of the earliest insect cell culturists are no longer active, making this somewhat problematic. However, the pool of researchers that have created new cell cultures is relatively small, so contacting one of the active researchers in the field will likely lead to a source if the cell line is still in existence.

Table 2
Baculoviruses Grown in Cell Culture

Original source and virus genera[a]	Designation
Anagrapha falcifera NPV	AnfaNPV
Antheraea yamamai NPV	AnyaNPV
Anticarsia gemmatalis MNPV	AgMNPV
Artogeia rapae GV	ArGV
Artogeia rapae NPV	ArNPV
Autographa californica MNPV	AcMNPV
Bombyx mori NPV	BmNPV
Buzura suppressaria NPV	BusuNPV
Choristoneura fumiferana MNPV	CfMNPV
Choristoneura murinana NPV	ChmuNPV
Cydia pomonella GV	CpGV
Diapropsis watersii NPV	DiwaNPV
Galleria mellonella MNPV	GmMNPV
Helicoverpa armisgera NPV	HearNPV
Helicoverpa zea SNPV	HzSNPV
Hyphantria cunea NPV	HycuNPV
Lambdina fiscellaaria somniaria NPV	LafiNPV
Latoia viridissima NPV	LaviNPV
Lymantria dispar MNPV	LdMNPV
Malacosoma disstria NPV	MadiNPV
Mamestra brassicae MNPV	MbMNPV
Orgyia leucostigma NPV	OrleNPV
Orgyia pseudotsugata MNPV	OpMNPV
Orgyia pseudotsugata MNPV	OpMNPV
Orgyia pseudotsugata SNPV	OpSNPV
Phthorimaea operculella GV	PhopGV
Plutella xylostella GV	PlxyGV
Plutella xylostella MNPV	PlxyMNPV
Rachiplusia ou MNPV	RoMNPV
Spilosoma imparilis NPV	SpimNPV
Spodoptera exigua MNPV	SeMNPV
Spodoptera frugiperda MNPV	SfMNPV
Spodoptera littoralis GV	SpliGV
Spodoptera littoralis NPV	SpliNPV
Spodoptera litura NPV	SpltNPV
Thysanoplusia orichalcea NPV	ThorNPV
Trichoplusia ni SNPV	TnSNPV

[a]The viruses are NPV, nucleopolyhedrovirus; MNPV, multiple NPVs; SNPV, single NPVs; GV, granulovirus.

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