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**AN ANNOTATED LIST AND BIBLIOGRAPHY
OF INSECTS REPORTED TO HAVE
VIRUS DISEASES**

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AN ANNOTATED LIST AND BIBLIOGRAPHY OF INSECTS REPORTED TO HAVE VIRUS DISEASES¹

KENNETH M. HUGHES²

No COMPREHENSIVE listing of the insects reported to be affected by viruses has been made for a number of years. In 1915, Chapman and Glaser (47)³ published a list of insects having "wilt." Revised listings based on Chapman and Glaser's work, and including additional entries, have been made by Sweetman (198), Bergold (7), and Steinhaus (185). Recent years have produced so much new information on the virus diseases of insects [Martignoni (125) reported that in 1954 more than 150 insect species were known to suffer from virus diseases] that all the above lists are now quite incomplete.

In the list presented here an attempt has been made to include all published reports of virus infections in insects, regardless of the validity of such reports. There are certainly many entries of questionable authenticity, but their evaluation is left to the judgment of those who may find the listing useful.

A notation as to the type of virus disease was included in nearly all entries. An attempt was made to distinguish between the nuclear polyhedroses and the cytoplasmic polyhedroses whenever the information available in the literature permitted such a distinction. Those cases in which a polyhedrosis is involved, but without evidence to indicate the type of polyhedrosis, were recorded simply as "polyhedrosis." The bibliography is not a complete listing of all literature in which reference is made to a virus disease of an insect, but it is hoped that none of the principal publications has been overlooked.

The scientific and common names used agree with those found in "Common Names of Insects Approved by the Entomological Society of America" (Amer. Ent. Soc. Bul. vol. 1, no. 4, December, 1955). Common names of some of the species not included in the above listing were obtained from "Catalogue of injurious insects in Japan" by T. Shiraki (Economic and Scientific Section, Natural Resources Division, Supreme Commander for the Allied Powers, Tokyo, 1952, 7 vols.), and from the publication or publications referred to in the text by number.

¹ Contribution from the Laboratory of Insect Pathology, Department of Biological Control, University of California, Berkeley. Originally submitted for publication June 8, 1956.

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³ See "Literature Cited" for citations referred to in the text by number. The survey of the literature pertaining to this paper was completed in January, 1957.

The scientific names of those species not included in the list approved by the Entomological Society of America agree with those found in the following publications:

Genus *Neodiprion*: Ross, H. H. The taxonomy and evolution of the sawfly genus *Neodiprion*; Forest Science 1:196-209, 1956.

Various orders: Schenkling, S., ed. Coleopterorum catalogus; 1910-1939. Bryk, F., ed. Lepidopterorum catalogus; 1911-1938. Hedicke, H., ed. Hymenopterorum catalogus; 1936-1938 (the three published by W. Junk, Verlag für Entomologie, 's Gravenhage). Muesebeck, C. F. W., K. V. Krombein and H. K. Townes, eds. Hymenoptera of America North of Mexico; synoptic catalog; U.S.D.A., Agricultural Monograph, Washington, 1951. Lindner, E. Die Fliegen der Palaearktischen Region; Schweizerbart'sche Verlagsbuchhandlung, 1930 and later.

Class Insecta: Kloet, G. S., and W. D. Hincks. A check list of British insects; Buncle Co., Ltd., Arbroath, 1945. Wu, C. F. Catalogus insectorum sinensium; The Fan Memorial Institute of Biology, Peiping, 1935-1941.

In some instances, synonyms are also given; they are quoted in parentheses, following the valid name of the species. Subgeneric names (where necessary) are in parentheses, after the generic name. The family designations agree with those used in "Common Names of Insects Approved by the Entomological Society of America," with the addition of two (Anthelidae and Thaumetopoeidae) which do not occur in that list. Families are arranged alphabetically within the orders.

ACKNOWLEDGMENTS

I am very grateful to Dr. M. E. Martignoni for having made certain revisions and many additions, and for having compiled the index; to Dr. E. A. Steinhaus and Dr. Y. Tanada for valuable suggestions; to Dr. K. S. Hagen, Dr. P. D. Hurd, Jr., Mr. R. L. Langston, Dr. W. W. Middlekauff, and Dr. R. F. Smith for their help in problems of insect nomenclature.

LEPIDOPTERA

AGROTIDAE

(See PHALAENIDAE)

ANTHELIDAE

Pterolocera amplicornis Wlk.

Nuclear polyhedrosis (59)

ANTHROCERIDAE

(See ZYGAENIDAE)

ARCTIIDAE

Apantesis virgo (L.)

Polyhedrosis (7, 182, 185, 198, 254)

Arctia caja (L.), great tiger moth

Nuclear polyhedrosis (16, 18, 169, 170, 172, 185)

Cytoplasmic polyhedrosis, in mixed infection with nuclear polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (169, 170, 172)

Arctia villica (L.), cream-spot tiger moth

Cytoplasmic polyhedrosis (16, 18, 163, 169, 170, 175, 244)

Cycnia mendica (Clerck), muslin moth

Nuclear polyhedrosis (163, 171)

Diacrisia purpurata (L.)

Nuclear polyhedrosis (16, 18, 169, 244)

Cytoplasmic polyhedrosis (163, 169, 170, 244)

Estigmene acrea (Drury), salt-marsh caterpillar

Polyhedrosis (185)

Granulosis (18, 185, 186, 187, 190, 195, 254)

Euplagia quadripunctaria (Poda), Jersey tiger moth

Cytoplasmic polyhedrosis (170)

Hyphantria cunea (Drury), fall webworm

Virus disease, not further identified (92)

Polyhedrosis (7, 47, 182, 185, 198, 220, 254)

Hypocrita jacobaeae (L.), cinnabar moth

Nuclear polyhedrosis, apparently as a result of cross-infection with polyhedra from *Panaxia dominula* (128, 171, 185)

Panaxia dominula (L.), scarlet tiger moth

Nuclear polyhedrosis (169, 170, 171, 246)

Phragmatobia fuliginosa (L.), ruby tiger moth

Polyhedrosis (170)

BOMBYCIDAE

Bombyx mori (L.), silkworm

Nuclear polyhedrosis (7, 8, 9, 13, 16, 17, 18, 19, 20, 21, 23, 62, 63, 65, 68, 81, 83, 84, 85, 107, 129, 133, 136, 144, 149, 173, 174, 185, 186, 189, 190, 191, 191d, 214, 234, 242, 247, 248, 249, 250, 251, 252, 253, 254)

Cytoplasmic polyhedrosis, naturally occurring, and apparently as a result of cross-infection with polyhedra from several other insects (18, 172, 215, 244)

A poorly defined group of diseases, including those known as flacherie and gattine, believed by Paillot to result from infection by a virus and a bacterium (134, 135, 136, 142, 185)

DIOPTIDAE

Phryganidia californica Pack., California oakworm

Nuclear polyhedrosis (7, 18, 47, 182, 185, 186, 187, 188, 190, 198, 254)

EPIPASCHIIDAE

Tetralopha scortealis (Led.), lespedeza webworm

Polyhedrosis (192)

GALLERIIDAE

Galleria mellonella (L.), greater wax moth

Polyhedrosis (156)

GELECHIIDAE

(See also OECOPHORIDAE)

Recurvaria milleri Busck, lodgepole needle miner

Granulosis (192)

GEOMETRIDAE

Abraixas grossulariata (L.), currant moth

Nuclear polyhedrosis (169, 170, 174, 246)

Cytoplasmic polyhedrosis (175)

Biston betularia (L.), pepper and salt moth

Cytoplasmic polyhedrosis (168)

Biston robustum Butler, giant geometrid

Virus disease, not further identified (92)

Bupalus piniarius (L.)

Nuclear polyhedrosis (7, 47, 182, 185, 198, 241, 254)

Cytoplasmic polyhedrosis, naturally occurring, and apparently as a result of cross-infection with the polyhedra of *Vanessa cardui* (168)

Ennomos quercinaria (Hufn.)

Nuclear polyhedrosis (102)

Lambdina fiscellaria fiscellaria (Guen.), hemlock looper

Virus disease, not further identified (45)

Lambdina fiscellaria lugubrosa (Hulst), western hemlock looper

Polyhedrosis (182, 185, 187, 254)

Lambdina fiscellaria somniaria (Hulst), western oak looper

Polyhedrosis (185)

Nepytia canosaria (Wlk.), false hemlock looper

Polyhedrosis (185)

Operophtera brumata (L.), winter moth

Cytoplasmic polyhedrosis, apparently as the result of cross-infection with polyhedra from *Vanessa cardui* (168)

Oporinia autumnata (Borkh.), larch looper

Nuclear polyhedrosis (124)

Ptychopoda seriata (Schrk.) (= *Sterrhia seriata* Schrk.)

Polyhedrosis (7, 16, 18, 185, 242)

Sabulodes caberata Guen., omnivorous looper

Polyhedrosis (192)

Granulosis (18, 99, 101, 186, 187, 190)

LASIOCAMPIDAE

Dendrolimus pini L.

Polyhedrosis, naturally occurring and apparently as a result of cross-infection with polyhedra from *Bombyx mori*, *Lymantria monacha* and *Porthetria dispar* (7, 18, 185)

Dendrolimus spectabilis Butler, pine caterpillar

Virus disease, not further identified (92)

Kunugia yamadai Nagano, Yamada lasiocampid

Virus disease, not further identified (92)

Malacosoma americanum (F.), eastern tent caterpillar

Polyhedrosis (7, 18, 22, 47, 81, 82, 97, 182, 185, 187, 198, 242, 254)

Malacosoma disstria Hbn., forest tent caterpillar

Nuclear polyhedrosis (7, 16, 18, 22, 47, 82, 150, 182, 185, 186, 254)

Malacosoma fragile (Stretch), Great Basin tent caterpillar

Nuclear polyhedrosis (49, 50, 51, 53, 187, 191a)

Malacosoma neustria (L.)

Polyhedrosis (7, 18)

Possible virus disease of the *Pailletella* type (4, 18)

Malacosoma pluviale (Dyar), western tent caterpillar

Nuclear polyhedrosis (18, 22, 186, 187)

Metanastria undans (Wlk.), chestnut-leaved oak caterpillar

Virus disease, not further identified (92)

LIMACODIDAE

Narosa conspersa Wlk.

Possible virus disease described as a "wilt disease" in the literature (109, 185)

Natada nararia (Moore) [= *Susica nararia* (Moore)]

Granulosis; reports of a "wilt disease" probably refer to this (109, 164, 175, 185)

Niphadolepis alianta Karsch

Possible virus disease described as a "wilt disease" in the literature (161, 185)

Parasa lepida (Cram.)

Possible virus disease described as a "wilt disease" in the literature (109, 185)

Spatulifimbria castaneiceps Hamps.

Possible virus disease described as a "wilt disease" in the literature (109, 185)

Thosea cana Wlk.

Possible virus disease described as a "wilt disease" in the literature (109, 185)

Thosea cervina Moore

Possible virus disease described as a "wilt disease" in the literature (109, 185)

Thosea recta Hamps.

Possible virus disease described as a "wilt disease" in the literature (109, 185)

LYCAENIDAE

Lycaena phlaeas (L.), small copper butterfly

Cytoplasmic polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (172)

LYMANTRIIDAE

Dasychira pseudabietis (Butler), Japanese cedar tussock moth

Virus disease, not further identified (92)

Dasychira pudibunda (L.)

Polyhedrosis (112, 113, 185)

Dasychira selenitica (Esp.)

Polyhedrosis (118, 185)

Euproctis chrysorrhoea (L.), brown-tail moth

Cytoplasmic polyhedrosis (168)

Euproctis terminalis (Wlk.), pine brown-tail moth

Polyhedrosis (185, 212)

Hemerocampa leucostigma (J. E. Smith), white-marked tussock moth

Polyhedrosis (7, 47, 182, 185, 198, 254)

Hemerocampa pseudotsugata McD., Douglas-fir tussock moth

Polyhedrosis (73, 185, 187)

Lymantria fumida Butler, red belly tussock moth

Virus disease, not further identified (92)

Lymantria monacha (L.), nun moth

Nuclear polyhedrosis (7, 9, 15, 16, 18, 19, 21, 38, 71, 72, 93, 96, 111, 130, 153, 170, 174, 186, 189, 190, 191a,d, 223, 224, 225, 226, 242, 254)

Nygma phaeorrhoea (Donov.), brown-tail moth

Polyhedrosis (185, 255)

Orgyia antiqua (L.), rusty tussock moth

Polyhedrosis (7, 47, 182, 185, 198, 254)

Porthetria dispar (L.), gypsy moth

Nuclear polyhedrosis (7, 8, 9, 10, 13, 15, 16, 18, 19, 21, 47, 48, 79, 80, 81, 82, 92, 96, 129, 170, 174, 185, 186, 189, 190, 191a, 198, 242, 254)

Cytoplasmic polyhedrosis, apparently as a result of cross-infection with polyhedra from another insect; not clear whether the insect was

Diacrisia purpurata, *Arctia villica* or *Sphinx ligustri* (244)

Stilpnotia salicis (L.) satin moth
Polyhedrosis (78, 185, 233)

MEGALOPYGIDAE

Megalopyge opercularis (J. E. Smith), puss caterpillar
Granulosis (192)

NOCTUIDAE

(See PHALAENIDAE)

NOTODONTIDAE

Cerura hermelina (Goeze) [=*Cerura bifida* (Hbn.)]

Polyhedrosis (7, 47, 182, 185, 198, 254)

Heterocampa guttivitta (Wlk.), saddled prominent

Polyhedrosis (7, 47, 55, 182, 185, 198, 254)

Phalera bucephala (L.), buff tip moth

Nuclear polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (172)

Cytoplasmic polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (172)

Stauropus alternus Wlk.

Polyhedrosis (185)

NYMPHALIDAE

Aglais urticae (L.), small tortoiseshell butterfly

Nuclear polyhedrosis; naturally occurring, and apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (7, 75, 138, 140, 172, 182, 185, 254)

Cytoplasmic polyhedrosis, in mixed infection with nuclear polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (171, 172, 244)

Argynnis lathonia (L.)

Polyhedrosis (54, 185)

Argynnis pandora Schiff.

Polyhedrosis (75)

Argynnis paphia (L.)

Polyhedrosis (75)

Charaxes jasius (L.)

Polyhedrosis (74, 75)

Junonia coenia Hbn., buckeye

Polyhedrosis (192)

Granulosis (18, 185, 186, 187, 190, 195, 254)

Nymphalis antiopa (L.)

Polyhedrosis (76)

Nymphalis io (L.), peacock butterfly

Nuclear polyhedrosis; naturally occurring and apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (74, 172)

Cytoplasmic polyhedrosis, apparently as a result of cross-infection with polyhedra from *Diacrisia purpurata* and *Vanessa cardui* (171, 172, 244)

Nymphalis polychloros (L.)

Polyhedrosis (76)

Vanessa atalanta (L.), red-admiral

Nuclear polyhedrosis (246)

Vanessa cardui (L.), painted lady butterfly

Nuclear polyhedrosis (75, 163, 172, 177, 187, 203)

Cytoplasmic polyhedrosis, apparently mixed with nuclear polyhedrosis (163, 172)

Vanessa tammeamea Esch., Kamehameha butterfly

Probable polyhedrosis (208, 239)

OECOPHORIDAE

Diurnea fagella (Schiff.) [=Chimbace fagella (Schiff.)]

Polyhedrosis (91, 182, 185, 254)

OLETHREUTIDAE

Carpocapsa pomonella (L.), codling moth

Polyhedrosis (158, 159, 185)

Eucosma griseana (Hbn.) [=Eucosma diniana (Guen.)], gray larch tortrix, larch bud moth

Virus disease, not further identified (92)

Polyhedrosis; some or all of these reports probably based on the granulosis noted below (61, 105, 106, 185)

Granulosis (124, 126)

Spilonota ocellana (D. & S.), eye-spotted bud moth

Nuclear polyhedrosis (197)

PHALAENIDAE

Agrotis segetum (Schiff.), turnipmoth or cutworm

Nuclear polyhedrosis (18, 140, 185, 254)

Cytoplasmic polyhedrosis (168)

Granulosis (137, 138, 140, 141, 187, 254)

Alabama argillacea (Hbn.), cotton leafworm

Polyhedrosis (7, 47, 182, 185, 198, 254)

Anticarsia gemmatalis Hbn., velvetbean caterpillar

Polyhedrosis (192). A mixture of disintegrating specimens of *Anticarsia gemmatalis* and *Xylomyges* sp. was found filled with polyhedra. Either or both of these species may have been infected.

Autographa biloba Steph.

Polyhedrosis (3, 185)

Autographa californica (Speyer), alfalfa looper

Nuclear polyhedrosis (7, 47, 90, 103, 182, 185, 198, 254)

Granulosis (90)

Catabena esula Druce

Polyhedrosis (203)

- Chorizagrotis auxiliaris* (Grote), army cutworm
 Polyhedrosis (192)
 Granulosis (192)
- Diataraxia oleracea* (L.), tomato moth
 Cytoplasmic polyhedrosis (168)
- Euplexia lucipara* (L.), small angleshades moth
 Granulosis (168)
- Euxoa ochrogaster* (Guen.), red-backed cutworm
 Disease of unknown etiology, possibly a polyhedrosis (110, 185)
- Heliothis phloxiphaga* Grt. & Rob.
 Polyhedrosis (185)
- Heliothis virescens* (F.), tobacco budworm
 Polyhedrosis (192)
- Heliothis zea* (Boddie), corn earworm, bollworm, tomato fruitworm
 Nuclear polyhedrosis (7, 47, 168, 180, 182, 185, 198, 254)
 Cytoplasmic polyhedrosis (168)
- Laphygma exempta* (Wlk.)
 Virus disease, not further identified (147, 240, 208)
- Laphygma exigua* (Hbn.), beet armyworm
 Nuclear polyhedrosis (18, 186, 187, 188)
 Granulosis (192)
- Laphygma frugiperda* (J. E. Smith), fall armyworm
 Polyhedrosis (2, 7, 47, 182, 185, 198, 254)
 Granulosis (192)
- Mamestra brassicae* (L.), cabbage armyworm
 Virus disease, not further identified (92)
- Melanchra persicariae* (L.), dot moth
 Granulosis (168)
- Moma champa* Moore, yellow belly dagger moth
 Virus disease, not further identified (92)
- Nephelodes emmedonia* (Cram.), bronzed cutworm
 Polyhedrosis (182, 185, 192, 227, 254)
 Granulosis (192)
- Panolis flammea* Schiff., pine moth
 Polyhedrosis (7, 152, 160, 185)
- Peridroma margaritosa* (Haw.), variegated cutworm
 Polyhedrosis (192)
 Granulosis (16, 18, 183, 185, 186, 187, 190, 194, 195, 254)
- Persectania ewingi* Wwd., New Zealand armyworm
 Granulosis (121)
- Phlogophora meticulosa* (L.), angleshades moth
 Nuclear polyhedrosis; apparently as a result of cross-infection with polyhedra from *Sphinx ligustri*; also, in mixed infection with cytoplasmic polyhedrosis as a result of cross-infection with polyhedra from *Vanessa cardui* (163, 172, 174)
 Cytoplasmic polyhedrosis, apparently as a result of cross-infection with cytoplasmic polyhedra from *Arctia villica*; also in mixed infection

with nuclear polyhedrosis as a result of cross-infection with polyhedra from *Vanessa cardui* (163, 172, 175)

Plusia gamma (L.)

Nuclear polyhedrosis (116)

Prodenia litura (F.)

Polyhedrosis (44, 69, 185)

Prodenia ornithogalli Guen., yellow-striped armyworm

Polyhedrosis (185)

Prodenia praefica Grote, western yellow-striped armyworm

Nuclear polyhedrosis (18, 33, 46, 98, 185, 186, 187, 188, 190, 254)

Pseudaleitia unipuncta (Haw.), armyworm

Nuclear polyhedrosis (7, 47, 58, 182, 185, 187, 191d, 198, 202, 203, 206, 254)

Granulosis (201, 202, 203, 206)

Noninclusion virus disease (18, 228)

Rachiplusia nu Guen.

Polyhedrosis (192)

Spaelotis clandestina (Harr.), W-marked cutworm

Polyhedrosis (7, 182, 185, 198, 254)

Spodoptera mauritia (Bdv.)

Polyhedrosis (207)

Trichoplusia ni (Hbn.) (=*Plusia brassicae* Riley), cabbage looper

Nuclear polyhedrosis (7, 47, 182, 185, 198, 254)

Tripaena pronuba (L.), yellow underwing

Cytoplasmic polyhedrosis (168)

PHALONIIDAE

Clysianna ambiguella (Hbn.)

Polyhedrosis (7, 47, 182, 185, 198, 254)

PHYCITIDAE

Dioryctria splendidella H. S., larger pine shoot borer

Virus disease, not further identified (92)

PIERIDAE

Aporia crataegi (L.), black-veined white butterfly

Nuclear polyhedrosis (114, 123, 185)

Cytoplasmic polyhedrosis (168)

Colias chrysostheme chrysostheme Esp.

Polyhedrosis (7)

Colias electo L., lucerne caterpillar

Polyhedrosis (120, 122, 162, 185)

Colias lesbia (F.)

Nuclear polyhedrosis; apparently identical with virus affecting *Colias philodice eurytheme* (188)

Colias philodice eurytheme Bdv., alfalfa caterpillar

Nuclear polyhedrosis (7, 16, 18, 40, 46, 47, 52, 60, 98, 100, 127, 179, 181,

182, 184, 185, 186, 187, 188, 189, 190, 191a,b,c, 198, 210, 211, 237, 238,
242, 254)

Colias philodice philodice Latr., clouded sulphur butterfly

Polyhedrosis (7, 47, 182, 185, 198)

Pieris brassicae (L.), European cabbage butterfly

Granulosis (131, 133, 185, 219, 254)

Possible virus disease with formation of polymorphic inclusion bodies
(131, 132, 133, 143, 168, 185, 189, 190, 254)

Pieris rapae (L.), imported cabbageworm

Nuclear polyhedrosis; result of cross-infection with polyhedra from
Colias philodice eurytheme; earlier reports of a naturally occurring
disease (7, 95, 168, 182, 185, 188, 198, 199, 200, 254)

Granulosis (18, 187, 199, 200, 204, 205, 208, 209)

PSYCHIDAE

Cryptothela junodi (Heylaerts) [= *Acanthopsyche junodi* (Heylaerts)],
wattle bagworm

Nuclear polyhedrosis (168, 185)

PYRALIDIDAE

Dichocroceis punctiferalis (Guen.), peach pyralid moth
Virus disease, not further identified (92)

PYRAUSTIDAE

Blepharomastix acutangulalis (Snellen)
Polyhedrosis (203)

Omiodes blackburni (Butler), coconut leaf roller
Virus disease, not further identified (104, 208)

SATURNIIDAE

Antheraea paphia (L.), tasar silkworm
Polyhedrosis; also reported to be susceptible to virus of *Bombyx mori*
polyhedrosis (7, 36, 47, 182, 185, 198, 254)

Antheraea pernyi Guér.-Men., Chinese oak silkworm
Polyhedrosis; also reported to be susceptible to virus of *Bombyx mori*
polyhedrosis (7, 35, 36, 47, 182, 185, 198, 254)

Antheraea polyphemus (Cram.), polyphemus moth
Polyhedrosis (18, 170, 171)

Antheraea yamamai Guér.-Men., Japanese oak silkworm
Polyhedrosis; also reported to be susceptible to virus of *Bombyx mori*
polyhedrosis (7, 35, 36, 47, 182, 185, 198, 254)

Coloradia pandora Blake, pandora moth
Polyhedrosis (185, 187, 243)

Hemileuca maia (Drury), buck moth
Polyhedrosis (7, 182, 185, 198, 254)

Hemileuca oliviae Ckll., range caterpillar
Polyhedrosis (7, 47, 182, 185, 198, 254)

Hemileuca tricolor (Pack.)
Polyhedrosis (192)

Nudaurelia cytherea (F.), pine tree emperor moth

Polyhedrosis (185, 213)

Samia cynthia (Drury) [= *Philosamia cynthia* Drury], cynthia moth

Polyhedrosis; naturally occurring, and apparently as a result of cross-infection with polyhedra from *Bombyx mori* and *Vanessa cardui* (7, 36, 47, 107, 172, 182, 185, 188, 198, 254)

Cytoplasmic polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (172)

Samia ricini (Bdv.), Arrindy silkworm

Polyhedrosis, apparently as a result of cross-infection with polyhedra from *Bombyx mori* (1, 177, 222)

Saturnia pyri (Schiff.) [= *Saturnia pavonia major* (L.)]

Polyhedrosis (7, 47, 56, 182, 185, 198, 254)

SATYRIDAE

Dira megera (L.), wall butterfly

Cytoplasmic polyhedrosis and possible nuclear polyhedrosis; a condition similar to that cited for *Pararge aegeria* (172)

Pararge aegeria (L.), speckled wood butterfly

Cytoplasmic polyhedrosis; apparently as a result of cross-infection with polyhedra from *Vanessa cardui*; also a nuclear polyhedrosis possibly present (172)

SPHINGIDAE

Celerio euphorbiae (L.), spurge hawk moth

Polyhedrosis (7, 34, 185)

Celerio galii (von Rott.), madder hawk moth

Polyhedrosis (7, 34, 185)

Celerio harmuthi (Kordesch) [= *Celerio euphorbiae* (L.) ♂ × *Deilephila elpenor* (L.) ♀]

Polyhedrosis (34, 185)

Celerio kindervateri Kys. [= *Celerio euphorbiae* (L.) ♂ × *Celerio galii* (von Rott.) ♀]

Polyhedrosis (34, 185)

Celerio phileuphorbiae Mütz. [= *Celerio galii* (von Rott.) ♂ × *Celerio euphorbiae* (L.) ♀]

Polyhedrosis (34, 185)

Celerio vespertilio (Esp.)

Polyhedrosis (7, 34, 185)

Deilephila elpenor (L.)

Polyhedrosis (7, 34, 185)

Laothoe populi (L.), poplar hawk moth

Nuclear polyhedrosis, apparently as a result of cross-infection with polyhedra from *Vanessa cardui* (172)

Proserpinus proserpina (Pall.)

Polyhedrosis (7, 34, 185)

Smerinthus ocellatus (L.)

Polyhedrosis (7, 47, 182, 185, 198, 254)

Sphinx ligustri L., privet hawk moth

Nuclear polyhedrosis, in mixed infection with cytoplasmic polyhedrosis, apparently as a result of cross-infection with viruses from several other insects (163, 171, 177)

Cytoplasmic polyhedrosis (177, 244)

THAUMETOPOEIDAE

Thaumetopoea pityocampa Schiff.

Nuclear polyhedrosis (216, 218)

Thaumetopoea processionea L.

Nuclear polyhedrosis (217)

Cytoplasmic polyhedrosis (221)

TINEIDAE

Tinea columbariella Wocke

Polyhedrosis (77)

Tinea pellionella (L.), casemaking clothes moth

Nuclear polyhedrosis, as a result of cross-infection with polyhedra from *Tineola bisselliella* (168, 171)

Cytoplasmic polyhedrosis (168)

Tineola bisselliella (Hum.), webbing clothes moth

Nuclear polyhedrosis, in some cases in mixed infection with cytoplasmic polyhedrosis (7, 18, 119, 170, 171, 174, 182, 190, 210, 254)

TORTRICIDAE

(See also OLETHRUTIDAE and PHALONIIDAE)

Acleris variana (Fern.), black-headed budworm

Nuclear polyhedrosis (88, 185, 254)

Amelia pallorana (Rob.)

Granulosis (192)

Argyrotaenia velutinana (Wlk.), red-banded leaf roller

Granulosis (18, 155, 157, 187, 190, 192, 229)

Cacoecia murinana (Hbn.), fir shoot roller

Polyhedrosis (113, 115, 192, 232)

Granulosis (11, 13, 16, 18, 185, 190, 234, 242, 254)

Choristoneura fumiferana (Clem.), spruce budworm

Nuclear polyhedrosis (12, 13, 15, 16, 18, 31, 242)

Cytoplasmic polyhedrosis (31, 87)

Granulosis (15, 16, 18, 86, 185, 242)

Homona coffearia Nietn., tea tortrix

Polyhedrosis (185, 196)

Tortrix loeflingiana L.

Polyhedrosis (231)

Tortrix viridana L.

Polyhedrosis (231)

ZYGAENIDAE

Harrisina brillians B. & McD., western grape leaf skeletonizer
 Granulosis (18, 178, 190, 193)

ORTHOPTERA**GRYLLIDAE**

Acheta domesticus (L.), house cricket
 Unidentified bodies in blood resembling virus inclusion bodies (89)

COLEOPTERA**CERAMBYCIDAE**

Batocera (Batocera) lineolata Chevrolat, white-striped longicorn
 Virus disease, not further identified (92)

DERMESTIDAE

Anthrenus museorum (L.)
 Polyhedrosis (7, 47, 182, 185, 198)
Dermestes lardarius L., larder beetle
 Polyhedrosis, reported to have resulted from cross-infection with poly-
 hedra from *Bombyx mori* (7, 47, 182, 185, 198, 210)

HYMENOPTERA**APIDAE**

Apis mellifera L., honey bee
 "Paralysis" of honey bee, a noninclusion virus disease (41, 42, 43, 185)
 Sacbrood, a noninclusion virus disease (7, 70, 96, 108, 182, 185, 186, 189,
 190, 198, 208, 235, 236, 254)

DIPRIONIDAE

Diprion (Gilpinia) hercyniae (Hartig) [= *Lophyrus Hercyniae* Hartig;
 = *Diprion polytoma* (Hartig) partim], European spruce sawfly
 Nuclear polyhedrosis of midgut cells; also reported to be susceptible to
 polyhedrosis of *Neodiprion pratti banksianae* (5, 6, 13, 15, 16, 18, 24,
 25, 26, 27, 29, 57, 67, 145, 146, 185, 189, 191a,b, 254)
Diprion nipponica (Rohwer), black-spotted pine sawfly
 Virus disease, not further identified (92)
Diprion pallida (Klug)
 Nuclear polyhedrosis of midgut cells (6, 185)
Diprion pini (L.)
 Nuclear polyhedrosis of midgut cells (6, 185)
Diprion (Gilpinia) polytoma (Hartig)
 Nuclear polyhedrosis of midgut cells (6, 185)
Neodiprion abietis (Harr.) (= *Lophyrus abietis* Harr.), balsam-fir sawfly
 Polyhedrosis (185)
Neodiprion lecontei (Fitch) (= *Lophyrus Lecontei* Fitch), red-headed pine
 sawfly
 Polyhedrosis (187)

- Neodiprion mundus* Rohwer [= *Neodiprion (Neodiprion) mundus* Rohwer]
 Polyhedrosis (192)
- Neodiprion nanulus* Schedl, red-pine sawfly
 Polyhedrosis, apparently as a result of cross-infection with polyhedra
 from *Neodiprion pratti banksianae* (29)
- Neodiprion pratti banksianae* Rohwer
 Nuclear polyhedrosis of midgut cells (29, 32)
- Neodiprion sertifer* (Geoff.) [= *Tenthredo sertifera* Geoff.; = *Lophyrus rufus*
 (Latr.)], European pine sawfly
 Virus disease, not further identified (92)
- Nuclear polyhedrosis of midgut cells; also susceptible to polyhedrosis of
Neodiprion pratti banksianae (6, 7, 16, 18, 28, 29, 30, 39, 163, 185,
 191a,c, 242, 254)
- Neodiprion taede taede* Ross [= *Neodiprion americanum* (Leach) Hetrick],
 loblolly-pine sawfly
 Polyhedrosis (94, 187)

PAMPHILIIDAE

- Acantholyda (Itycorsia) nemoralis* C. G. Thomson [= *Lyda stellata*
 (Christ.); = *Tenthredo pratensis* F.]
 Possible polyhedrosis (185)
- Cephaleia (Cephaleia) abietis* L. (= *Lyda hypotrophica* Hartig; = *Lyda*
campestris Fallén non L.)
 Polyhedrosis (154a)
- Cephaleia (Cephaleia) alpina* Klug (= *Cephaleia lariciphila* Wachtl.)
 Polyhedrosis (37, 154)

TENTHREDINIDAE

- Pristiphora erichsonii* (Hartig) (= *Nematus Ericksonii* Hartig), larch saw-
 fly
 Polyhedrosis (185)
- Nematus olfaciens* Benson, black currant sawfly
 Nuclear polyhedrosis (168)

DIPTERA

CALLIPHORIDAE

- Calliphora vomitoria* (L.), bluebottle fly
 Polyhedrosis (7, 47, 182, 185, 198)

CECIDOMYIIDAE

(See ITONIDIDAE)

CHIRONOMIDAE

(See TENDIPEDIDAE)

DROSOPHILIDAE

- Drosophila fasciata* Meig. [= *Drosophila melanogaster* (Meig.)]
 Virus "σ" (117, 148)

ITONIDIDAE

Contarinia tritici (Kirby)

Polyhedrosis (66, 185)

Sitodiplosis mosellana (Gehin), wheat midge

Polyhedrosis (66, 185)

TENDIPEDIDAE

Chironomus tentans F.

Inclusions in the cytoplasm of fat cells not bearing very strong resemblance to typical polyhedra (185, 230)

TIPULIDAE

Tipula (*Tipula*) *paludosa* Meig., leatherjacket

Polyhedrosis; inclusions not bearing very strong resemblance to typical polyhedra (151, 165, 166, 167, 176, 185)

Noninclusion virus disease (245)

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