

# Assessing for potential unintended effects

Monica Garcia-Alonso

Workshop “ Environmental Risk Assessment for cultivation of GM crops”  
15-16 October 2009, Brussels

## ★ Assessment of unintended effects

- According Directive 2001/18/EC all applications for cultivation of GM crops in the EU have to include:

Environmental Risk Assessment

General Surveillance

*The ERA should focus on the **identified characteristics** of the GM crop and its use which have the potential to cause adverse effect”.*

*The objective is to identify the occurrence of adverse effects of the GMO or its use on human health or the environment which were **not anticipated** in the environmental risk assessment”.*



## Assessment of unintended effects

- How do we assess if there are potential unintended effects on NTOs due to the genetic modification?
- All cultivation applications need to comply with the data requirements set by Directive 2001/18 and EFSA guidance to pass the completeness check
- All applications contain:
  - Molecular characterization data
  - Extensive field trial data from Compositional Analysis, Expression and Agronomic studies



# Assessment of unintended effects

## • THE COMPARATIVE ASSESSMENT

- Following the concepts of “**substantial equivalence**”, “**familiarity**” and “**history of safe use**” the GM crop is compared to its non-GM counterpart
- Data from three main sources:
  - Molecular characterization
  - Compositional analysis
  - Agronomic characterization
- Allows the identification of differences between the GM plant and the non-GM
- Any differences identified are assessed for their **biological relevance**

# Assessment of unintended effects: The comparative assessment

## MOLECULAR CHARACTERIZATION

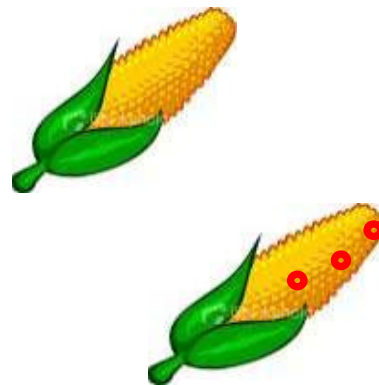
Disruption of endogenous  
genes of known function

Production of new proteins  
(other than those intended)



## COMPOSITIONAL ANALYSIS

Comparison of key single  
compounds, which  
represent components of  
important metabolic  
pathways in the organism  
(e.g. proteins, fat,  
vitamins...) (OECD)

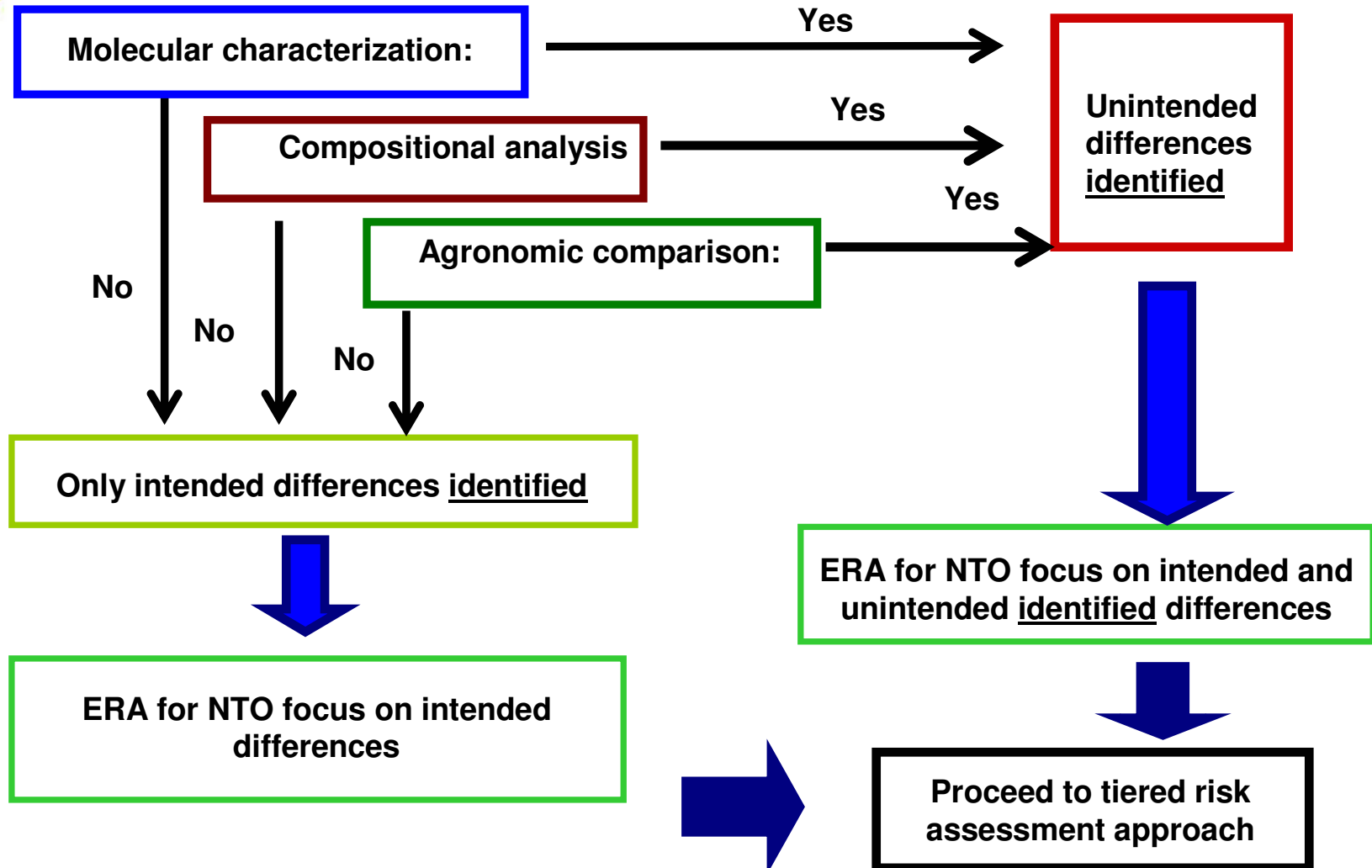


## AGRONOMIC COMPARISON

Comparison of plant biology  
and agronomic parameters.



# Unintended effects assessment





# Assessment of unintended effects

## How does this fit in the environmental risk assessment?

- Allows the identification of differences between the GM and non-GM plants and establish biological relevance
- The risk associated with the identified differences either intended or unintended is assessed using the tiered approach

## What about assessment of potential unintended effects on NTOs?

- Are the parameters studied relevant to NTOs?
- Should additional studies be conducted to assess potential unintended effects on NTOs?

# Examples

## Identified Intended differences

The only difference identified between the GM and non-GM plant is the introduced Cry protein



## Identified Unintended differences

Unanticipated differences are identified in the agronomic assessment



## Unidentified Unintended differences



Tiered ERA

Monitoring ???



# Assessment of unintended effects

## Current options under consideration

1. Preferred option: Continue with the current methodology for the assessment of potential unintended effects:
  - Use of the current data package to identify differences, whether intended or unintended, for pre-market assessment
  - Monitoring for post-market assessment
  
2. Other options: *Generate more data for the pre-market assessment*
  - 1.1. *NTO faunistic trials*
  - 1.2. *Extended compositional trials*
  - 1.3. *Extended agronomy trials*



## NTO trials: faunistic studies set in the field.

- Advantages:
  - Provide data on NTOs generated “*in planta*”. Realistic exposure
  - Many NTOs tested in one go, providing data on a range of functional groups
  
- Disadvantages:
  - No clear testing hypothesis that allows a specific design (studies always open to criticism)
  - Unpredictable provision of data sometimes difficult to interpret
  - Severe practical constraints. E.g. Compliance requirements force this trials in areas where the crop is isolated and therefore dubious representation of real crop conditions
  - If unanticipated differences are detected there is not enough baseline data to determine biological relevance
  - Not clear how they help in decision making



## Extended compositional analysis: analysis of additional plant parts and plant analytes important for insect nutrition and behaviour

### ➤ Advantages:

- Provide additional information on the comparison of plant parameters that may be relevant to insects
- If the parameters and their function are clearly defined clear testing hypothesis can be constructed

### ➤ Disadvantages:

- Only validated extraction methods for specific analytes in specific plant parts are currently available. Introducing more plant parts (roots, pollen,...) and more analytes would lead to a major research project
- Unclear what compounds are key for insect nutrition and behavior and the relevance in insect populations
- Unclear how the biological relevance of any differences could be established (no baselines available)
- Not clear how they help in decision making



**Extended agronomy trials: agronomic trials where additional data is collected on ecological parameters related to plant/arthropod interaction. Provide information on ecological parameters relevant to the “normal functioning” of the crop system**

➤ Advantages:

- Provide information on ecological parameters relevant to the “normal functioning” of the crop system (data generated “*in planta*”)
- Clear testing hypothesis
- Feasibility: fit within the standard set of field trials normally conducted for all products

➤ Disadvantages:

- Only NTOs or NTO stages that are associated with the plant are tested (stages with low mobility)
- Some practical constraints (generic to trialling in the EU)

# Summary

- The current data package that all cultivation applications need to comply with provides enough information for a pre-registration assessment of the potential occurrence of unintended effects
- The purpose of the obligatory monitoring imposed to all products cultivated in the EU foresees the detection of unanticipated effects once the product is marketed
- It is essential that any additional data requests to address unintended effects:
  - Allows risk assessors to determine if any differences detected between the GM and non-GM are of biological relevance
  - Has a clear purpose for aiding in decision making



*Thank you!*



For more information visit:  
Green Biotechnology Europe on the EuropaBio website:  
[www.europabio.org](http://www.europabio.org)

EuropaBio Workshop “ Environmental Risk Assessment for cultivation of GM crops”