Misinformation & the Limits of Science: an industrial perspective

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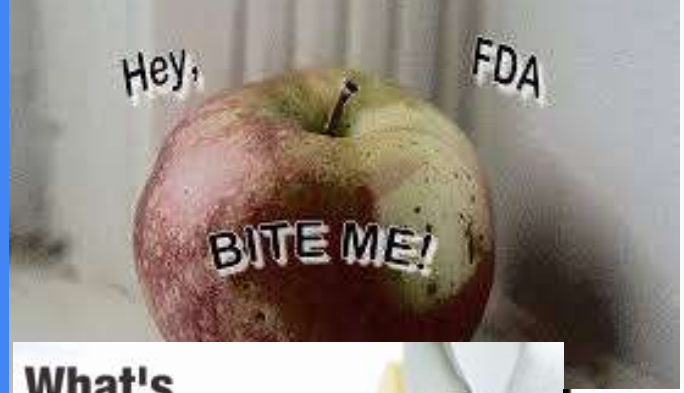
NGOs communicate differently

- Concise
- Compelling
- Catchy
- Clever



PVC
the Poison Plastic

Evolution of the Role of Science

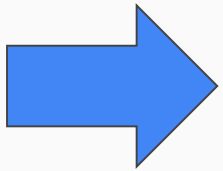
Science will prevail!!!

Science will prevail!

- Fails to account for necessary policy decisions
  - *e.g., 1 in 1,000,000 risk or* GWP_{100}
- Lacks a role for value-laden judgements
  - *e.g., what is most important GHGs? Ozone depletion? Water? Embodied energy?*
- Ignores that you cannot prove a negative
  - *e.g., you show what's "unsafe"*
- Underestimates the time to achieve consensus or the impact of outliers
  - *e.g., hand washing, evolution, plate tectonics...*

Evolution of the Role of Science

Science will prevail!!!



Science is necessary but not sufficient.

Building Credibility and Confidence

Be first

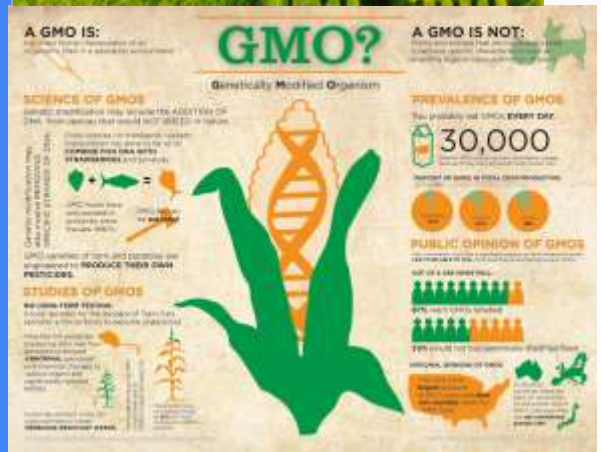
Address non-scientific interests

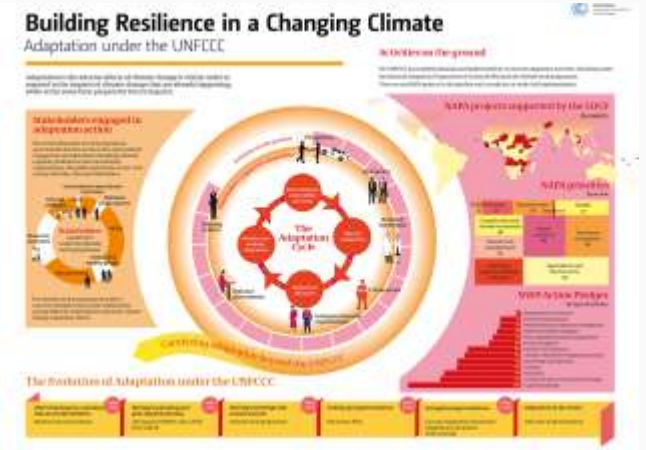
Focus on “influencers”

Find the right partners

Value role of regulations

Know when to walk away





Evolution of the Role of Science

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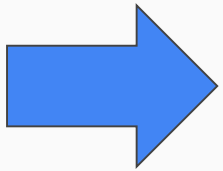

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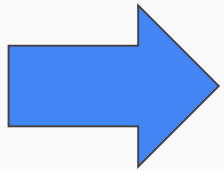

Science has a role.

Policy Science Interface

Science can inform choices.

- Predict likely outcomes
- Highlight limitations
- Articulate assumptions
- Reduce uncertainty
- Respond with new innovations

Policy can encourage science.

- Use weight of evidence
- Leverage data
- Insist on peer-reviewed studies
- Take a life cycle view
- Enable “good” vs. restricting “bad”

Are we really solving a scientific problem?

Thank you

“ No amount of experimentation can ever prove me right; a single experiment can prove me wrong.”

- Albert Einstein

Two Scenarios

Offensive

New technology such as GMOs, nanotech cell phones

Defensive

Existing technology such as BPA, plastic, chlorine

Science will prevail!

Health effects of coffee: Where do we stand?[1]

- **1970s and ’80s: Coffee is as serious as a heart attack**
- **2001: Coffee increases risk of urinary tract cancer**
- **2007: Coffee decreases risk of liver cancer**
- **2010: Coffee & lung disease go together like coffee & smoking**
- **2011: Coffee reduces risk of stroke and prostate cancer**
- **2012: Coffee lowers risk of heart failure**
- **2013: Coffee lowers risk of heart disease & helps you live longer**
- **2015: Coffee is practically a health food**
- **2017: Drink up unless you are pregnant, at risk for fractures or have Parkinson’s**
- **2018: Coffee could come with a warning in California**

1. https://fox13now.com/2018/01/31/health-effects-of-coffee-where-do-we-stand/

Science will prevail!

The scientific process

- Takes time
- Benefits from repetition which is hard to fund
- Uses a messy process to arrive at a consensus
- May have “outlier” viewpoints

The scientific process communicates

- With obtuse vocabulary
- Using strings of qualifiers
- Resting on dry numbers
- Loathing any sort of value-laden statement
- With an abundance of caution

Coffee consumption and health: umbrella review of meta-analyses of multiple health outcomes- results

There was ***evidence of*** a non-linear ***association*** between consumption and ***some outcomes***, with summary estimates i***ndicating*** largest relative risk reduction at intakes of three to four cups a day versus none, including all cause mortality (**relative risk 0.83, 95% confidence interval 0.83 to 0.88**), cardiovascular mortality (**0.81, 0.72 to 0.90**), and cardiovascular disease (**0.85, 0.80 to 0.90**). High versus low consumption was ***associated with*** an 18% lower risk of incident cancer (**0.82, 0.74 to 0.89**). Consumption was also ***associated with*** a lower risk of several specific cancers and neurological, metabolic, and liver conditions. Harmful associations were ***largely nullified*** by adequate adjustment for smoking, except in pregnancy, where high versus low/no consumption was ***associated with*** low birth weight (**odds ratio 1.31, 95% confidence interval 1.03 to 1.67**), preterm birth in the first (**1.22, 1.00 to 1.49) and second (1.12, 1.02 to 1.22**) trimester, and pregnancy loss (**1.46, 1.06 to 1.99**). There was also an ***association*** between coffee drinking and risk of fracture in women but not in men.

BMJ 2017; 359 doi: https://doi.org/10.1136/bmj.j5024 (Published 22 November 2017)Cite this as: BMJ 2017;359:j5024

Coffee consumption and health: umbrella review of meta-analyses of multiple health outcomes- conclusions

Coffee consumption ***seems generally safe*** within usual levels of intake, with summary estimates indicating largest risk reduction for various health outcomes at three to four cups a day, and ***more likely*** to benefit health than harm. **Robust randomised controlled trials are needed to understand whether the observed associations are causal**. Importantly, outside of pregnancy, existing ***evidence suggests*** that coffee ***could be*** tested as an intervention without significant risk of causing harm. Women at increased risk of fracture ***should possibly be*** excluded

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Science is necessary but not sufficient.

Peer-reviewed science remains the bedrock.

- Be robust
- Withstand scrutiny
- Weather critiques
- “Translated” for others to use

But that science should

- Be accompanied by modern communication tools
- Acknowledge the policy and value decisions needed
- Highlight the tradeoffs for decision-makers
- Recognize the benefits of regulations

The Future: source of innovation?

Provide new technologies

- New can coatings, pouches vs. cans, etc
- CFCs to HCFCs to HFCs to HFOs...

Find sources of differentiation

- Third-party certifications
- Create connections
  - Recommendations by trusted leaders
  - Application in high profile venues/applications