National Honey Bee Advisory Board

Promoting Honey Bee Sustainability

To protect $50 billion in pollinated food production through

- Balanced Pesticide Policy - Evidence Based Decisions - Proactive Education -

All members of NHBAB are professional beekeepers. All have experienced pesticide related mortality in their respective honey bee operations. They were chosen to serve this industry-wide capacity because of their personal and professional qualifications.

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TO THE USDA COMMITTEE FOR PUBLIC COMMENTS on RNAi TECHNOLOGY AS A PESTICIDE

The National Honey Bee Advisory Board (NHBAB) is pleased to offer these comments on the use of RNAi technology to alter plants for insect resistance in the near term future. As agribusiness professionals who support American Agriculture through providing pollination services contributing approximately $20 Billion per year to America's food system, we have a fundamental stake in the potential consequences of this technology and its total impacts on American Agriculture. We have greatly benefited from independent scientific input, upon which these comments are based, and urge you to fully investigate the current realities of this highly promising, but not yet fully realized technology before allowing further expansion of its use.

Science operates in a highly independent and redundant manner to eventually discover the truth about natural phenomena, their underlying mechanisms and how they operate in the real world. No arena is more challenging than the natural ecosystems of our planet and how man's efforts to produce food have impacted these in often less than sustainable manners in the past. US EPA estimates that the current *annual* rebuilding cost to the beekeeping industry from un-intended collateral damage from crop protection products at $300 million dollars. Bee industry leaders believe this number to be quite understated.

It has taken more than 50 years of scientific effort to begin to understand the operating mechanisms behind sustainable soils, plant varieties, pest complexes, and their interactions in our food production systems, yet many details remain to be determined. The fledgling arena of GMO plants and the recent developments of RNA interference (RNAi) technology for plant modification are a most cogent example of theoretical promises not yet realized or understood. The promises for GMO plants to reduce pest insect pressure and weed control along with reduced chemical inputs to the environment and effective cost savings for farmers have not been realized. Recent publications have documented the lack of cost savings for producers as well as the increasing herbicide resistance among weeds. The promise of using RNAi technology to alter plants likewise is attractive from a theoretical standpoint, but put in the context of failures of plant GMO use to date, brings major reasons for concern. We are decades away from enough scientific

understanding to allow sustainable and predictable use of this technology under field conditions.

A brief review of current scientific literature involving RNAi technology with plants is sufficient to indicate that this area of science is relatively early in the discovery phase and nowhere near the point of understanding how this technology can be used safely and with any degree of predictability of its consequences in highly managed cropping systems embedded in the real world ecosystem. To attempt to use this technology at this current state of understanding would be more naive than our use of DDT in the 1950's, and far more irresponsible given our recent history of failures in sustaining our environment alongside increased food productivity. In addition to the lack in our knowledge, this particular arena involves the fundamental modes of plant and insect virus resistance and the rapidly evolving counter adaptations by which viruses overwhelm their hosts to become successful invaders. Our understanding of these molecular interactions is woefully limited. To attempt to use this technology at this point is placing the evolution of viral diseases and plants and animals, including human well being, at the epitome of risk. This is totally unacceptable when one evaluates the potential risks of plant and animal health, human health, and ecosystem impacts alongside the potentially limited gains in pest protection for food production.

There are many specific questions that need to be addressed to gain a reasonable understanding of the true risks imposed by the use of this technology in crop plants. Here are but a few of the more obvious ones for which answers to do not currently exist:

(1) Since the whole genome sequences of most plants, animals and viruses are currently unknown, how can dsRNA sequences be designed to have minimal off-target impacts?

(2) Since RNAi is a key antiviral pathway in plants, what is the effect of chronic dsRNA exposure on plant immunity?

(3) Since RNAi is a key antiviral pathway in insects, what is the effect of chronic dsRNA exposure on the immunity of the target and non-target species?

(4) What does exposure to dsRNA do to insects, in terms of off-target effects?

(5) Can transgenic plants be designed to reduce exposure? For example, is it possible to produce dsRNA only in specific tissues, at specific times? Is there a way to turn on dsRNA production upon herbivore feeding?

(6) How effective is dsRNA? One concern is that to increase effectiveness, it will be necessary to target multiple genes/transcripts, and/or use very long dsRNA sequences, which will then also increase the likelihood of off-target effects.

The SAP committee advises EPA, and hopefully EPA follows your advice; we strongly recommend that you advise EPA not to consider registration of any of the RNA interference technologies as pesticides until far more of this technology is understood.

We thank Dr. Christina M. Grozinger and Dr. James L. Frazier (Penn State University) for their technical advice in writing this letter and provide their contact information for follow up questions.

Sincerely,

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Certain pesticides deleteriously impact the health of honey bee colonies, threatening the sustainability of the U.S. beekeeping industry and significantly imperil our national food supply.