Drinks hotter than 65°C can cause cancer of the esophagus, a new report says.

EPIDEMIOLOGY

High-profile cancer reviews trigger controversy

IARC reports create mostly confusion, scientists say

By **Kai Kupferschmidt**

Officially released at 3 p.m. EST on 15 June, the news immediately raced around the world, spread by hundreds of websites. Judging by reader comments, many found it reassuring, whereas others were spooked. The message: Coffee doesn't give you cancer after all, but very hot drinks might, according to the International Agency for Research on Cancer (IARC), the cancer research arm of the World Health Organization.

But scientists grumbled that the hot drink verdict left the public none the wiser, because IARC couldn't say how big the risk is. And the next day, Germany's Federal Institute for Risk Assessment (BfR) in Berlin warned that blanket assessments, such as the one on coffee, are "of limited usefulness" to consumers. "Like almost any food, coffee is a complicated mixture of many different chemicals, some of which we know can cause cancer and others that are beneficial," says BfR President Andreas Hensel.

It has become a recurring pattern: an IARC announcement, followed by confusion, controversy, and criticism. In October 2015, IARC made headlines when it declared processed meat a carcinogen, putting it alongside plutonium and smoking in its classification scheme. Statisticians and risk communication experts, however, were quick to point out that the risk was very low. A few months earlier, IARC announced that glyphosate, the world's most widely used herbicide, was "probably carcinogenic," a verdict that helped fuel efforts to ban the chemical in the European Union, but was at odds with that of many other agencies, including BfR and the U.S. Environmental Protection Agency.

"What is the public supposed to do with these judgments?" asks Geoffrey Kabat, a cancer epidemiologist at the Albert Einstein College of Medicine in New York City. "No matter how much I observe IARC, I find it baffling."

IARC, formed in 1965 and based in Lyon, France, helps set up cancer registries around the world, and tries to harmonize data collection. "Some of these databases are incredibly useful," says Paul Pharoah, a cancer epidemiologist at the University of Cambridge in the United Kingdom. The agency also trains epidemiologists and conducts excellent research, he says. But IARC's most visible products are "monographs on the evaluation of carcinogenic risks to humans" that it started producing in 1971. They group substances and environmental exposures (almost a thousand so far) into one of five categories, ranging from "carcinogenic" to "probably not carcinogenic" (see table, below).

In the case of coffee, IARC announced that a review of recent research had prompted it to move the beverage from the "possibly carcinogenic" category, where it had been since 1991, to "not classifiable as to its carcinogenicity." The agency also said that drinking beverages at temperatures higher than 65°C probably causes cancer of the esophagus—but without quantifying the risk. "That's interesting for science but does not provide the information for making decisions," says David Spiegelhalter, a statistician at Cambridge.

Observers say several developments have helped IARC become a controversy catalyst. One is that the agency often evaluates widely used products such as mobile phones and coffee that are of great interest to a global public. Another is that IARC "aggressively seeks media coverage for its assessments," sending out press releases and organizing news conferences, says Peter Sandman, an independent expert on risk communication based in New York City. He accuses the agency of publicizing relatively vague statements "knowing they will be widely misperceived. I have to think this is intentional ... [IARC] believes, probably correctly, that this misperception motivates people to change their behavior."

Veronique Terrasse, IARC's press officer, says that the agency's solid technical reputation means it "doesn't need to seek media coverage as such," and that its outreach is primarily intended to promote transparency. "I think the general public has the right to know what expert scientists with no conflicts of interest came up with," adds Kurt Straif, who heads IARC's monographs program. Much of the criticism, he says, is coming from

Weighing the evidence

Since 1971, IARC has issued almost 1000 verdicts on human carcinogenicity for a wide variety of products and environmental factors. Here's a sample, with reviews published in the past 12 months in red.

Carcinogenic (118 substances/exposures)
Processed meat, outdoor air pollution, asbestos, estrogen therapy, hepatitis B and C viruses, plutonium, solar radiation, tamoxifen (a breast cancer drug), alcohol, smoking

Probably carcinogenic (80)
Red meat, very hot beverages, glyphosate, shift work, working as a hairdresser or barber, acrylamide

Possibly carcinogenic (289)
Lead, nickel, cellphone use, AZT (an HIV drug), styrene

Not classifiable as to carcinogenicity (502)
Coffee, anesthetics, static electric fields, mineral wool, saccharin, tea, printing inks

Probably not carcinogenic (1)
Caprolactam (a precursor to nylon)

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"people who are directly or indirectly affiliated with stakeholders that are not happy with us," such as the pesticide and meat industries. Straif concedes, however, that it's less than ideal that IARC often announces its findings first in a relatively brief scientific summary, followed months later by the full monograph.

Further complicating IARC's communications effort is the distinction, often not appreciated by the public, between hazard and risk. An exposure is a cancer hazard if it can cause the disease under some circumstances; the risk is how likely one is to get cancer if exposed. Although IARC uses the word "risk" in monograph titles, a preamble cautions that the agency's aim is to "identify cancer hazards even when risks are very low at current exposure levels," because new uses could increase exposures.

But looking only at hazard has downsides. For one, it is very hard to prove that something will never cause cancer. Indeed, IARC has classified just one compound—caprolactam, a nylon precursor—as "probably not carcinogenic." And critics note IARC has no "not carcinogenic" category. Straif says that's also because IARC reviews prioritize substances suspected of carcinogenicity.

The classification is confusing for consumers because the different categories say nothing about how dangerous a substance is—only about how sure the agency is that there is a danger. IARC places smoking and processed meat in the same category, for instance, despite smoking's vastly higher risks. "People end up worrying about the wrong things and concluding that everything causes cancer, so why bother to stop smoking?" Kabat says.

Scientifically, the focus on hazard is outdated, Hensel adds, in part because the world is full of carcinogenic substances that are harmless at low levels. IARC's Straif says there often isn't enough scientific evidence to quantify the risk. But when there is, the agency "does try to move in that direction," he says.

In the meantime, scientists are bracing for more high-impact IARC pronouncements. The agency plans to produce monographs on controversial substances such as the cooking byproduct acrylamide and the plastic component bisphenole A. Hensel, for one, fears that IARC's seemingly black and white verdicts will lead to further politicization of regulatory debates.

At least the report about very hot drinks—although perhaps not particularly helpful—didn't play into a political issue, Pharoah says. "It's hard to see a big downside," he says, "to telling people to leave their tea to cool for 5 minutes." ■

PUBLIC HEALTH

California approves publicly funded gun research center

University of California to run $5 million center that could tap state's extensive database on firearm transfers

By **Emily Underwood**

For 2 decades, firearm advocates in Congress have blocked taxpayer-funded research into the causes and consequences of gun violence, which kills more people in the United States than in any other developed nation. Last week, California's state legislature bucked that trend, voting to establish the nation's first publicly funded center for studying gun violence.

The new California Firearm Violence Research Center will be run by the University of California (UC) system. Its lean budget—$1 million per year over the next 5 years—will likely preclude large-scale studies, but backers hope it will demonstrate the value of publicly funded gun research and perhaps help build support in Congress for a similar federal effort. The 16 June vote to create the center poses "a very stark" contrast to the continuing gridlock in Congress, says epidemiologist Garen Wintemute, who studies firearm violence at UC Davis. Last fall, he worked with state Senator Lois Wolk (D) to develop plans for the center.

> ***"We know that using real data and scientific methods, our best researchers can help policy makers get past the politics and find real answers to this public health crisis."***
>
> **Lois Wolk**, California legislator

Coincidentally, the California vote came just 4 days after a gunman killed 49 people and injured 53 at a gay nightclub in Orlando, Florida, sparking renewed debate in Congress over proposals to impose new federal rules on gun purchases. Events like the Orlando massacre—one of the country's worst mass shootings—"leave us searching for answers," Wolk said in a statement. "We know that using real data and scientific methods, our best researchers can help policy makers get past the politics and find real answers to this public health crisis."

"This shows the kind of thing states can do" in the absence of federal action, says David Hemenway, a health policy researcher at Harvard University. In 1996, the National Rifle Association and other groups successfully lobbied Congress to stifle federally funded gun research. Led by then-Representative Jay Dickey (R–AR), lawmakers barred the U.S. Centers for Disease Control and Prevention from funding any activity that would "advocate or promote gun control" and eliminated a $2.5 million pot of money for gun-related studies.

Dickey, now retired, has since reversed his position and advocates for more gun research. But the lack of public funding means that few young scientists are drawn to the field, says Wintemute, who has spent more than $1 million of his own funds to sustain his research.

The new center will focus on interdisciplinary research "to provide the scientific evidence upon which to base sound firearm violence prevention policies and programs," according to Wolk. "You name it, we need to know about it," says Hemenway, citing the need for more information on everything from firearm training and gun thefts to their role in suicide and homicide.

Wintemute adds that the center could enable a small team of researchers to examine California's unique data set on statewide gun transfers and other firearm-related activities. One pressing question, he says, is why California's annual fatalities from gun violence have dropped by roughly 20% since 2000, even as the nationwide rate has not changed. "We don't know why that is," Wintemute says. "Are we doing something right? Or are we not doing something wrong that other [states] are?"

The location of the new center is not yet "locked in," but Wintemute believes UC Davis is the most likely candidate. And he hopes the state funding will help researchers attract additional money from private donors. ■

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Editor's Summary

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