

**Elucidating expression patterns for Toll 2-5 protein that potentially underlies
compensatory plasticity in *Gryllus bimaculatus*
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Neuroplasticity refers to the ability of the nervous system to change and adapt through development and to new environments when needed especially after injury (von Bernhardi et al., 2017). During development, it is known that humans create new connections based on experiences which strengthen as one gets older, making it harder to alter those connections. When injured, however, the human central nervous system is often unable to recover, limiting its plasticity (Smith, 2013). Examples of unusual neuroplasticity and potential for neural regeneration are present in some invertebrates which raise questions about the mechanisms organisms have evolved that specifically permit this plasticity (Pfister et al., 2013).

The Mediterranean field cricket, *Gryllus bimaculatus*, sees an unusual amount of neural plasticity in the auditory system which has most of its circuitry located in the prothoracic ganglia (PTG). Within the PTG, dendrites will grow across a barrier that they normally respect after the loss of their ear (Horch et al., 2011). This results in the restoration of the auditory neuron connectivity allowing for the cricket to compensate for the loss of an ear. One potential explanation for this unusual plasticity involves the presence of Toll proteins. Toll

Figure 1: *toll 2-5* expression in adult brains and prothoracic ganglia and developing embryos in the cricket. A) Image of 100-micron slice of the brain and B) zoomed in image of the same brain. *toll 2-5* is expressed in the mushroom bodies of the brain which is noted with the red arrows. C) Image of 100-micron slice of the prothoracic ganglia (PTG) and D) zoomed in image of the same PTG. *toll 2-5* is potentially expressed in the midline of the prothoracic ganglia noted with the red arrow. E) Image of a developing embryo seen with nonspecific staining shown in the dotted red arrows. F) Zoomed in image of limb buds of the same embryo with potential *toll 2-5* expression in stripes indicated with the red arrows.

References

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