Science Nonfiction: How Biotechnology is Shaping Food’s Future

- **VONNIE ESTES**, ESTES CONSULTING
- **LARRY FEINBERG**, KNIPBIO
- **MICHAEL TLUSTY**, UNIVERSITY OF MASSACHUSETTS-BOSTON
- **DAVID TZE**, NOVONUTRIENTS
- MODERATED BY **JAMES WRIGHT**, GAA
Vonnie Estes

Agtech and bio-industrial innovation consultant Vonnie Estes was the 2017 recipient of the Rosalind Franklin Award for leadership in biotechnology. With a career working in leadership roles at prominent ag companies including DuPont, Monsanto and Syngenta, along with small startups and venture funds, she is driven by a passion for biology and sustainability and consults with companies to develop and commercialize innovation.
Biotechnology: Improving ways to feed, fuel, and heal the world

Vonnie Estes
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What is Biotechnology?

Technology based on biology using cellular processes to develop products to improve our lives and the health of our planet.
Biotechnology

Applications
Government regulation
Public perception & acceptance
New horizons
Biotech uses in medicine

Tools for disease detection
Reduce rates of disease
Fight serious illnesses
Individual medicine

Very high acceptance rate by consumers
Industrial biotech

Streamline chemical manufacturing processes
Lower temperature to clean clothes
Reduce use of and reliance on petrochemicals
Production of materials we haven’t dreamed of

Promising new approaches to pollution prevention, resource conservation, and cost reduction
Industrial companies using biotech

Geltor
Collagen

Modern Meadow
Leather

LYGOS
Chemicals

Ginkgo Bioworks
Flavors & Fragrances

Bolt Threads
Fabric

Biofuels
Biotechnology in food chain

Climate change and consumer demands affecting food supply

Biotechnology is now more **consumer-facing** with crops, food, food ingredients, animal breeding, and animal feed

Don’t come with a clean slate
(GMO backlash)
Biotechnology in crop production

Higher crop yields with fewer inputs
Less chemicals use and run-off
Crops with enhanced nutrition profiles
Produce foods free of allergens
Reduce fuel use and CO2 emissions

More environmentally sustainable farming practices
Biotech alternative food proteins

Microbes are factories making animal proteins
Production of alternative animal products: meat, milk, egg whites
Reduce land and water requirements to sustainably meet growing protein needs

USDA and FDA Announce Joint Public Meeting on Use of Animal Cell Culture Technology to Develop Products Derived from Livestock and Poultry - Sept. 10, 2018
Biotechnology applications in animal health

Improve health and production through breeding
Better detection and treatment of disease
More nutritious and digestible feed
New and better vaccines
U.S. biotech regulations

**U.S. Department of Agriculture:** *Is it safe to grow?*
- Transgenic plants, potential plant pests
- Plant-produced industrial products

**Environmental Protection Agency:** *Is it safe for environment?*
- Microbial pesticides, plant pesticides
- Engineered microorganisms used for industrial purposes

**Food and Drug Administration:** *Is it safe to consume?*
- Foods, food additives, animal feed, feed additives
- Pharmaceuticals
Regulations outside US

EU: European Food Safety Authority
  Err on the side of caution, high burden of proof of safety
  Focus on process rather than product (unlike U.S.)

Differing labeling thresholds
  EU, Saudi Arabia, Turkey and Australia: 0.9%
  South Korea: 3%
  Japan: 5%
Global regulation of GMOs
Public perception
CLOSE THE TECH TRANSFER GAP
by engaging consumers early and often
Biotechnology moving forward

Need sound policy decisions supporting innovation & risk-taking
Requires a well-informed public
Industry is worth $ trillions and provides millions jobs
Requires funding, protection, and regulation
Risks and challenges need to be addressed through dialogues among stakeholders including policy makers, experts, the public, and NGOs

Biotech enhances all parts of our lives
health, food, environment
What’s next?

Genome editing of microorganisms, plants and animals
Signs of increasing public acceptance
AI, machine learning, robotics
Advancing different legal and technical ways to work and new biz models

Speed and confluence of new tools and technologies