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Insect leg development: evolution out on a limb

Pierre Jerlström

Hidden unity

The body plans of vertebrates and insects differ greatly in their size and shape, and in the type and number of appendages. Nevertheless, there is a hidden unity in the genes and the genetic system that control their development. Cells along the main body axis of vertebrates, and of insects such as fruit flies, 'know' their position as well as what type of appendage they will develop into from the level of expression of the homeotic selector genes (Hox) inside their nuclei.[1]

The role of specific Hox genes in insect limb development has recently been studied. At a certain stage of insect larva growth the Distal-less (*Dll*) gene switches on, causing some of its cells to organize into legs. Switching off *Dll* on the other hand, results in only stumps forming.[2] In the early 1990s, scientists were astounded to find almost identical copies of this gene in vertebrates, and to find that as with insects, these genes switch on during leg development. This was surprising because vertebrates and insects have completely different limbs: bugs have their muscles on the inside of a protective exoskeleton, whereas in animals muscle covers the bone. And, according to evolutionary belief, insects and vertebrates are only distantly related to a limbless flatworm that lived perhaps a billion years ago. They believe that limbs and the genes for their development have evolved independently in these two lineages.[2]

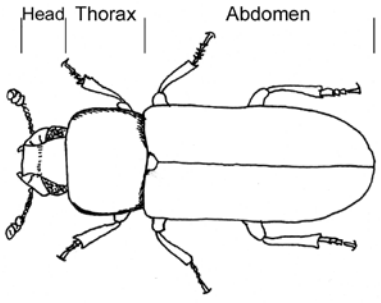

Figure 1. *Adult red flour beetle* Tribolium castaneum *(after Merit Students Encyclopedia).*[9]

Scientists further looked at other 'distant relatives' of the flatworm such as velvet worms, sea urchins and sea squirts, which also have limb-like appendages. They found that *Dll*-like genes were active in the developing appendages in each of these animals.[2]

Looking at the evidence within a Biblical framework, it is easy to recognise this hidden unity in limb development as the work of one Creator who used a highly successful, basic blueprint to design appendages for movement for the various created kinds. By analogy, the wheels of bicycles, cars, trains, etc., have not arisen by accident, but are all variants of a basic engineering design. In this light, it is not surprising to find that similar molecular information (Hox genes) in the genetic code of different animals gives rise to analogous leg structures.

Mutant study

Two other Hox genes, *Ultrabithorax* (*Ubx*) and *abdominal-A* (*abd-A*), also have distinct functions in some insects. In the red flour beetle, *Tribolium castaneum*, *abd-A* determines whether or not a limb grows in the abdomen by acting on *Dll*, while *Ubx* tells the cells what type of limb they should become.[3,4] When scientists inactivated these two genes they found that flour beetle larvae sprouted 16 legs on their abdomen. This has been hailed as supporting evidence for the idea that insects and arthropods (animals without backbones) evolved 400 million years ago from animals resembling centipedes and millipedes, which have many non-specialized body segments, each with its own pair of legs. During the supposed evolution of insects, groups of segments fused together to form the head, the thorax and a legless abdomen. Leg-making genes also switched off, giving rise to more agile six-legged insects.[4,5]

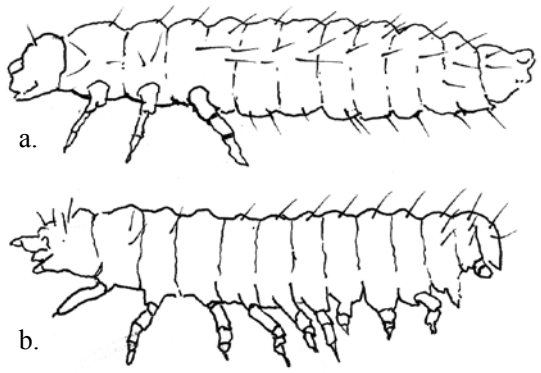

Figure 2. *Flour beetle larvae. a) Wild type, b)* Ubx – abd-A *mutated larva with 16 abdominal legs (after Lewis, DeCamillis and Bennett).*[3]

Although a beetle larva can be persuaded to produce legs on its abdomen, this is hardly support for evolution. It only confirms the role of particular genes in leg development—it is well known that in insects every segment has the potential to form a limb.[5] But the type of limb, or whether or not it forms, is determined by the individual Hox genes—in the fruit fly *Drosophila melanogaster*, a particular appendage (leg type or antenna) in a segment is specified by a pair of Hox genes.

Conclusion

Even the idea of mere insect evolution is inconsistent. Evolutionists are perplexed as to how evolution could have produced such huge morphological variation among insects, especially considering how highly conserved Hox gene expression is within this lineage.[3] The Scriptures plainly describe that all creeping things, which includes insects, were created complete on the same 6th Day of Creation to multiply after their own kind.

Evolutionary dogma interprets similarity as phylogeny. The genome of the fruit fly *Drosophila* has recently been sequenced.[6] With the elucidation of the complete DNA sequence of more insects in the future, the lack of phylogeny will become clearly evident, as has been recently documented among microorganisms.[7,8] This will result in the further collapse of the ailing evolutionary 'tree of life', as insects believed to be lower or higher in the tree are seen not to be connected by consistent lines of descent. One wonders whether multiple origins of insects ('Creationist orchard' again) will also be proposed as this unfolds.[8]

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Food scare leads to design discovery

Don Batten

The idea that nitrates cause stomach cancer gained credence in the 1980s. Environmentalists made a tenuous connection between nitrates, nitrites and nitrosamines, the latter considered to be carcinogenic. The resulting public health scare resulted in many governments substantially reducing the legal limits on the amount of nitrates and nitrites allowed in food and water. Nitrites were the major preservative for all sorts of foods, particularly manufactured meats.

Are nitrates/nitrites dangerous? Epidemiological research in the mid-1980s failed to find any evidence of health risks.[1] People who eat lots of vegetables (a major source of dietary nitrate), or drink water high in nitrates, do not have elevated stomach and bowel cancer rates. Indeed, workers in a factory producing ammonium nitrate fertilizer had no indications of elevated cancer risks and were actually healthier than other factory workers in the area.[2]

Since the big scare of the 1980s, research has filled in the picture in a remarkable way. It would now appear that, rather than being bad for healthy people, nitrates/nitrites are actually part of our body's defence systems against disease-causing micro-organisms. It works in the following way.[3]

Nitrate from food (leafy vegetables, especially) is released into the mouth through chewing. Nitrate is also produced within the body and circulates in the blood. If insufficient is released from eating, extra is excreted in the saliva. Anaerobic microbes, such as *Staphylococcus sciuri* and *S. intermedius,* in deep pockets in the back of the tongue, reduce the nitrate to nitrite. The nitrite is swallowed, ending up in the stomach. The acidity of the stomach results in the conversion of the nitrite to form large amounts of nitric oxide (NO) and other oxides of nitrogen. The conversion to NO is so