Novel biocontrol agents for insect pests from neuroendocrinology

(nEUROSTRESSPEP)

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Deliverable D2.1

Comprehensive database of physiological function of selected neuropeptides across model and pest insects

Lead Beneficiary: University of Leeds

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1 INTRODUCTION

This deliverable contributes to the overall aim of WP2 in the functional characterisation of insect neuropeptides. Much of this deliverable has been included in the comprehensive Diner database (deliverable D1.1). In addition to this a more focused database on selected peptides were based on the prioritisation list (Table 1) generated as an output from WP3. The data has been brought together in two formats. Firstly an Excel spread sheet that provides summary information and the **url** to the relevant pages in Diner (Table 2) and secondly a series of Endnote libraries for each insect peptide of publications up to May 2017. These will be updated every 6 months.

1.1 TABLE 1

Neuropeptide family	Priority	Rationale
PK/PBAN	**High**	A wide array of analogues (metabolically stable and highly active agonists and antagonists) are already available for immediate testing. Receptors are well-characterized. Wide range of activities in lepidopteran species, recent experiments show some effects on the viability of eggs. Low association with natural enemies such as ladybirds and predatory wasps (DINeR* analysis).
CAP2B/CAPA	**High**	Role in environmental stress response. Desiccation and cold stress are greatly impacted by capa signalling in *Drosophila* spp. Analogues are available that directly influence desiccation tolerance. High probability of being kind to harmless insect species (e.g. mayflies), based on DINeR record analysis. No existing IP resistance.
Kinin	**High**	Peptide and receptor required for successful ecdysis in *Drosophila*, mutants display early mortality. Important functions in water, ion balance and feeding. Based on DINeR analysis, analogues are potentially kind to Hymenoptera (beneficial pollinators and natural enemies). No existing IP resistance.
Diuretic hormone type peptides	**Low – (High)****	Diuretic hormones are interesting targets since a lot of the tested species are prone to desiccation stress. Nevertheless, it may not be feasible to synthesize DH analogues in large quantities because of their relatively long sequence. **DH-like peptides should be on high priority list for the promotor-effector approach (Deliverable 3.3). No existing IP resistance.
Sulfakinins	**High**	Satiety-inducing peptide in several insect species. Inhibition of feeding by injecting in locusts, very potent effects on digestion. Some lethal effects observed for SKs in larval development. Low association with ladybirds and beneficial wasps (DINeR). No existing IP resistance.
AKH, Crz	**Low**	Corazonin is known as a stress peptide; Crz neurons regulating capa-producing neurons, therefore important for metabolic stress, ion balance and water stress. No severe effects and/or high amount of peptide seems needed to obtain sub-lethal effects for both AKH and Crz. Little is known about the pharmacology of these peptides which will compromise the successful design of more biostable analogues/mimics on the short run. So, more basic data from different species are still needed first. No existing IP resistance.

1.2 TABLE 2

Peptide family	Insect	Function	from Diner
pyrokinin/ PBAN	Drosophila	myostimulatory	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=2
	Drosophila	feeding behaviour	
	Periplaneta	myostimulatory	
	Leucophaea	myostimulatory	
	Heliothis	stimulates pheromone biosynthesis	
	Agrotis ipsilon	stimulates pheromone biosynthesis	
	Spodoptera	stimulates pheromone biosynthesis	
	Helicoverpa	stimulates pheromone biosynthesis	
	Flesh fly	pupariation acceleration	
	Bombyx	Diapause induction	
	Bombyx	coloration change/ melanisation	
	Spodoptera	coloration change/ melanisation	
	Mamestra	coloration change/ melanisation	
CAP2B/ CAPA	Drosophila	fluid secretion	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=6
	Drosophila	cold tolerance	
	D. suzukii	fluid secretion	
	Manduca	cardioacceleratory	
	Periplaneta	myostimulatory cardiac	
	Periplaneta	myotropic	
	Periplaneta	cardioacceleratory	
	Rhodnius	anit-diuretic	
	Musca	diuretic	
	Acheta	diuretic	
	Stomoxys	diuretic	
	Glossina	diuretic	

Kinin	Leucophaea	myostimulatory	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=7
	Drosophila	diuretic	
	Musca	diuretic	
AKH	Schistocreca	lipid mobilisation	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=3
	Schistocreca	glycogen mobilisation	
	Leptinotarsa	proline utilisation for energy	
		cardiac myostimulatory	
	Drosophila	motor/searching activity in response to starvation	
	Drosophila	lipid mobilisation	
	Drosophila	glycogen mobilisation	
	Drosophila	nutritional and oxidative stress responses	
	Periplaneta	increase motor activity	
	Phormia	modulation of crop	
corazonin	Drosophila	nutritional stress	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=4
	Drosophila	osmotic stress	
	Rhodnius	cardiac myostimulatory	
	Manduca	ecdysis behaviour	
	Schistocreca	locust phase transition	
	Periplaneta	cardiac myostimulatory	
	Bactrocera	ecdysis behaviour	
sulfakinin	Drosophila	feeding/satiety	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=5
	Drosophila	cardiac myostimulatory	
	Zophobas	hypertrehalosemic	
	Schistocerca	digestive enzyme secretion	
	Schistocerca	reduced feeding/satiety	
	Rhodnius	reduced feeding/satiety	

	Rhodnius	stimulates gut contractions	
	Tribolium	reduced feeding/satiety	
	Phormia	reduced feeding/satiety	
	Blattella	reduced feeding/satiety	
	Gryllus	reduced feeding/satiety	
diuretic hormones (DH31)	Drosophila	fluid secretion	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=8
	Drosophila	gut peristalsis	
	Drosophila	temperature prefernce rhythm	
	Drosophila	desiccation tolerance	
	Rhodnius	fluid secretion	
	Acheta	fluid secretion	
	Oncopeltus	fluid secretion	
	Anopheles	fluid secretion	
	D. suzukii	fluid secretion	
	Hylobius	fluid secretion	
diuretic hormones (DH44)	Drosophila	fluid secretion	http://www.neurostresspep.eu/diner/npinfopage?neuropeptideID=9
	Drosophila	desiccation tolerance	
	Drosophila	circadian rhythm	
	Drosophila	gut contractions	
	Drosophila	diet selection	
	Drosophila	female sperm ejection	
	D. suzukii	fluid secretion	
	Hylobius	fluid secretion	
	Schistocerca	reproduction	
	Schistocerca	feeding	
	Schistocerca		
	Rhodnius	fluid secretion	
	Periplaneta	fluid secretion	
	Manduca	fluid secretion	
	Manduca	ecdysis behaviour	