Q&A for RNAi in Varroa press release

Q How did the project come about?
A The project was funded by the Scottish Government through a Faraday SPARK award, the Scottish Beekeepers Association, Defra and the Welsh assembly government to form a partnership between the University of Aberdeen and the National Bee Unit.

Q So please explain what you have found
A We have demonstrated that RNA interference (RNAi) can be instigated in the Varroa mite. What this means is that we can control the gene expression within the mite by exposing it to short dsRNA molecules, which may act as a potential future treatment. OR Our study has demonstrated that we are able to target a specific pathway and remove the mite's ability to produce a non-lethal protein. Now we must find a gene which is essential for survival in the mite but completely absent from the honey bee.

Q Why is it important
A Beekeepers have been using miticides to control the Varroa mite, however, the mite has developed resistance to these traditional treatments in recent years. This adaption by the mite has made it much more difficult for beekeepers to control Varroa, and new treatments could make a significant contribution to control.

Q How would it be used?
A Other researchers have demonstrated that this treatment can be effectively distributed throughout a honey bee colony by simply adding it to the bee food.

Q Is it a silver bullet?
A It may be a very effective treatment, capable of clearing a high proportion of Varroa mites from a colony. However, in recent years we have tried to move away from silver bullet treatments, and instead concentrate on integrated pest management approaches, which require several different interventions in a year whose combined efficacy attains the control required.

Q How soon could the treatment be available?
A Given sufficient resources from industry, then products could be available in 5-10 years.

Q What practical way can it be applied?
A Other researchers have demonstrated that this treatment can be effectively distributed throughout a honey bee colony by simply adding it to the bee food. The Varroa mite climbs into the cells which honey bees use to rear their young. Whilst there, the mite hides in the food provided for the young bees. Our work has demonstrated that mites will absorb the treatment simply by immersion, so this hiding behaviour offers the perfect opportunity to treat the mite.

Q How is this treatment different from normal miticides which the beekeeper might apply?
A Most normal miticides effectively take advantage of the size different between honey bees and Varroa mites. The chemicals applied are harmful to varroa mites at doses which are not detrimental to the honey bees, which have an ability to detox the chemicals rendering them harmless. However, it has been shown that the ability to detox can be restricted by the presence of other chemicals which are commonly found in the honey bee colony, in some circumstances leading to a loss of some honey bees. Our proposed method would not have any detrimental effect on the honey bees, because it specifically target the mites.

Q So are current beekeeper treatments dangerous to honey bees?

A No. It is important to remember that, whilst chemical synergies my damage a colonies, failure to treat Varroa will likely lead to the death of a whole colony. Therefore it is important that beekeepers continue to treat for the Varroa mite using a integrated approach to management. For full details of the measures available for Varroa control beekeepers can download our free advisory leaflet from (https://secure.fera.defra.gov.uk/beebase/index.cfm?pageid=167).

Q How much of a role is Varroa having on worldwide honey bee colony losses?
A It is difficult to compare drivers of honey bee decline such as climate, pest and diseases. However, it is clear that the Varroa mite has had a massive impact on and is one of the leading causes of honey bee colony losses in contrived to which the mite has spread.

Q Why do you use dsRNA?
A The mechanism we are exploiting is a natural system which has been developed to help us cope with viral infections. dsRNA is required to enter cells and to start the cascade which results in gene silencing.

Q What non-lethal gene have you used and why?
A We have used the glutathione S-tranferase (GST) gene. We chose GST because it has been implicated in acaricide resistance in mites and also because we had the ability to monitor the changes in this gene product so we could say whether the method was working. GST is an enzyme which has a key function in detoxification.

Q Is CCD here in the UK yet – if not, is there a worry it will arrive?
A Colony collapse disorder is a syndrome with a specific symptomatology. Sudden loss of the adult bee population; no dead adults in the apiary; large brood area; plenty of food stores; often the queen remains with around 100 attendants. To date, these symptoms have not been reliably documents outside North America. It is always worry that syndromes and diseases can spread to our shores, after all the honey bee industry is a global enterprise.

Q What causes CCD
A This is a question that scientists have been grappling with for the last few years. Whilst we do not yet know the exact causes of CCD, American researchers have uncovered several clues. There is some evidence that CCD is infectious and that viruses and certain fungi have been linked.