Smoking: Hazy Air or Hazy Science?

CASE STUDY

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This case study highlights three tactics of science misinformation and disinformation efforts: fabrication of a fake scientific controversy, deviant criteria of assent for accepting scientific ideas, and creating a pretense of a larger support among scientists. See ***Characteristics of Science Misinformation/ Disinformation Efforts*** *for more information regarding these tactics and* ***Water Fluoridation: Misuse of Valid Science to Create Doubt*** *for the companion story to this case study.*

Numbered red flags refer to descriptions of misinformation and disinformation provided at the end of the case study.

On a chilly November evening, Ethan, Robin, and Michael had just left a restaurant. They were waiting in Michael's car for their friend Sarah when Michael pulled out a small carton and clicked a lighter, blowing smoke out the window and flicking away a bit of ash that had built up on the end of his cigarette.

Robin: Michael, stop smoking and roll the window all the way up! I can't stop shivering back here!

Ethan: Don't you know those things cause cancer?

Michael: Relax, it's fine. All of that stuff is overblown. They can't really prove smoking causes any of those problems because somebody can't both smoke and not smoke. Until scientists can control that in a longitudinal experiment, the results are flawed.

Ethan: Scientists have ways to gather evidence besides control-treatment experiments. If we made the criteria for proof unbearably high for everything, like requiring randomized control-treatment experiments when they aren't possible or are inappropriate, then society wouldn't ever get any decisions made.

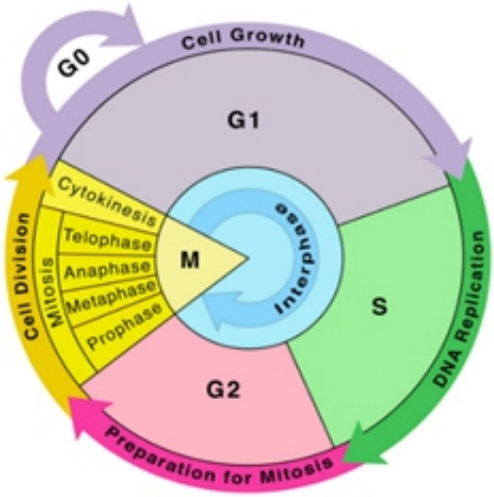
Why might it be problematic to dismiss scientists' warnings about consequences of smoking unless there is evidence based on direct, long-term experiments?

Michael: I don't see how breathing in a little smoke could possibly cause cancer. Most of that stuff is just genetics.

Ethan: The cancer link is no joke. Those chemicals can really mess with your cells. Hang on, I just reviewed this stuff for my biology final, let me pull up the notes on my phone.

Robin: Yeah, my uncle smoked for years and only recently tried to quit after his cancer diagnosis. The doctors are only giving him a few months to live… And what's really sad is that my little cousin is only eight.

Ethan: So yes, genes do play a role, but listen to this: *When cells replicate, they go through a cycle. There are several checkpoints along the way where a cell determines whether it is safe to continue. Most of the time, a cell is in the G0 phase and is not going through replication. But, when it is signaled to replicate—such as if a nearby cell dies—it performs a check on itself at G1 to see if it has enough proteins to split. Then, the cell checks the DNA for mistakes in the S phase...*



The Cell Cycle (Mukherjee, 2021)

Michael: So? What's the point of all that?

Ethan: As a cell replicates, there are checks along the way to make sure the cell is doing so properly. If there's an issue in the DNA and the cell keeps replicating, then all of the new cells have the problem too. If those cells continue to replicate without being controlled…

Michael: Get to the point, guy. What's going to happen?

Ethan: You could end up with a cancerous tumor. Some tumors stay isolated in one location and so they're benign. But, if they don't, new tumors can show up throughout the body, producing even more mutations along the way. In other words, you get cancer.

Michael: OK, OK, but you aren't really making a point about smoking, though.

Robin: Yes, he is, Mike. Smoking can increase the chance that major mistakes happen during cell replication, leading to a greater risk of cancer. Besides, you can actually pass that risk on to other people through secondhand smoke.

Michael: I hear what you're saying, but my but my grandparents smoked their entire lives, my dad grew up in their house, and none of them have had cancer or anything like that.

Ethan: There are other consequences besides cancer such as teeth and mouth problems, decreased lung capacity, or decreased cardiovascular health.. Just because your family have been lucky not to have gotten cancer doesn't change the reported findings supporting scientists' claim regarding dangers of smoking.

> ***What might be causing Michael to reject the idea that smoking can cause cancer even when presented with scientific evidence supporting the claim?***

Michael: People are always talking about risks, and they might be real, but they blow them out of proportion. Besides, a lot of the research on smoking and cancer is pretty sketchy at best. Tommy shared a video from the "we care" group just the other day who disagreed that there's an actual link between smoking and cancer.

Robin: "We care"? Who are they?

Michael: The Western Environmental Center for Air Research and Evidence (WECARE). They're a group of scientists who provide position statements regarding smoking and vaping. They very recently created the organization for people who aren't blindly following the smoking research status quo.

Robin: If people have to make their own organization because they are no longer listened to by the consensus of experts in their given field, then that is definitely a cause for caution.

> ***Rigorous peer review and scrutiny from a global scientific community ensures the trustworthiness of the scientific information made available by the field. How can creating organizations, conferences, and journals that "sound" scientific but do not follow the rules and norms of the scientific community negatively impact peoples' decision-making?***

Ethan: I've seen their video, they missed a few ideas. Cigarettes are full of carcinogens, which are chemicals that can cause damage to your DNA. Those chemicals can actually change the structure of the DNA in your cells or interfere with other cellular functions which can lead to mutations (and cancer).

Michael: Alright, carcinogens are present in other stuff too. I've seen news on food, paint, and toys.

Ethan: Sure. But look here. *Tar from smoking builds up inside of the lungs and can damage the cilia that normally transport wastes out of the lungs. Also, even though nicotine is not a carcinogen, it can increase cell proliferation and is known to inhibit apoptosis, that is, the normally controlled cell death…* So, all of this just unnecessarily increases your risk of cancer and generally decreases your quality of life.

Michael: I'm still not sure how I feel about it. I really think we should be listening to both sides of scientific debate, and I prefer what the WECARE group is saying. Supposedly secondhand smoke isn't as bad as some scientists think.

Robin: See that's the tricky part. When the tobacoo industry funds these organizations designed to manufacture doubt, then people end up thinking the science is unresolved and dubious even though scientists *funded by the tobacco industry* had already linked cigarettes to cancer in the 1950s.

> ***How can the release of information from an organization purporting to be part of the scientific community create the illusion that a controversy exists regarding a scientific issue?***

Michael: That's the problem, isn't it? It's hard to know what research to trust when one scientist says one thing, and another says something else…

Ethan: Yeah, knowing what to trust is tough. The best choice is usually to try and find out what the scientific consensus is by reading position statements from professional organizations. Those statements best represent the collective knowledge gained from independent research of the relevant field.

***Michael*:** Hmm… Where's Sarah? She said it would only be a few minutes.

Using the information from the case study and other credible sources (e.g., your course content) answer the following questions.

How might the features of misinformation and disinformation associated with smoking impact peoples' thinking and decision-making?

How might personal and group-reinforced emotions and biases influence thinking and decision-making regarding this issue?

Regulating your own emotions and personal biases and citing multiple lines of credible evidence (scientific, economic) as well as ethical and social considerations, propose a resolution regarding the decision to smoke.

RED FLAG GLOSSARY

1 ***Deviant criteria of assent***

The standards for acceptance of scientific knowledge are multifaceted and nuanced, but reasonable and evenhanded. In contrast, those spreading science misinformation/disinformation establish criteria that are customized in a way that the accepted science is almost impossible to satisfy. At the same time, purveyors of science misinformation/disinformation do not hold the information they spread to such standards.

2 ***Pretense of a larger support in science***

In appeals to the public, misinformation/disinformation efforts convey much greater support in the scientific community than is actually true. This can be accomplished by creating organizations, holding conferences, and establishing websites and even journals – all devoted to the discredited idea.

3 ***Creating a fake controversy***

Pseudoscientific sources often attempt to manufacture a false sense of legitimacy through the formation of scientific sounding organization and dissemination of information from that organization. This can easily lead to confusion, and cause the public to errantly believe that experts are divided on an issue.

References

Mukherjee, S. (2021, January 18). *Cell Cycle*. ScienceFacts. https://www.sciencefacts.net/cell-cycle.html