Proposal 7: Refocus tobacco science on the public interest not bureaucratic expansion

Recommendation 7. Overall, the imperative is to change the incentive structures in tobacco-related research to stress objectivity in the public interest, not to justify expanded bureaucratic intervention.

- Congressional oversight hearings should examine the state of tobacco science
- FDA/CTP should commission replications, counterfactuals, quality reviews and contrarian analysis to challenge its own thinking
- CDC should commission tobacco use surveillance but outsource conduct and analysis to independent third parties and practice open data principles
- NIH should produce guidelines on conduct and reporting of tobacco-related research (e.g. inclusion of comparisons with smoking, materiality of risk, not drawing policy conclusions)
- Encourage establishment of a "Center for Nicotine and Tobacco Science in the Public Interest" to act as a defender of the public interest.

A dysfunctional science system. The science system for tobacco policy in the United States is failing the American people. Over years of conflict with Big Tobacco, tobacco control science has developed a culture with strong cognitive biases towards problem-finding and alarm-sounding, justifying 'abstinence-only' approaches, and a tendency to rally to support policy proposals that go far beyond what a science paper can support. This culture was never right or justifiable, even if it felt necessary to those involved. When it comes to reduced risk products, such activist bias is a scientific and public health disaster. Several skilled experts now monitor the literature and a tour of their work[1] or PubMed Commons[2] will reveal how bad the situation has become. The types of error widely propagated in the literature have been summarized in a guide to bad vaping science (see box)[3]. A devastating critique[4] of a recent WHO paper drew heavily on poor science that originated in the United States. Overall, the problem is an obsessive focus on minor or hypothetical risks combined with indifference to or denial of opportunities.

A wall of money in favor of regulation. The system of funding starts with deep biases. For example, a NIH request for applications for grant funding[5] stated: "*The overall goal is to develop an evidence base to inform smokeless tobacco control efforts, and to develop effective ways to limit the spread and promote cessation of smokeless tobacco use*." The idea that smokeless tobacco might be a valuable low-risk substitute for smoking is excluded and the research subordinated to supporting control efforts. FDA's Center for Tobacco Products funds a major tobacco regulatory research program and 14 Tobacco Centers of Regulatory Science[6]. These research centers will receive more than $273 million in grants from 2013-2018. It should be obvious that so much science funded by a regulator will be biased towards finding reasons to regulate. Further, it will create supposedly independent advocates for FDA regulation. This establishes giant conflicts of interest that are never acknowledged by those involved. Professor Brad Rodu has analyzed overall NIH spending on tobacco-related research: he comments[7]

> *In 2014, the NIH (mainly the National Cancer, Heart Blood Lung, Drug Abuse and Mental Health Institutes) dispensed $623 million (total costs) in 1,300 grants to over 1,000 PIs at almost 300 universities, medical centers and other institutions. That works out to about $600,000 for each investigator. Few researchers will jeopardize grants of that size by doing or saying anything that conflicts with NIH dogma.*

Even the most basic data on youth tobacco/nicotine use is controlled and interpreted by CDC and has been routinely misrepresented to create a moral panic[8]. But when full data is eventually released, the results appear much more positive, suggesting any gateways might be 'exits' from smoking[9]. The Truth Initiative's Schroeder Institute has been one bright spot in a dismal U.S. landscape with recent in-depth and credible reviews on e-cigarette science[10] and nicotine[11]. This sort of impartial and robust analysis that should be informing U.S. tobacco policy – not that designed to support activism or more regulation.

Amplification of bias. The initial bias and perverse incentives are then amplified through various mechanisms, including: grant-seeking behavior by researchers; publicity-seeking by university press offices; impact-seeking by journals and editors; group-think and common cause by peer-reviewers; sensation-seeking by news outlets; the rise of 'click-bait' as a driver of news values.

The case of "hidden formaldehyde". One example will suffice: a letter published in the New England Journal of Medicine claimed e-cigarettes could produce 5-15 times greater formaldehyde-related cancer risk than smoking[12]. This created huge global media coverage[13]. However, the experiment was deeply flawed (it operated e-cigarettes at temperatures no human would ever use)[14], yet the journal published only a 125-word response three months later[15], and declined to correct or withdraw the original letter even though it has no relevance to human health and despite the damage that such false information causes[16]. Nine months later, the team at Portland State were awarded a $3.5m grant from NIH/FDA[17].

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16 Bates CD. More on New England Journal of Medicine fake formaldehyde scandal. Counterfactual [link]

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Box 1: Challenging common sources of error in scientific papers on vaping

1 Toxic chemicals have been identified in e-cigarette vapor or e-liquids

1.1 Did they show potentially harmful *exposure* not just the *presence* of a chemical? "The dose makes the poison".
1.2 How risky is the exposure compared to smoking?
1.3 How risky is the exposure compared to other risks such as those accepted under occupational health limits?
1.4 Were measurements made in realistic human operating conditions or overheated or at very high concentrations?
1.5 Are inappropriate proxies being used for risk – for example effects that are also seen with coffee or exercise?
1.6 Are flawed analogies being used – for example assuming all ultrafine particles are equally toxic?

2 Adverse health effects from e-cigarettes are reported

2.1 Was vaping the real cause?
2.2 Was the person suffering from adverse impacts of beings a smoker before using e-cigarettes?
2.3 Is the study just observing the effect of nicotine on the body (though no serious disease is caused by nicotine)?
2.4 Is there evidence of actual harm or is it just a *change* in the body or brain?
2.5 Is it based on a cell culture study and are the limitations recognized and was exposure realistic proxy for human use?
2.6 Is it based on an animal study and are the limitations recognized?

3 Claims second-hand vapor is toxic and indoor vaping should be banned

3.1 Are vapor exposures to bystanders potentially harmful given they pose little risk to direct users?
3.2 Is the difference between risk or harm and nuisance or personal preference recognized?
3.3 Have false choices been proposed? – e.g. between a ban and *laissez faire,* when it could be left to owners to decide?

4 Nicotine damages the adolescent brain

4.1 What is the specific nature of the detriment to human health?
4.2 Where is the evidence for the brain damage from nicotine in the longstanding human population of smokers?
4.3 How does this compare to damage from alcohol, cannabis or caffeine?

5 More children using e-cigarettes and gateway effects

5.1 Did they characterize use properly? For example, 'ever use' of an e-cigarette is really a marker of experimentation.
5.2 Could the rising use of e-cigarettes be a good thing if it is displacing smoking?
5.3 High level of smoking associated with vaping – but is this due to independent common factors (confounding)?
5.4 Have they defined a gateway effect?
5.5 Are they assuming prior behavior caused the later behavior?

6 E-cigarettes keep people smoking and reduce quit rates

6.1 Has vaping been wrongly conceptualized as though it is a medical intervention?
6.2 Has the importance of product's consumer appeal been recognized?
6.3 Was "dual use" described as problematic – any cutting down is beneficial and may be part of a longer transition?
6.4 Did they claim there are no benefits to cutting down?
6.5 Not enough randomized controlled trials (RCTs)? RCTs are a poor way to measure impact of diffusion of technology.

7 Flavors and e-cigarette marketing aimed at children

7.1 Do they assume it is just obvious that childish names appeal to kids?
7.2 Why would adolescents try to emphasize their childishness?
7.3 Have *preferences* for particular flavors been misrepresented as a *cause* of vaping?
7.4 Could it be a benefit that some flavors are attractive to adolescents if it means they don't smoke?
7.5 Is an e-cig advertising in effect an anti-smoking ad?

8 Citing uncertainty and appeal to the 'precautionary approach'

8.1 Have they understood what is known and recognized the physical processes in vaping are different to smoking?
8.2 Are they asking the impossible? For example, by saying we will only know the risks when we have 40 years of data?
8.3 Do they realize that 'precautionary approach can do harm to health if it stops people accessing beneficial technology?

9 Tobacco industry involvement implies inevitable harm

9.1 Is the malign influence of tobacco companies assumed or demonstrated?
9.2 Is there over-reliance on decades old industry statements, documents or behaviors?
9.3 Is there a proper understanding of how the nicotine and tobacco market works?
9.4 Are the authors concerned about the right things? For example, are they fighting ill-health or capitalism?

10 Policy recommendations in a scientific paper

10.1 Do policy recommendations go beyond what their research justifies?
10.2 Have policy-making disciplines been followed – options generation, impact assessment, consultation etc.?
10.3 Are the authors' policy positions revealing their biases and priors?
10.4 Have unintended consequences been ignored? Many e-cigarette policy proposals could lead to more smoking.