

# Are Health Screening Tools Available for Evaluating Emissions from New Fuels and Technologies?

## Introductory Remarks

Rashid Shaikh, Ph.D.  
Director of Science, HEI

# Vehicles and Fuels

Major milestones of the last several decades:

- Fuels
  - Gasoline: Lead phase-out, reduced benzene and sulfur
  - Diesel: Low to ultra low sulfur fuel
- Technology
  - Gasoline: 3-way catalyst
  - Diesel: Particulate filters
- Many, many, many other improvements
- Net result: Vehicles today are *far* less polluting than before

*But: problems persist, world-wide*

# New Drivers in the 2000s

- Further Emissions Reduction
  - Adverse health effects, lower ambient standards
  - Air quality
- Energy and Climate
  - Global climate change
    - Reduced-carbon fuels leading to lower CO<sub>2</sub> emissions
  - Fuel efficiency
  - Energy security and costs:
    - Diversification of resources
    - Energy independence

*These and other drivers are forcing changes in fuels and technologies for transportation*

# New Directions

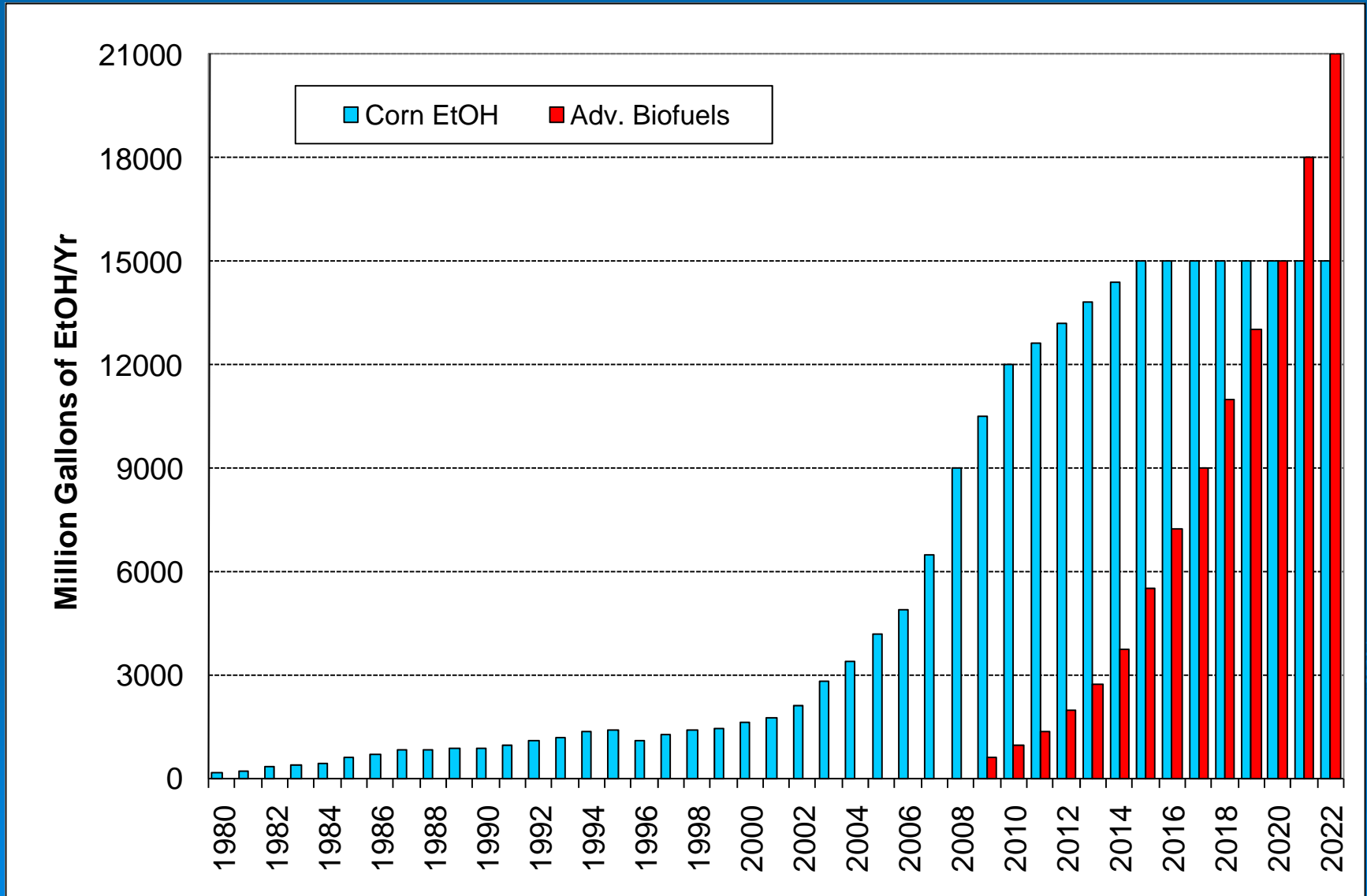
- Fuels: Search for new, (reduced-carbon) fuels, for example:
  - Alcohols derived from crops and biomass
  - Biodiesel
  - Electricity
  - Natural gas
  - Hydrogen
- Technologies: Search for more-efficient, less-polluting technologies:
  - Direct injection gasoline engines
  - New ways to treat diesel exhaust

# What factors are pushing these changes

- A host of laws and rules that are forcing changes in fuels:
  - California: Low carbon standards
  - US: EISA mandated changes
  - Europe: EU low carbon requirement
- Also rules forcing technology change
  - California, US greenhouse gas emission standards

*Not going to discuss specifics of these rules  
but the trend is very clear*

# The 2007 Energy Independence and Security Act Established Aggressive Biofuel Production Targets



# Impact of New Fuels

- Vehicle performance and drivability
- Durability and materials compatibility
- Tailpipe emissions
- Evaporative emissions
- Others

*HEI's focus: health effects of emission*

# What's in tail-pipe emissions

- Alcohols: Increases in *aldehydes*, carbonyls, evaporative emissions
- Biodiesel: NO<sub>x</sub> (O<sub>3</sub>) up, soluble organic fraction of PM up, aldehydes up
- Impact of lubricants, detergents and additives
- Ultrafine, other(?) emissions issues from *new technologies*

# Why this session?

- What tools are available for a rapid assessment of alternative fuels and technologies?
  - Screening for cardiac and pulmonary effects
  - Other health endpoints
  - Genotoxicity – needs further refinements
  - Screening for gaseous components
  - Screening for particulate components
  - Issues related to chemical transformations
  - In vitro – In vivo
  - Appropriate species
- New solutions to old problems?
  - Application of new techniques and technologies
  - Entirely new approaches

***Holy Grail: Simpler, Faster, Cheaper and Better Methods***

# This Session

Chairs: Dr. Joe N. Garcia and Dr. John Hoidal

10:30	Screening for Oxidative Stress and Lung Injury: Endpoints and Methods for Exposing Cells <i>Robert Devlin, US Environmental Protection Agency</i>
11:00	Screening for Cardiovascular Effects: Endpoints and Cellular Systems <i>Aruni Bhatnagar, University of Louisville</i>
11:30	Screening for Genotoxicity: Genomic Approaches <i>Avrum Spira, Boston University</i>
12:00	Discussion
12:15	Lunch