



Tobacco Biotechnology and Omics Task Force

Kunming China

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- 1. A brief summary of the original TF goals**
- 2. TF organization and members**
- 3. Progress made in 2018**
- 4. Where we are now**
- 5. Where we expect to go**



TBO Objectives

TBO TF was proposed by Dongmei Xu and Marcos Lusso (Altria) in early 2017, who recognized the need for a document that would:

- 1. Describe and summarize the publicly-available literature regarding the use of biotechnology and “omics” techniques and the nomenclature commonly used in agriculture in different countries.**
- 2. Present clear and concise definitions of the biotechnology and omics nomenclature and techniques.**
- 3. Describe the application of biotechnology and omics technologies to tobacco**



AP2017 Objectives

1. Invite CORESTA members to participate in the TBO Task Force.
2. Discuss potential subject areas to be covered
3. Present a basic outline for a Technical Report that will be written and published on the CORESTA website at the end of 2018

❖ **TBO-151 Task Force Members**

- **Dave Zaitlin & Orlando Chambers (UK KTRDC)**
- **Christelle Bonnet (JT International, Geneva)**
- **Jennifer Bromley & Louise Jones (BAT Cambridge)**
- **Ramsey Lewis (NCSU)**
- **Emilie Julio (Imperial Tobacco Group)**
- **Peijian Cao (CNTC)**
- **Chengalrayan Kudithipudi, Donmei Xu, & Marcos Lusso (Altria Client Services)**



Expected Outcomes

- ❖ **Produce a descriptive document on crop biotechnology that is accessible to both technical and lay audiences that includes a detailed glossary of technical terms used**
- ❖ **The Technical Report will explain, in a clear and unbiased manner, the benefits, risks, and negative outcomes of biotech crops since their adoption in 1996**
- ❖ **The TR will examine the benefits of applying the various technologies, including gene editing (CRISPR/Cas9), to traits that will reduce the risk of using tobacco products and that will satisfy regulators**



Milestones for TBO-151 TF

- ❖ **The objectives and subject areas to be covered and the format will be set and prioritized by consensus to produce the final outline**
- ❖ **TF members will then choose their topics, find and compile references, and begin to read and write**
- ❖ **The draft Technical Report will be reviewed by TF members by September 2018 and will be presented at the CORESTA congress in China, October 2018**
- ❖ **The TR will be published on the CORESTA website in December 2018, after which the TF will be disbanded**



Proposed Outline for TBO

- 1. The Introduction will describe the early efforts to develop transgenic plants and the history of biotech crops. It will stress the importance of tobacco to this early research**
 - a. We will also discuss the impact of genomics and other “omics” technologies (proteomics, transcriptomics, and metabolomics) on modern crop breeding and development**
- 2. We will then summarize the benefits, risks, and negative outcomes that have resulted from biotech crops. Farmer and consumer benefits and adoption rates in the US, EU, and some other countries will be included.**



Potential Topics to be Covered

- ❖ **Economic impacts of GM crops**
- ❖ **Benefits/risks of 1st & 2nd generation transgenic crops**
- ❖ **Ethical considerations**
- ❖ **Sustainability/environmental effects**
- ❖ **Negative aspects and public perceptions of GMO crops**
- ❖ **GMO regulations; EU, USA, and other countries**



Topics (2)

- ❖ **Food security**
- ❖ **Future prospects; epigenetic modifications**
- ❖ **Tobacco:**
 1. **Potential benefits of GM tobacco (to growers, consumers, environment)**
 2. **Gene editing technologies**
 3. **Targets for gene editing (what genes and traits?)**
 4. **Use of FT (early-flowering) plants in breeding**
 5. **GM tobacco and harm reduction**
 6. **Regulation**

1. **TBO TR outline was approved and amended by the TF members in March of 2018**
2. **Commitments:**
 1. **DZ: Introduction (Sect. I), Sect. II, parts 1 & 2, Section IV (glossary)**
 2. **Christelle & Emilie: Sect. II, parts 3 & 4**
 3. **Louise & Peijian: Sect. III, parts 1 & 2**
 4. **Orlando: Sect. II, part 6**
 5. **Dongmei & Marcos (and others?): document review**
3. **I will also edit and assemble the final Technical Report document**

- ❖ **Section I is complete (Introductory Statement)**
- ❖ **Section II, parts 1, 6, and 7 are largely complete; parts 2, 4, and 9 are underway**
- ❖ **Section III, part 4 is complete; parts 3 & 6 are in progress**
- ❖ **Presently unsubscribed: Section II, parts 3, 5, & 8; Section III, parts 1, 2, & 5; Section IV (the glossary).**

We have yet to tackle “omics” and gene editing



Change in Course

- ❖ **Directions from the CORESTA Scientific Commission to split TBO-151 into two TFs:**
 - **#1 will be mostly what we have written about crop biotechnology, consumer acceptance, regulatory issues, etc.**
 - **#2 will focus on gene editing (TALENS, CRISPER, etc.), mutagenesis, & associated technologies; is it possible to tell the difference between plants derived by traditional breeding methods vs. modern biotech?**



A Few Things About “Tobacco”



- ❖ **Tobacco played a prominent role in early plant research**
 1. **First plant to be grown in tissue culture on synthetic medium**
 2. **First plant to be regenerated from tissue culture**
 3. **First plant to be regenerated from a single cell/protoplast**
 4. **Tobacco was central to the discovery of cytokinins and the effects of the auxin/cytokinin ratio on cells in tissue culture**
 5. **First plant to be stably transformed with foreign DNA**
 6. **First transgenic crop to be grown on an agricultural scale – millions of hectares (virus resistance, China, 1992)**

- ❖ P.R. White's original tissue culture was derived from tumors that form spontaneously on the hybrid *N. glauca* X *N. langsdorffii*. This tissue is auxin-independent (it produces its own auxin), and was used as an early source for chemical extraction of natural auxin. Called "White's tobacco callus" or just "tobacco callus" by Folke Skoog and others.
- ❖ The first documented regeneration of a plant from a single cell in 1965 was from the sterile F₁ hybrid *N. glutinosa* X *N. tabacum*
- ❖ It is common to see *N. benthamiana* referred to as tobacco

N. benthamiana is not tobacco

