Seed applied neonicotinoids provide considerable value to the economy

- Most (94 percent) seed corn in the U.S. is treated with neonicotinoids
- Yield increase of 6 to 14 bushels per acre
- Value to the U.S. economy: $2-$5 billion
- 3.3 million production acres required to replace the lost yields

The Risk Assessment Process

Key Concepts

- Toxicity DOES NOT equal risk
- Risk = Hazard (Toxicity) x Exposure

- The toxicity of a pesticide remains constant regardless of its use
- The exposure to a pesticide is dependent on the conditions surrounding its use
- The risk associated with using a pesticide can only be reduced (mitigated) by decreasing the potential for exposure

Why Have Neonicotinoids Been Targeted?

- There is a public perception, influenced by considerable misinformation, that neonicotinoids, particularly seed treatments are a major factor in declining bee health based on a few unrelated facts:
  - Because neonicotinoids are toxic to bees they must be affecting colony health
    - But risk is very low because of minimal exposure
  - Politically motivated suspensions elsewhere in the world e.g. sunflower (1999) and corn (2004) in France
    - Subsequent research by the French Government concluded that neonicotinoids played little if any role in the bee colony losses
  - A significant acute bee incident in Germany in 2008
    - Caused by unusual weather conditions and seed treatment procedures

Neonicotinoids and Pollinator Health

- In large “multi-factorial” studies in North America and Europe poor bee health correlates well with Varroa bee diseases but poorly with exposure to agrochemicals
- Elevated colony losses are NOT occurring in Australia where Varroa is absent
- NNIs among the least frequently detected pesticides in US bee hives
- Many beekeepers whose bees pollinate agricultural crops treated with NNIs and other agrochemicals report low annual colony losses
- Improvements in bee health have not been seen in France following NNC suspension in some crops
- Field studies have consistently found no adverse effects on colonies when NNIs are applied properly in the field in contrast to lab and semi-field studies often conducted at exaggerated rates
- There is no evidence of neonicotinoid involvement in declining bee health which has been confirmed in numerous review articles this year

Colony Health versus Acute Effects

- Pollinator health is different from acute bee effects such as potential effects at planting
- Colonies generally recover from acute effects
- The whole industry works hard to minimize acute effects through technological advances, stewardship and training
Sources of Information on Potential Exposure at Planting

- Incident reporting
- Investigations of incidents involving possible misuse
- Bee investigations around planting
- Literature studies

Incident Reporting

- Despite hundreds of millions of acres being planted with neonicotinoid treated seeds, there have been very few reported, acute bee losses (different from bee health as the hives recover)
- Prior to 2012 there was only a handful of reported incidents
- In 2012, there have been around 20 incidents of increased bee losses at the time of corn planting predominately in the Midwest (Canadian authorities are investigating effects in SW Ontario)
- Investigations have shown that neonicotinoids were not involved in several of these but may have been a causative factor in a few of them

Investigations of incidents involving possible misuse

- Incident in Southern Germany 2008
  - 10,000+ colonies impacted, but almost all recovered
  - For some seed batches, the application quality and use of film coatings was substandard leading to higher dust levels
  - Most of the pneumatic vacuum planters used in the Upper Rhine Valley exhaust the emissions upward or to the side.
  - Later than normal planting window
  - Small field sizes (<10 acres) in close proximity to flowering crops (OSR)
  - Dry weather and windy conditions led to dust drift
  - Heutach measurement = 80 g dust / 100,000 seeds

Bee Investigations

Bees exhibiting potential pesticide effects could have been exposed from a wide area. Even a 2 mile radius would encompass approximately 12 square miles

Literature Studies (1)

- Krupke et al. study
  - Apparent small bee kill incidents investigated
  - Field experiment conducted to measure exposure
  - Exposure levels in soil, pollen, whole flowers do not explain how a bee kill happened
  - Concentration in waste tanks very high, but samples were only collected from inside a planter, no measurement of what was released into the environment
  - No long-term colony-level impact
Literature Studies (2)
- Tapparo et al study and others from Girolami group
- Bees trained to fly through dust exhaust cloud during simulated planting
- Effects on individual bees, no colony-level effects
- Minimal effects on individual bees from contact with contaminated flowers, or ingestion of guttation droplets; bees had to fly through the planter exhaust stream for effects to be prevalent
- Exposed bees placed in cages in laboratory
- Normal humidity – nearly all bees survived
- Very high humidity – most bees died
- No long-term colony-level impact

What have we learned?
- Acute effects involving neonicotinoid seed treatments have been rare despite significant use over the last decade
- Some reports alleging neonicotinoids involvement have been due to other factors
- In a few cases around corn planting neonicotinoid seed treatment appears to be a contributing factor
- The major possible routes of exposure are known but their relative importance under different field conditions has not been fully quantified

What needs to be done?
Collaboration Initiative
Proposal is for Bayer, Syngenta, corn grower associations, selected university researchers and beekeepers to collaborate on 2-3 year research project
- Identify factors that drive exposure levels to bees at planting time
- Determine frequency and significance of exposures
- Determine efficacy of options for reducing exposures
- Determine best management practices for growers and beekeepers

Because we do not have all the required information does not mean we cannot take steps to further minimize potential exposure now

Opportunities to Reduce Exposure
- Ensuring the best possible seed treatment processes
- Improving seed coatings
- Improving planter lubricants
- Incorporating specific pollinator messages into stewardship literature
- Communicating stewardship message and BMPs widely
- Improved seed treatment equipment
- Improved incident investigations to better target possible improvements

All of these are being actively pursued
**Continuing Improvements in Seed Coating**

BCS field testing modified coating recommendations in 2013 that reduced dust abrasion levels on additional 40 - 50% in lab tests.

**A Major Initiative: Reduce Dust by Replacing Talc as a Lubricant in Planters**

- Evaluation of an alternative planter lubricant that could replace talc and reduce dust emissions from planters is underway by BCS.
- Significant decrease in both total dust (90%) and active ingredient dust emissions (15%) have been observed from the vacuum exhaust of planters in laboratory testing.
- Extended testing is being established with several planter manufacturers.
- Goal is a large scale test market to be conducted in 2013.

**Stewardship brochures widely distributed to address all stages of use that could affect bee health**

**Communicating the stewardship message**

- Since 2001 BCS has had extensive stewardship program with customers trained Commitment to Quality which is regularly enhanced with new information.
- Frequently update seed customers on treated seed quality, new recipe evaluations, EMPS for seed handling and planting, technical improvements.
- Information further disseminated by seed companies to the grower level by training meetings, field days and electronic distribution.
- Bee health bulletins and technical information provided to seed industry.
- Video on minimizing environmental impact to beneficials including pollinators.
- BCS hotline established where questions or concerns about bee health can be received, or an incident involving bee health reported.
- Working through industry associations (CLA and ASTA) to further disseminate the message.

**Improved Bee Health Investigations**

- BCS takes instances of reported bee losses very seriously.
- By investigating alleged incidents we can improve mitigation recommendations.
- We have organized a rapid response team to accommodate rapid and consistent investigations of alleged incidents.
- Developing electronic tools (iPad application) to aid in site investigations and record all critical information.
- Willing to partner with State Lead Agencies to share methods and results.
- Wish to encourage any affected beekeepers to report possible incidents to us as well as the authorities to help identify and address areas of possible concern.

**Improved Seed Treatment Equipment (On Demand™)**

- Growers have greater assurance that seed treatments are being applied correctly, consistently, and according to labeled rate.
- Fully automated closed system eliminates inconveniences caused by traditional hand mixing.
- On Demand™ provides seed dealers with more accurate and efficient reporting capabilities, improved inventory management and streamlined invoicing.
- Provides detailed records to customers based on seed variety, field name, lot number, for more efficient tracking.
- Reduced environmental and human exposure.
Pest Management Workshop 2013  
Kelly, Seed Treatment

Summary
- Neonicotinoid seed treatments are a major benefit to agriculture.
- Available information does not implicate neonicotinoid ST in declining colony health.
- Potential acute effects on bees at corn planting have been observed but infrequently.
- Available information does not quantify how neonicotinoid seed treatments may be involved in these observed effects.
- Immediate steps have been taken to reduce the exposure of bees to neonicotinoids while further research is ongoing.

More Information
- Web Resources
  - Bee Health YouTube Playlist: [Link](https://www.youtube.com/playlist?list=PL5CAE857B5F7722D3&feature=cpl)
  - BayerCropScience us External Website
    - Bee Health Initiative: [Link](http://bcspublic.tladatlas.com/our-commitment/bee-health)
  - Twitter: [Link](https://twitter.com/#bayercompsus)