

Supporting Information

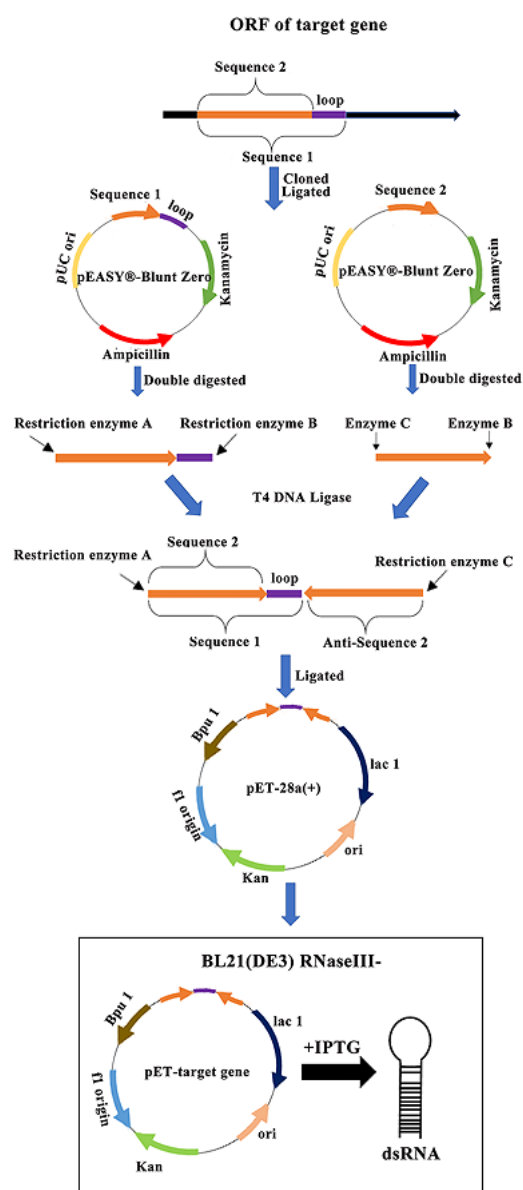


Figure S1. Schematic diagram of the dsRNA production system.

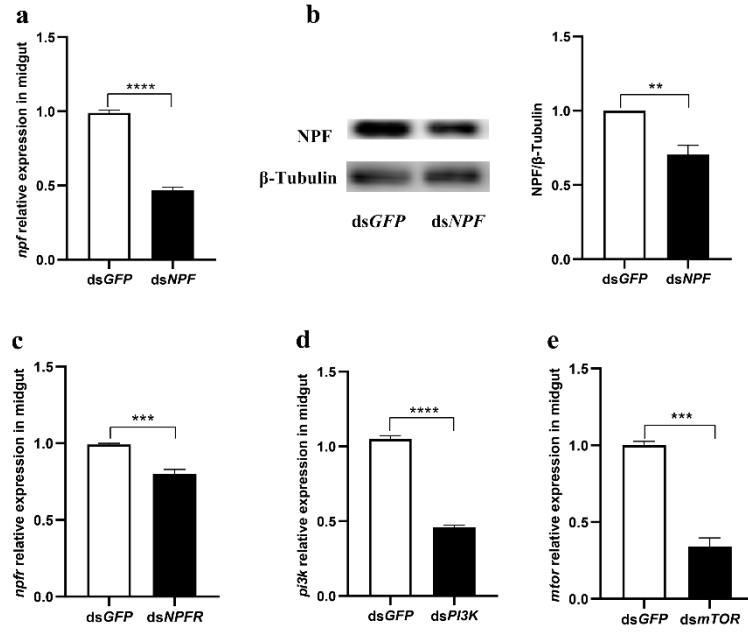


Figure S2. RNAi. (a) the relative expression levels of *npf* in midgut of the 5th instar larvae after larvae were treated with ds*NPF* for 24 h. (b) The protein level of NPF was analyzed by Western blot and the gray scale value of the protein strip was analyzed by Image J software. (c-e) the relative expression levels of *npfr*, *pi3k* and *mtor* in midgut of the 5th instar larvae after larvae were treated with ds*NPFR*, ds*PI3K* and ds*mTOR* for 24 h, respectively. Each treatment was repeated 3 times with 10 individuals per replicate. Bars represent the mean \pm SE, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

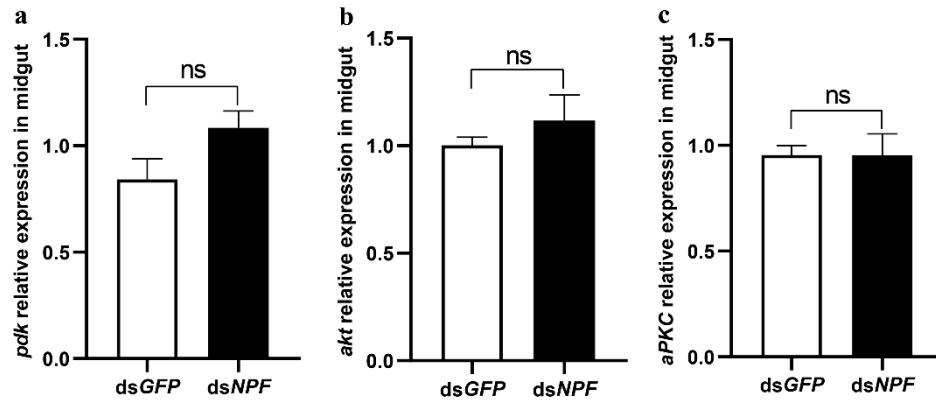


Figure S3. The relationship between NPF and PDK/AKT/PKC in insulin pathway in midgut of *O. furnacalis*. (a-c) Relative expression levels of *pdk*, *akt* and *pkc* in insulin signaling pathway after the 5th instar larvae were knocked down NPF for 24 h, respectively. Each treatment was repeated 3 times with 10 individuals per replicate. Bars represent the means \pm SE. ns indicates no significant difference.

>*α*-amylase -promoter (-1914 to +86)

GAAAGATATTTCAAAAATTTATAATAATATGATCTTTGATATTAATGCAAATAATGCAATAAGTAATCAACAGCAT
TATTTTTATTACCTACATTAAATCAAAGGTCATTTAGGTCACACATGTGTGATTTGATTGTATTATTTTCAATTGA
TACCCTGTGTTTTAGGGCTCCGCAAACTTTTGAATAAACGGAAGTGTGCAAAATCTATCACGTGTAGCTTTACG
TACACTTTTCAGTCTATAATTAGCCATTTTTTTTTTCAGAAAACCTTCAATTGGTGTATTTTTGTTATTAAACAACAT
GAAAAAAAATATTTTAAACCAAAATATTACATCCGAAATCACTGAACAATAATTTAAAAAAAATAGGAACATAAC
AGTTTTTACAGAAAAATATACTGAAACTCTTATTATAATTTTTTAGCATTTTGTGTATTAATTAAGGTACCTAATATT
AATTAATACAAAAAATTGCTGTTCTTGATACACGTAAAAGTAAGTATTACATTTATCATGCAAGAACCCTCTTCA
AGCGAGTAAAAATCACACTTGACCGGTATAAGACCGGATAGGTGTAATTATCAGTTGATTAAATGAGATCGATATC
ACTTATACCTTCACCGAGGACTGATAATTTTCAGCAAGCAATCAGATTGGATAACAATGCATTTTTGATTGTTG
ATGTAAGCTTCCCCCTAGACAAGACAACCGTGTTCAGTTTCATTGCGATATCGCTTCGTTCCGTGCCGTGTAG
CGATCGAAATTTTCATCTTTCAAGAATGTTTCCATGCAAGGTTTCTGCGGCAAAGACTACATTTTTCAAAAATGATA
TGCTTGTAATAAACTAAATGGTGGTACCATTATAGCATTGACCCTGGACTTAACCTGATCTTTATCCTGCCCTGA
AACACCTAGATTACTTCTTCAAAGATATACTAAGCAAGCAAGTATCAGTATGTACGATCAATTTTGAATTTTACAG
TTTCGAAAGTTTTTAAATAACTTGATCGTTAGGATTATCCACAACCTGTTGAATAGCTTCCCACTAATGCCTCGAAT
AGTAATAAAAAGTCAGAATCTCAGGTAGTGCAAGTAGATCAATGAACTAGCAGCCATTGCGTGAGGGTTCAAATA
AAAATACTTATTCTTAAACAACAAGAGGGTTAATTGTTACAATAAAACCTTTCCACGCCACTGAATGTTCCGTTT
AAACATCAATTAATCGTTTTAATTCAAAGCATGAATTTATATCGCTAATTAAGCTCATATTGCGTACCATTAATT
CTTACCTATCCTGATGACCGTAATTAATTCATATTTCCGGTGTGAAGAATGATTAACTTTTAATTACTTGTATTG
TTCAATATAATAATTAGTATCATCAATAATATTACGCGTAACCAATTGCGGATGAATAACAACCTAAGGTATAC
AAATAAACACGATCGAGAACATTGGAAGTCTTCTTTCTACAAAGTTTTCTTTAGAAAAGTTTTACAAAACGAT
TATATGAATGTAATATTGTGACTTGAACTTTCTTCTAACTGAGAAACCCGACCATAGTCTTTTAAGAGAGTGTCT
TTGTCAGAGAAAAAGAAAAAGGTGTTTTTTTATCCTGCCATCTGAAAAAGAATTGCTGTTTTGTCTTATGGATGA
ATGTTATTTCAACATAAGTGTTCAACTGTATTTCTAAAATGAGAAGGAAAGCATCCTGGAAAATGCTTGATTAA
TAAATTGAAAGATTCCGATTTCTTTTTATAGAACACTAAGGATGGAATATTGCTTTAGATAGGTATTTTTACGGA
GAATCTCAGCAGATTGGAATCAAAAATATTTCAACTAGTCATACAAAGATAAAATTCAGTCGATATAAATACACTA
CCACCCAGTCTTTTATCATTAGCACCGCCAGGGCGATCGCGATAGTGTATCTGTATCGGAGCATAATTGGGCAATT
CGCGAGCCGAGGTGGTCAGTAACC

Figure S4. The nucleotide promoter sequences of *α*-amylase. The *α*-amylase promoter sequences were cloned to the pGL3 vector to conduct the dual luciferase reporter assay. The binding sites of transcription factors *c-Myc* is underlined.

>*Lipase* -promoter (-1923 to +175)

CATCGTAAAGCAGGGAAGCGCTGGACGCAGGCTGCTACCAATCGACCAACATGGAATGCATTGGGGGAGGCTTATG
TTCAGCAGTGTACGTCTTATGAAATGATGATGATGAACCGTCGGCCGACATAAAGTCTGTAGTCTGCGGCTAGGCT
AAAAAGGAACGATGAGGCATGAGCTACATTTCGACATGAAAAGCAGATATGCATAAGTTACGGGTGGGTTACCCAC
AATAGTCCGTGTGGCGAAGGGATTGCAACATGCGTTCTTGGGATCTCGAGTCGGCCAATCCGACACCGACACCATTG
GGGTATTGTGTATTTTAGAATACGGTCCACAGTTATGTTTATTGACTTTATTAGGATTTATTAACCAGGTA
TCTTCTATCTATATCTATAAAAGCGAAAAGTCACTAATTGACTGACACACTCATCACGAAATCTCAGAACTACAA
GTGCTAGGAGTCTCAAATATTGCATGGGGGTTCACTAAGAACGGATTTTACGAAACTCCACCCTTAAGGGGGTAAA
ACGGGATCCACGCTACGAAGTCGCGAAGCTTTACACCAATATGTTTTTCGCATACAATACATAACTGAGAAAATCA
TTTAACCGTAGTCAACTAGTGTGCCTTGATGTGCTGTCAGTCGTCAGTTTTTAGTCTCTTATCAAACCATTTACCA
TCATCTAACGTATGAATTTGTGGTGAGCTTACAATAATGATGTATGTACGCCTATTCTGTCTATTATCTATGAAAT
CTCGGCTTGACATCGAGCCGCTCACAAGATCCTAACCAAAATTCAAAGATTGACAGATGTTTCAGCCAGTCGAACAT
ACATACCTAATATCGAGACCCCTTATCGCTGGAAGTGCAGACGACGCTCTGGGACTCGAATACACGACAAACCTC
GCACTGTGCATGGGCTGTGACGTGTAATAGAAGCATCAATAAAGTTTTACAAGTTACTGGCTTTAGGCTAAATCCT
TCATTTGTCTTTGGTAAATTAGAAAGGAAGGTGCCTGGATGCGGGTGGCGCAGGACCGGTCTTTGAAAAAACCTT
GGGGG**AGGCCTTTGTCC**AGCAGTGGACGTCTTTTCGGCTGAAACGAACGAACGAAATCAGAAAGGGTCGTGCTCCTG
TAGTAAATACTAAATGACTTGGAATGATGATGATGAATATGTACCAGTGCAGTAAATTTACAAACTCGTTTTTAA
AGGTTTACAATAGTATATTTATTATTTTGTAGATACCCGCTAGGCAATTAACATACTTCATCATCGTCATTTTCAG
AAACAGGACGTCCACTTCTGAACATAGGCCTCCCCAACACAAATAGGTAGGTAGGTCTAATGAAAAATAATACT
TAGGTAGGGTTCCAAGACGTGGTCTGCACTCGAGCTTAAGATTATGACATTAAAGTTATTTTAATTTTCAACTTC
ACAAAAAACAAATTGTCATTTTCGCACTGATTTTCAAGATAAGGGGGTGGCCCTTATTTTTTGCCAAAGCATAATT
TTAGCTATTAGATAAAACCAATCAATTTGATCATATTATAGTAGGTACACTTTGAGATAGTTAAAAATGTGATTCC
ACAAAAACAAATTGTCATTTTCGCACTGATTTTCAAGATAAGGGGGTGGCCCTTATTTTTTGCCAAAGCATAATTT
TAGCTATTAGATAAAACCAATCAATTTGATCATATAGTACACTTTGAGATAATTAAAAATGTGATTCAACAAAAA
CAATTGTCATTTTCGCACTGATTTTCAAGATAAGGGGGTGGCCCTTATTTTTTGTCAAAAACATAATTTTAGCTATT
AGATAAAACCAATTCAATTTGATCATATTATACATAGTACCTACACTTTGAGATAATTAAAAATGTGATTCCACAAA
AAAAACAAATTGTCATTTTCGCACTGATTTTCAAGATAAGGGGGTGGCCCTTATTTAGCCAAAACATAATTTTAAC
TATTAGATAAAACCAATCAATTTGATCATATAGTACACTTTGAGATAATAAAAAATGTGATTATTATCTACGCATT
GATTATCTAAATTGATATGTTTTATAAATAAGCATTTTATTCTCGA

Figure S5. The nucleotide promoter sequences of lipase. The lipase promoter sequences were cloned to the pGL3 vector to conduct the dual luciferase reporter assay. The binding sites of transcription factors *PPAR* γ is italicized.

Table S1. Primer sequences of synthesis dsRNA used for larval treatment *via* diet-feeding

Primer name		Primer sequence (5'-3')	Restriction Site
ds <i>NPFR</i>	Sequence	CCGGAATTCAGGCATACAGGACCCAAACG	EcoRI
	1-F		
	Sequence	TGCTCTAGACTTGATGGGCCAGTCTTCTAT	XbaI
	1-R		
	Sequence	CCGCTCGAGAGGCATACAGGACCCAAACG	XhoI
	2-F		
ds <i>PI3K</i>	Sequence	TGCTCTAGAAGGGGAGGCGAGGGTGAAG	XbaI
	2-R		
	Sequence	CCGGAATTCGTCAGTCAAGGTCCCAGGTG	EcoRI
	1-F		
	Sequence	TGCTCTAGACTTGGGAGTCAGTCAGAAAC	XbaI
	1-R		
ds <i>PI3K</i>	Sequence	CCGCTCGAGGTCAGTCAAGGTCCCAGGTG	XhoI
	2-F		
	Sequence	TGCTCTAGATGGAACTGTATGAGGGGGTA	XbaI
	2-R		
ds <i>mTOR</i>	Sequence	CCGGAATTCCTGCCTCCTTATCTTGCCGTA	EcoRI
	1-F		
	Sequence	TGCTCTAGATGCAGGTCGTACATCGACAG	XbaI
	1-R		
	Sequence	CCCAAGCTTTGCCTCCTTATCTTGCCGTA	HindIII
	2-F		
ds <i>GFP</i>	Sequence	TGCTCTAGACCGTTGTAGTGGAATAGCAC	XbaI
	2-R		
	Sequence	TGCTCTAGACACAAGTTCAGCGTGTCC	XbaI
	1-F		
	Sequence	TATAAGCTTGATATGGCTAACCTGGTTC	HindIII
	1-R	ACCTTGATGCCGTT	
ds <i>GFP</i>	Sequence	TATCTCGAGCACAAAGTTCAGCGTGTCC	XhoI
	2-F		
	Sequence	ATCAAGCTTACCTGCCAAAACGAACG	HindIII
	2-R	TTGTGGCTGTTGTAGT	

Notes: The underline is restriction site.

Table S2. Primer sequences of synthesis dsRNA used for larval treatment *via* injection

Primer name	Primer sequence (5'-3')	usage
<i>α-amylase</i> -CDS-F	ATGACGACTTTGAAGGCAGT	
<i>α-amylase</i> -CDS-R	TTACGATACTGGTGCAGTTT	
<i>Lipase</i> -CDS-F	ATGTTTTATTCCGTGTTG	
<i>Lipase</i> -CDS-R	TTAGACAAATGGGTAATATCT	Synthesis
<i>dsa-amylase</i> -F	<u>TAATACGACTCACTATAGGGTGGCTGGCGA</u> CGAGAAATA	double- stranded RNA
<i>dsa-amylase</i> -R	<u>TAATACGACTCACTATAGG</u> ACTCCCTCCAC TCGTACACT	for injection
<i>dsLipase</i> -F	<u>TAATACGACTCACTATAGGCCTTTCGGTAA</u> CCTCCATCT	
<i>dsLipase</i> -R	<u>TAATACGACTCACTATAGGGATAAATGCCG</u> TTCCCTCGT	
<i>dsGFP</i> -F	<u>TAATACGACTCACTATAGGGAGACAGCGTGCCGGCGAGG</u>	
<i>dsGFP</i> -R	<u>TAATACGACTCACTATAGGGAGAGTTACCTTGATGCCGT</u>	

Notes: The underline is T7 promoter sequences

Table S3. Primer sequences for the qPCR assay

Primer name	Primer sequence (5'-3')	usage
q <i>NPF</i> -F	CCGCATTTACTCCTACCACA	
q <i>NPF</i> -R	CCAACCAAGCGGGTAAGT	
q <i>NPFR</i> -F	ATAGAAGACTGGCCCATCAAGAATG	
q <i>NPFR</i> -R	CTCGTGGTCCTTCTTCTCCC	
q <i>PI3K</i> -F	CTCCAGCCCTAATACCGACTC	
q <i>PI3K</i> -R	TGGGGTCCCTTTCAGCGGTTG	
q <i>mTOR</i> -F	GCGAAAGGTCACAAATACTT	
q <i>mTOR</i> -R	GGCAGATTGAGATCATGGAT	
q <i>PDK</i> -F	GACTGGCGAACATAATGAAAG	
q <i>PDK</i> -R	CGCAGAACTGACTCAACACCG	
q <i>AKT</i> -F	TCGAGTTCGTGAAGGTGCTG	Real-time quantitative
q <i>AKT</i> -R	GATGCTTGGTCTTCTTGAGC	

qaPKC -F	GATCACGAGGGGCACATCAA	PCR (qPCR)
qaPKC -R	GTCCACGCTGAAGCCATACT	
q α -amylase -F	TCGTGGATGCTGGTGTAGAC	
q α -amylase -R	ATTTTGCTTCAGTGCTGGCG	
qLipase -F	CCAACCGTGATTCTCGTCCA	
qLipase -R	ATTCATGATAATAAACTGTATAGG	
qc-Myc -F	AGATTCCAAGAGAGAAGAGT	
qc-Myc -R	CTCATCGTCACCACCATCTG	
qPPAR γ -F	ACACCACCGCCAAAAGTATG	
qPPAR γ -R	AACCCACCAAACCAGCGTAA	
actin-F	ACGGAGGTGGTAACCATCAACA	
actin-R	ACGCCTCCTTCTTGGTGTCTG	
Dm-qNPF-F	CATCCTGGTTGCCTGTG	
Dm-qNPF-R	TGTTGACATCGTTCTTTTCG	
Dm-q α -amylase -F	ACCAACCCATCTCCTACAAGC	
Dm-q α -amylase -R	CTCTTGCTGCTGGGGCTGG	
Dm-qLipase -F	CTATTTCTGATTGCGGTGAG	
Dm-qLipase -R	AGGAAGAACTCAGCATGCCG	
Dm-actin-F	CAGAGCAAGCGTGGTATCCT	
Dm-actin-R	CTCATTGTAGAAGGTGTGGTGC	

Notes: Dm represents *Drosophila melanogaster*

Table S4. Primer sequences for dual luciferase reporter assay

Primer name	Primer sequence (5'-3')	Restriction Site
α -amylase-PGL3-F	<u>CGAGCTC</u> GAAAGATATTTCAAAAATTTA	SacI
α -amylase-PGL3-R	TCCCCCGGGGTTACTGACCACCTCGGCT	SmaI
Lipase-PGL3-F	<u>CGAGCTC</u> CATCGTAAAGCAGGGAAGCG	SacI
Lipase-PGL3-R	TCCCCCGGGTTCGAGAATAAAATGCTTATTTA	SmaI
α -amylase-mutant-F	TAGCTTTACGTACACTTTTCA	
α -amylase-mutant-R	ATAGATTTTGCAACAGTTCCG	
Lipase- mutant -F	AGCAGTGGACGTCTTTCGGCT	
Lipase- mutant -R	CCCCCAAGGTTTTTTTCAAGA	
c-Myc-CDS -F	CAGTGTGGTGAATT ATGTCGTCGTACAAA	
	CCTATAGATTCCAAG	

<i>c-Myc</i> -CDS -R	<u>GGCCCATAATAAGCT</u> TTATCCTTCCGTTGG
	GGCTGC
<i>PPAR</i> γ -CDS -F	<u>CAGTGTGGTGAATT</u> ATGGGTATACAAGAT
	TTAC
<i>PPAR</i> γ -CDS -R	<u>GGCCCATAATAAGCT</u> TTATCTGGCTTTTGG
	TTCTTTTGT

Notes: The underline is restriction site and labeled green is the homologous recombination sequence