

# Between Immunity, Metabolism, and Development: A story of a Fly Gut!

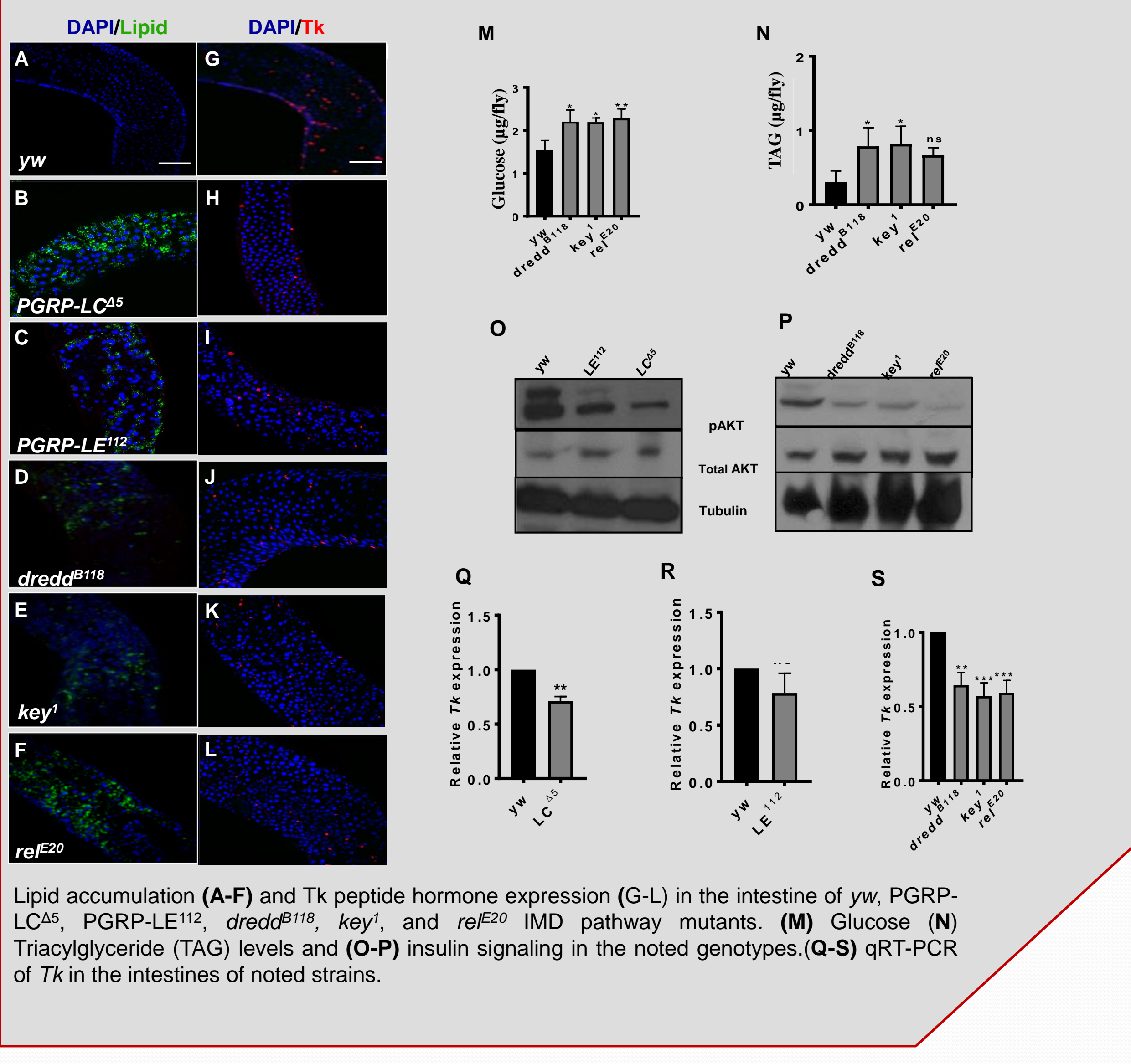
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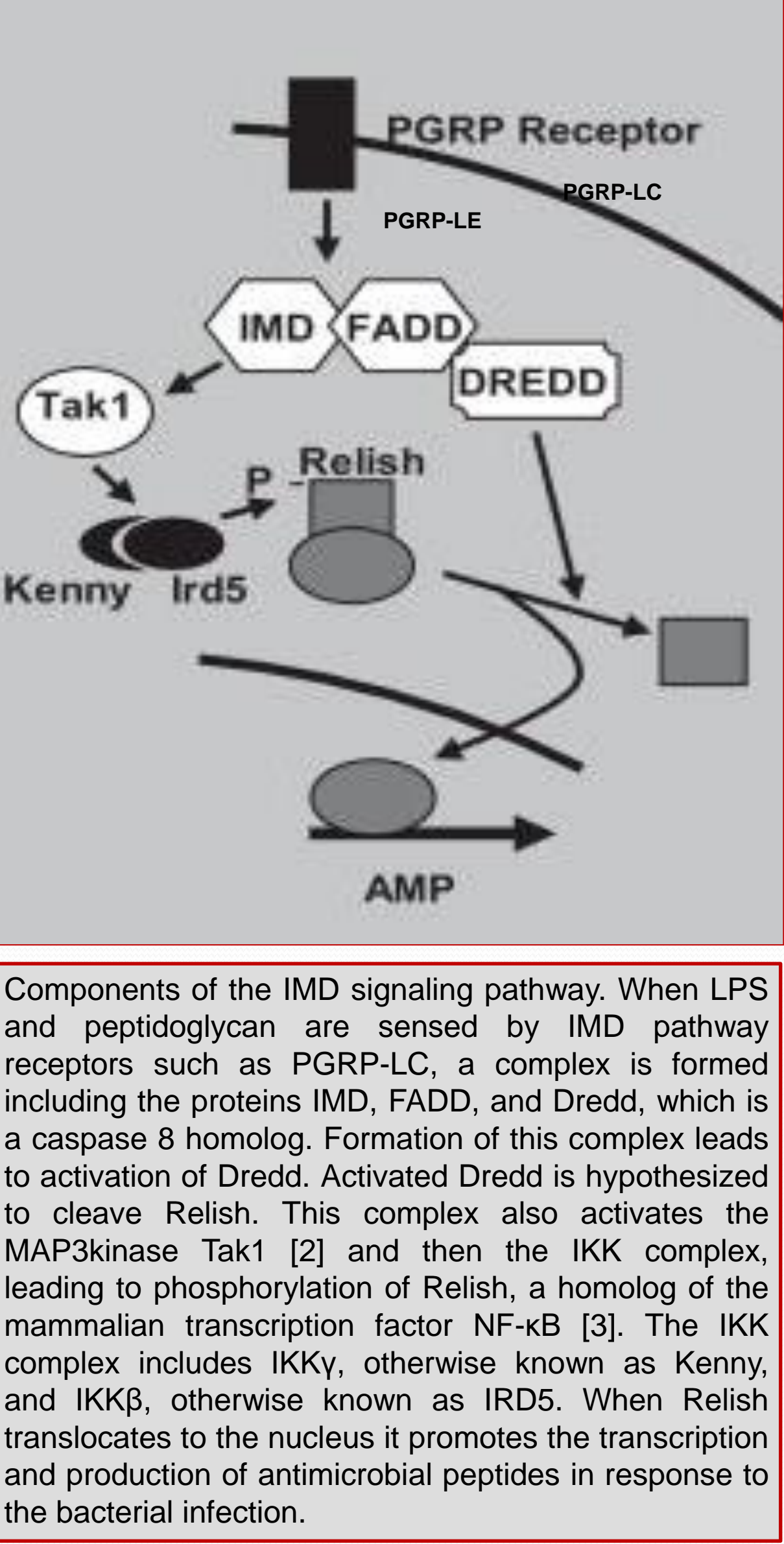
## Abstract

In addition to its role in initiating immune response in the body, the innate immune system seems to also play a critical role in maintaining homeostatic balance in the gut epithelium. Our recent studies in the *Drosophila melanogaster* fruit fly model suggest that different innate immune pathways contribute to this homeostatic balance through activating the transcription of genes encoding antimicrobial peptides. We provide evidence that several metabolic parameters are altered in immune deficient flies. We also highlight a role of the gut flora, particularly through its short chain fatty acid, in contributing to this metabolic balance. Interestingly, our data suggest that impaired immunity and metabolic alteration, in turn, exhibit an effect on host development. Collectively, these findings provide evidence that innate immune pathways not only provide the first line of defense against infection but also contribute to host metabolism and development.

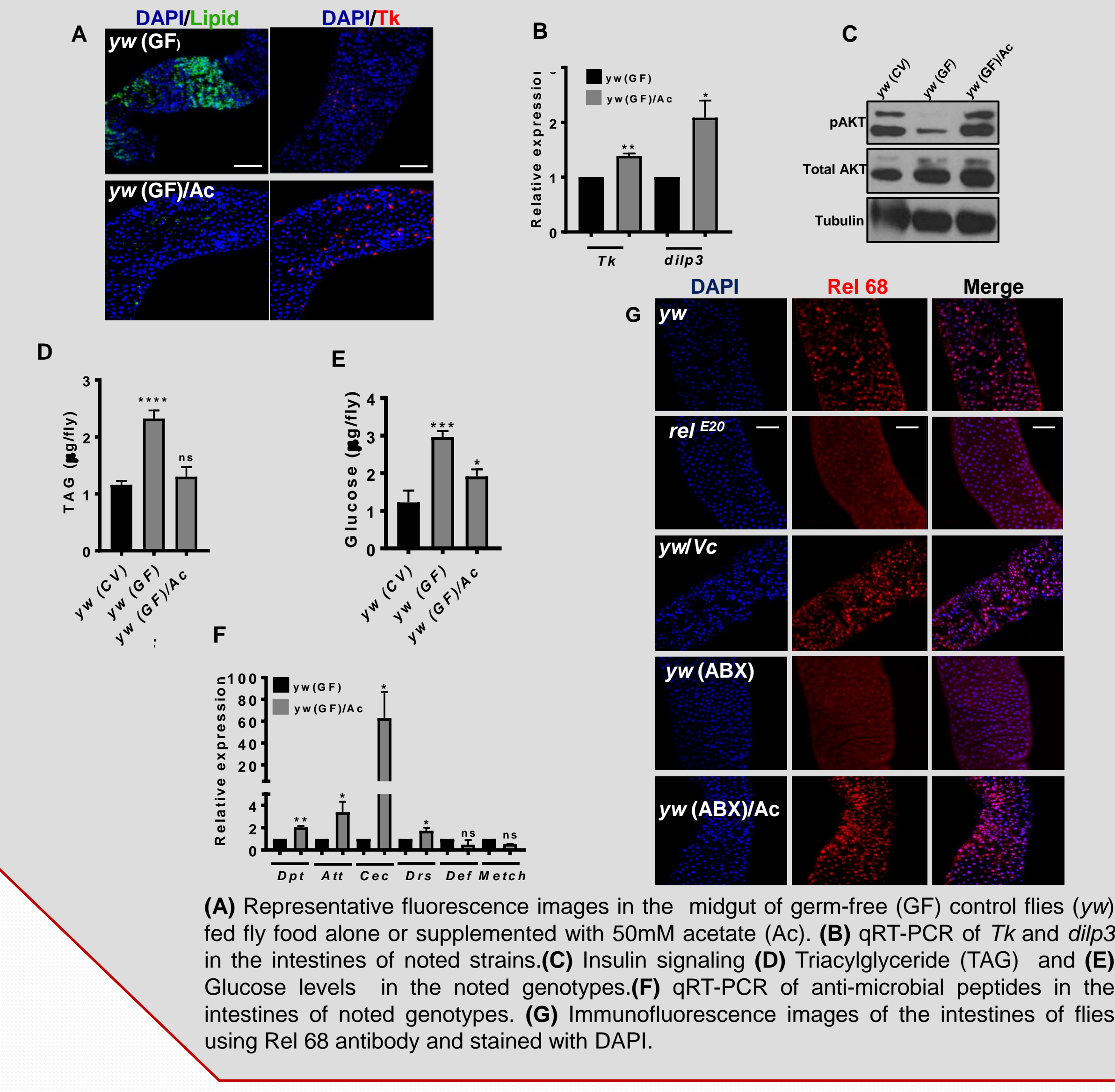
### IMD Innate Immune Signaling Pathway Regulates Metabolic Homeostasis



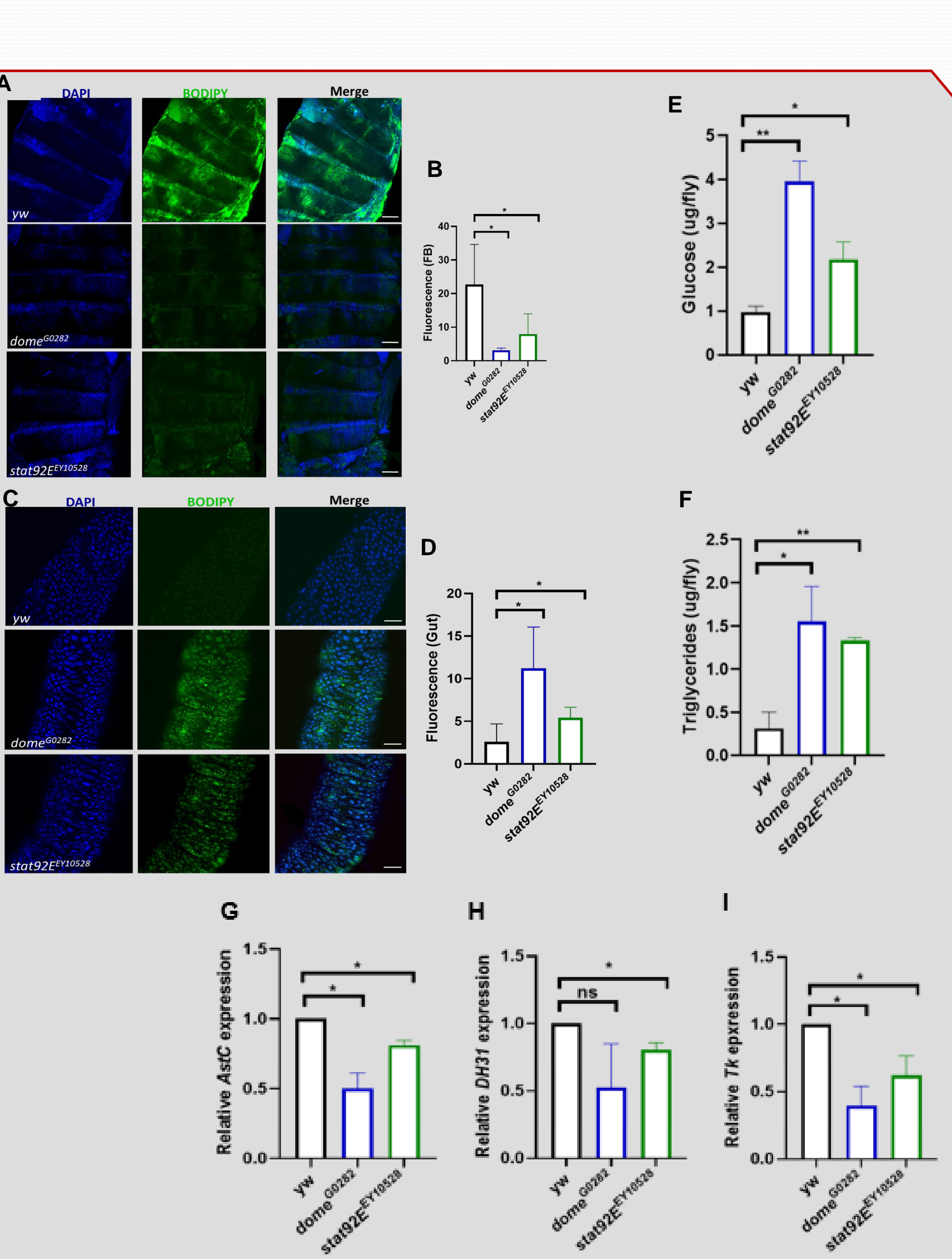
### IMD pathway



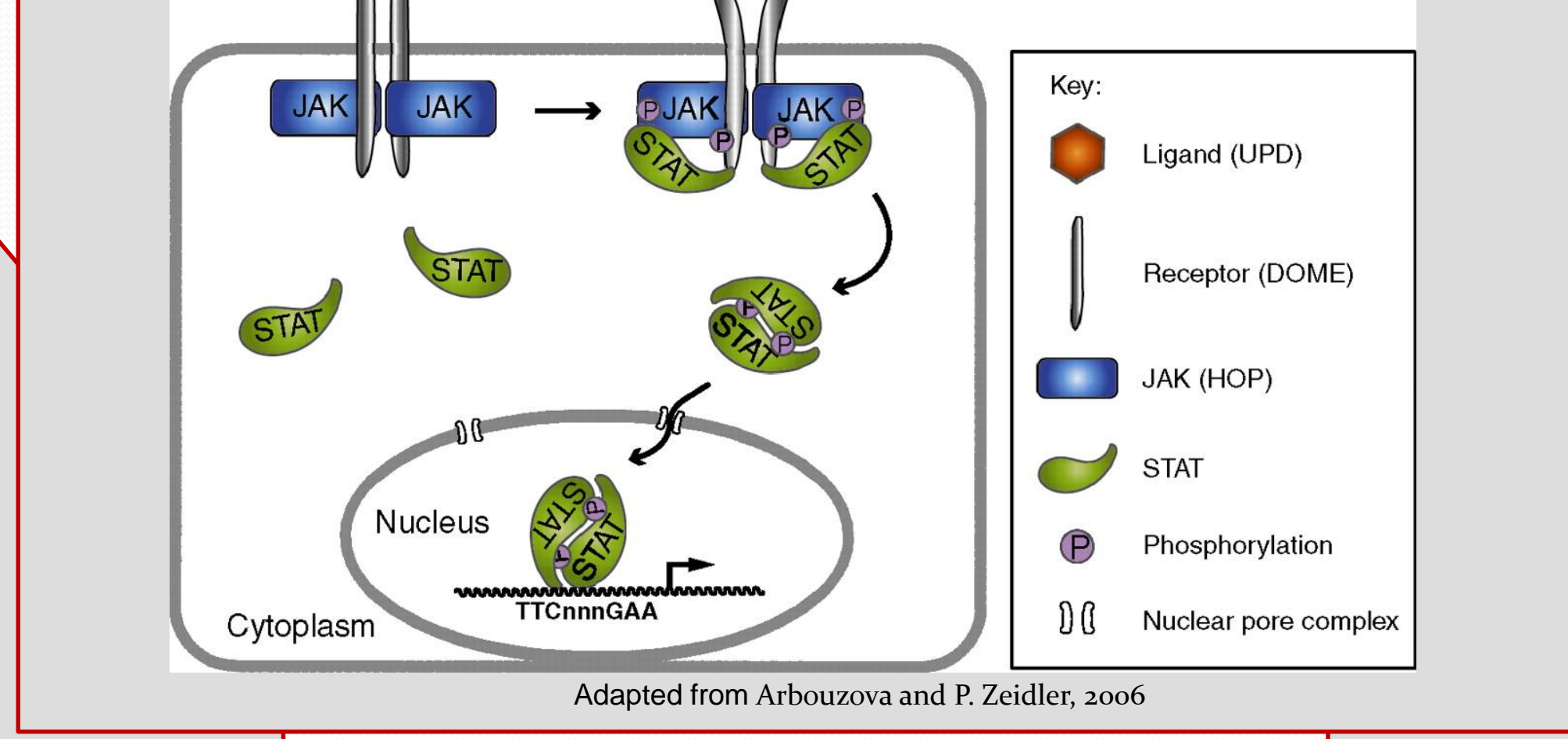
### Dietary Acetate Activates IMD Pathway Signaling and Restores Metabolic Homeostasis to Germ-free Flies



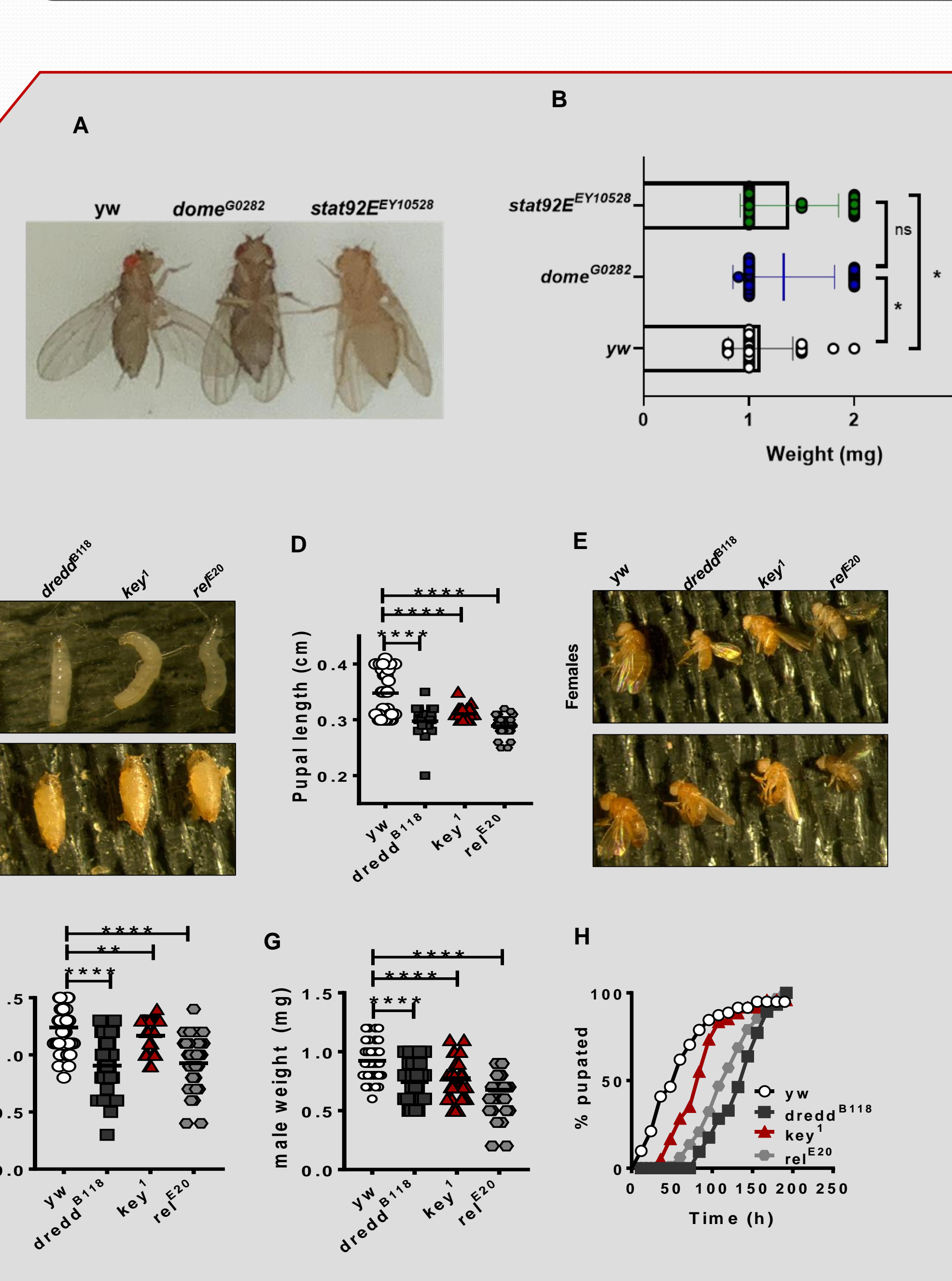
### JAK/STAT Signaling Pathway Regulates Metabolic Homeostasis



### JAK/STAT pathway



### Impaired Immunity and Altered Metabolism Affects Development



## Acknowledgement

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## References

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25. Rutschmann, S., A. C. Jung, R. Zhou, N. Silverman, J. A. Hoffmann, and D. Ferrandon. 2000. Role of *Drosophila* IKK gamma in a toll-independent antibacterial immune response. *Nat Immunol* 1:342-7.  
Arbouzova and P. Zeidler, 2006. JAK/STAT signalling in *Drosophila*: insights into conserved regulatory and cellular functions. *Development* 133, 2605-2616 (2006) doi:10.1242/dev.02411

(A-C) Representative fluorescence images of fat body tissues and gut of adult *yw* (control), *dome<sup>G0282</sup>*, and *stat92E<sup>EY10528</sup>* JAK/STAT mutant female flies, respectively, with DAPI (blue) staining nucleus on the left, BODIPY lipid staining (green) in the middle, and a merge of both on the right. Scale bar, 50μm. (B,D) Quantification of the normalized total BODIPY fluorescence in fat bodies tissues in the indicated fly genotypes in A. Measurements indicate the mean; error bars indicate the standard deviation. (E) Glucose (F) Triacylglyceride (TAG) levels in the noted genotypes. (G-I) qRT-PCR of *AstC*, *DH31*, and *Tk* peptide hormones in the intestines of noted strains.

(A) Representative image of 5 days old *yw* (control), *dome<sup>G0282</sup>*, and *stat92E<sup>EY10528</sup>* JAK/STAT pathway mutant female flies. (B) Measurement of body weight of indicated fly genotypes. (C,E) Representative images of 5 days old *yw*, *dredd<sup>B118</sup>*, *key<sup>1</sup>*, and *relE20* IMD pathway mutants. (D) pupal length (F,G) weights of adult female and male flies, and (H) time to larval pupation of noted IMD mutant genotypes.