



to all the *BB* queens?

Shocking as it may seem, all *BB* queens attempting to reproduce are killed by workers who primarily have the *Bb* gene combination. This means that workers who possess at least one copy of the gene *b* (*Bb* workers) recognise the presence of *b* in the queens (*Bb* queens) and permit them to reproduce. But they kill all queens who do not possess any copy of the gene *b* (*BB* queens).

Keller and Ross conclude that *b* is a green beard gene as it permits its bearers to recognise other bearers of itself and be nice to them. What is equivalent of green beard here? In other word what is the label of queens possessing the gene *b*? It appears that *BB* queens and *Bb* queens smell different. Moreover, this smell has something to do with reproduction — *BB* queens are not killed until they begin to reproduce.

The researchers also found that *Bb* workers who involved in killing *BB* queens sometimes acquire the peculiar smell of *BB* queens and thereby become victims of aggression by other *Bb* workers.

Why do *Bb* workers kill *BB* queens attempting to reproduce? There appears to be indirect evidence that *BB* queens are so strong that if allowed to reproduce, they will outcompete all other queens, whereas *Bb* queens are moderate and will permit the coexistence of many queens in the colony. This is something that the workers seem to prefer. It is most remarkable indeed that workers possessing the moderate gene *b* can recognise queens who do not possess it. This is the moderate gene's strategy for survival: strike before your opponent does.

Why has not *b* gene completely eliminated its opponent *B*? As *bb* individuals die prematurely, *b* can never completely eliminate *B*. The only individuals that possess *b* and survive are individuals who have the *Bb* gene combination, and thus harbour a copy of *B* themselves. *Bb* individuals kill *BB* queens, but *B* can never be completely eliminated. It is because of this inability of *b* to completely eliminate *B* that we still recognise *b* as a green beard gene. Otherwise, *B* would have been completely lost. And scientists could never have recognised the green beard gene. ■