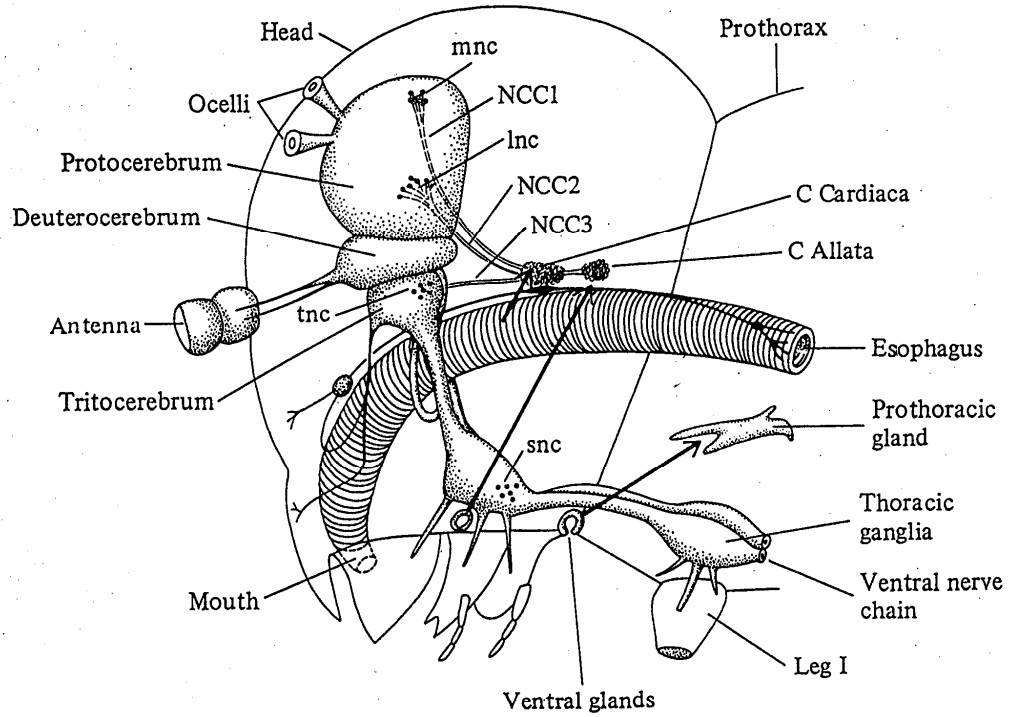
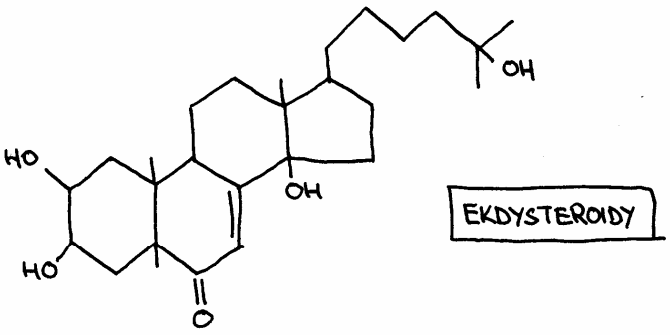
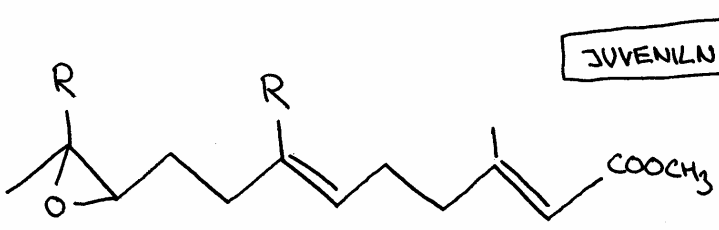


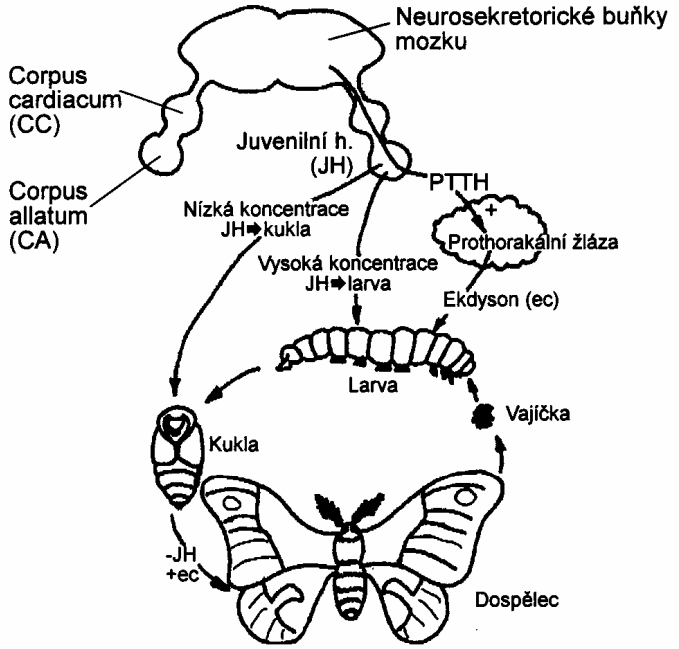
FIGURE 11–19 Generalized central nervous system and endocrine systems of an insect. The nervous system contains three major groups of neurosecretory cells: the median (mnc), lateral (lnc), and subesophageal (snc), which are connected with the corpora cardiaca via NCCI and NCCII nerves; phasmid insects have additional neurosecretory cells in the tritocerebrum (tnc) connected to the corpora cardiaca via NCCIII nerves. The corpora cardiaca are a neurohemal organ for the release of neurosecretions; they arise from stomodeal ectoderm (shown by black arrows). The corpora allata are classical endocrine glands that arise from ectodermal invaginations near the maxillae (black arrows). The prothoracic gland is another important classical endocrine gland; it arises (black arrow) from ventral glands (which are present in primitive insects). *(Modified from Jenkin 1962; after Knowles 1963.)*



EKDYSTEROIDY



JUVENILNÍ HORMON



Obr. 14.5. Hormonální řízení svlékání hmyzu. Produkce ekdysonu z prothorakálních žlaz je stimulována protoracikotropním hormonem (PTTH) syntetizovaného v mozku a vylévaného z kardiálních tělísek (CC). Ekdyson iniciuje svlékací děje. Zda se vytvoří kutikula kuklová nebo opět larvální, rozhodne koncentrace juvenilního hormonu (JH). Ten je produkován v tělískách přilehlých (CA).

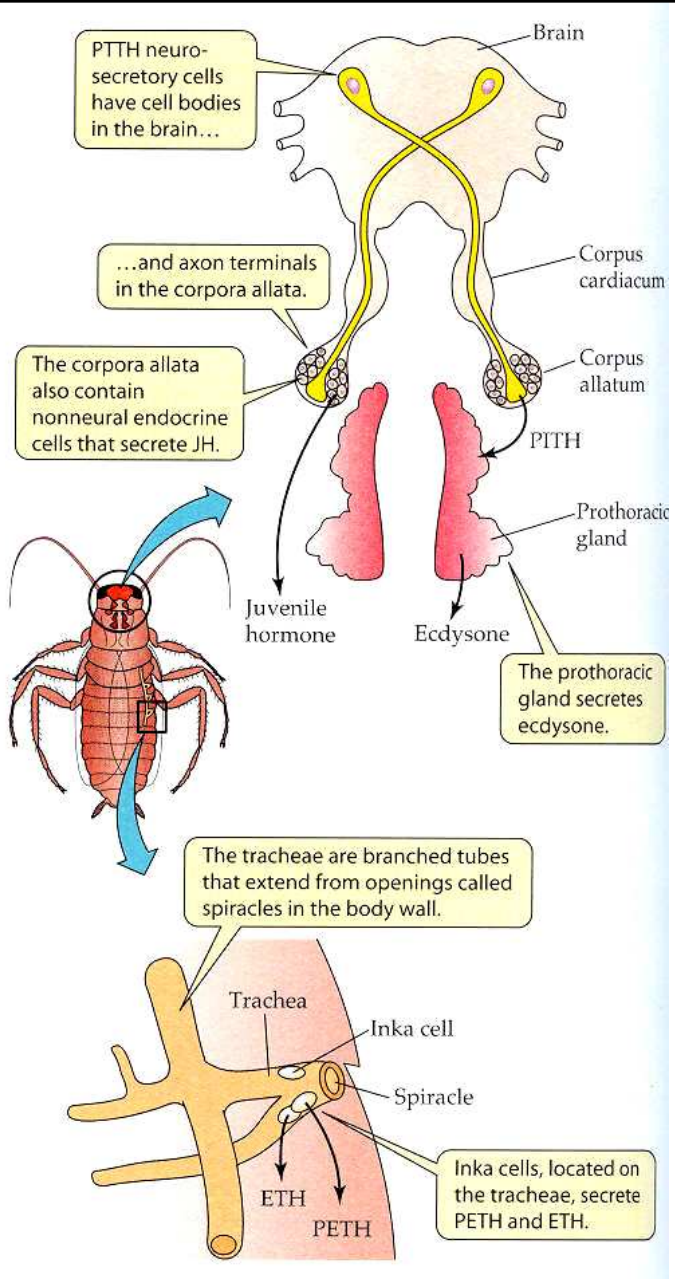


TABLE 14.6 Major hormones and neurohormones that control insect metamorphosis

Hormone	Type of molecule	Type of signal	Site of secretion	Major target tissue	Action
Prothoracicotropic hormone (PTTH)	Protein (~5000 molecular weight)	Neuroendocrine	Brain, with axon terminals extending to corpora allata	Prothoracic glands	Initiates molting (ecdysis) by stimulating release of ecdysone from prothoracic glands
Ecdysone (molting hormone)	Steroid	Endocrine	Prothoracic glands in larva/nymph; ovary in adult	Epidermis in larva/nymph; fat body in adult	When activated to 20-hydroxyecdysone, promotes cellular mechanisms to digest old cuticle and synthesize new one; stimulates production of yolk proteins in adult
Juvenile hormone (JH)	Terpene (fatty-acid derivative)	Endocrine	Corpora allata	Epidermis in larva/nymph; ovary in adult	Opposes formation of adult structures and promotes formation of larval/nymphal structures; functions as a gonadotropin in the adult
Eclosion hormone (EH)	Peptide	Neuroendocrine	Brain	Inka cells, possibly others	Promotes PETH and ETH secretion from Inka cells
Pre-ecdysis triggering hormone (PETH)	Peptide	Endocrine	Inka cells of tracheae	Neuronal circuits in brain	Coordinates motor programs to prepare for shedding the cuticle
Ecdysis triggering hormone (ETH)	Peptide	Endocrine	Inka cells of tracheae	Neuronal circuits in brain	Coordinates final motor programs for escaping from old cuticle
Bursicon	Large protein (~35,000 molecular weight)	Neuroendocrine	Brain and nerve cord	Cuticle and epidermis	Tans and hardens new cuticle

Sources: After Randall, Burggren, and French 2002; and Žitňan et al. 2003.

Přehled hmyzích hormonů

1. Ekdysteroidy

- ekdyson, 20-hydroxyekdyson (20-E), makisteron A (=24-metyl-20E), 2-deoxyekdyson, 26-hydroxyekdyson a další

2. Juvenilní hormony

JH-I, JH-II, JH-III, JH-0, 4-metyl-JH-I, kyselina juvenilního hormonu

3. Peptidické neurohormony

I. Hormony řídící metabolismus a homeostázu

1. Adipokinetické hormony (AKH) a hypertrehalosemické hormony
2. Diuretické hormony
3. Antidiuretické hormony
4. Chloride transport stimulating hormone a ion transport peptide

II. Hormony řídící metamorfózu, vývoj a růst

1. Prothoracikotropní hormon (PTTH) a bombyxin
2. prothoracikostatický hormon (PTSH)
3. Allatostatiny a allatotropin
4. PBAN I, II, III (pheromone biosynthesis activating neuropeptide)
5. Eklozní hormon a *ecdysis triggering hormone (ETH)*
6. Burzikon
7. Faktory regulující puparizaci much
8. Diapauzní hormon

III. Hormony řídící pohlavní funkce

1. stimulační gonádotropní neurohormony (gonadotropiny):
   - ovary maturing parsin (OMP)
   - egg development neurohormone (EDNH) (=ovarian ecdysteroidogenic factor)
2. inhibiční neurohormony (antigonadotropiny, folikulostatiny):
   - neuroparsin
   - oostatické hormony a TMOF (trypsin-modulating oostatic factor)

VI. Hormony modifikující svalovou kontrakci (myotropní peptidy)

1. Proctolin
2. Kardiostimulační hormony - crustacean cardioactive peptide (CCAP)
3. Skupiny myotropních neurohormonů - myokininy, sulfakininy, pyrokininy, tachykininy, myoinhibiční peptidy, periviscerokininy, FMRF-amid

V. Hormony řídící barvoměnu (chromatotropiny)

1. PDF - pigment dispersing factor
2. MRCH - melanization and reddish coloratig hormone (identický s PBAN)

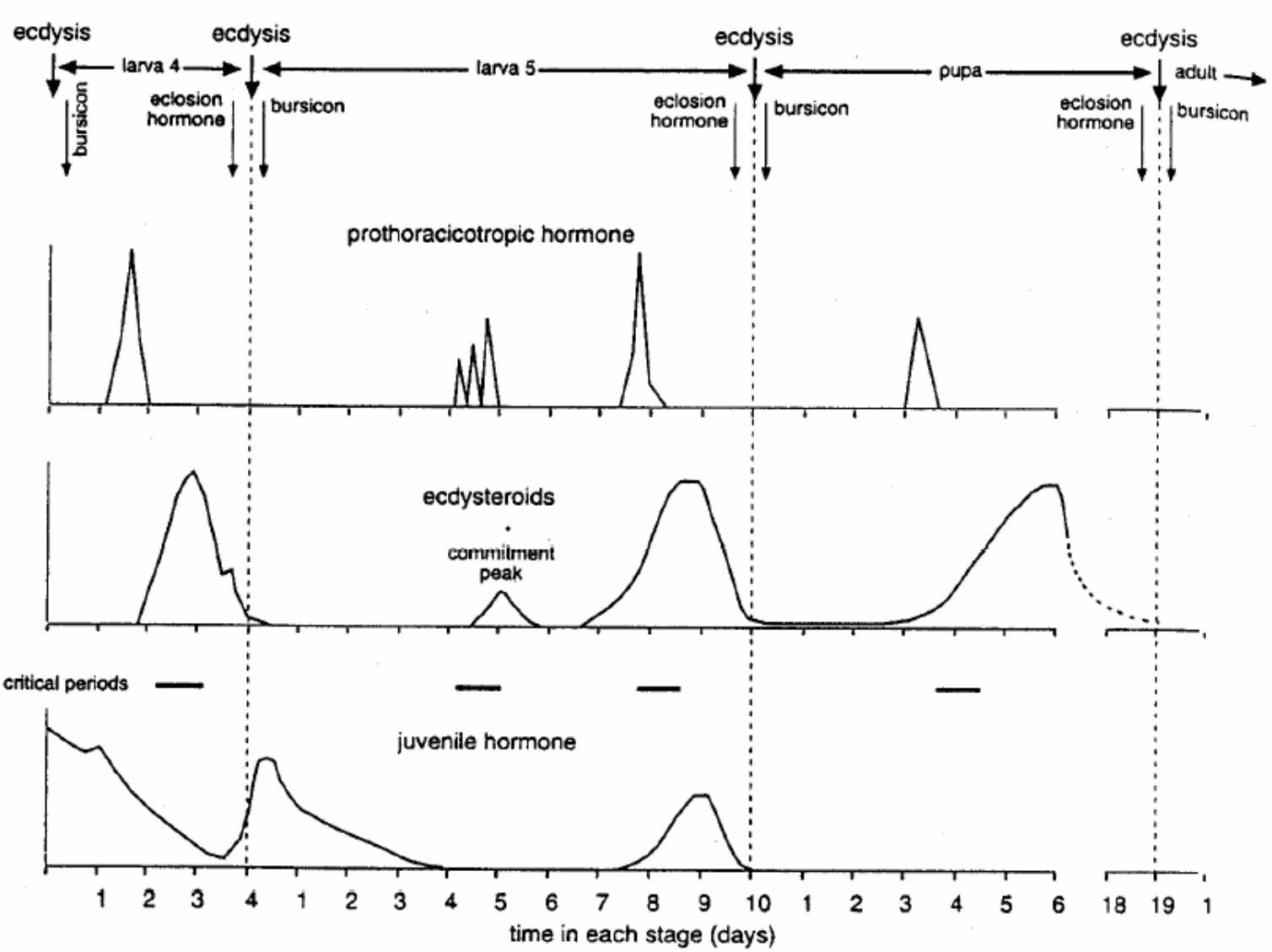


Fig. 15.30. Changes in hormone titers regulating molting and metamorphosis in a holometabolous insect. At the molt from larva to larva, juvenile hormone is present during the critical period; at the molt from larva to pupa, no juvenile hormone is present at the first critical period. The second critical period of sensitivity to juvenile hormone in the fifth stage larva regulates development of the imaginal discs. Eclosion hormone and bursicon are produced for a brief period before and after each ecdysis (based on data for *Manduca*, Lepidoptera).