SCIENTIFIC AMERICAN™

Permanent Address: http://www.scientificamerican.com/article.cfm?id=retraction-impact-lancet

Impact Factor: Can a Scientific Retraction Change Public Opinion?

A month after the keystone paper proposing a link between a common childhood vaccine series and autism was retracted, the debate rages on

By Katherine Harmon | Thursday, March 4, 2010 | 35

When science revises its stance, the field itself follows established protocol to adapt, but public opinion can be slow to catch up. Rather than wiping the slate clean, last month's retraction of a key paper proposing a link between childhood vaccines and autism seem only to have widened the societal divide on the issue. And the rising rate of retractions—roughly ninefold between 1990 and 2008—suggest that there could be more cases in which public opinion carries on long after science has reversed course.

REVISING SCIENCE: Can the publishing protocol of revising or retracting papers change minds outside the academic community? Last month's retraction in *The Lancet* hints that change might not be so simple. *Image: ISTOCKPHOTO/SODAFISH*

The case series report by Andrew Wakefield (then of the Inflammatory Bowel Disease Study Group at the Royal Free Hospital in London) and 12 co-authors published February 28, 1998, in the well-regarded U.K. medical journal *The Lancet* described gastrointestinal problems in children with developmental regression—and suggested a possible link with inoculation of the combination measles–mumps–rubella (MMR) vaccine, which had preceded the symptoms in the children. What appeared, on its surface, to be a descriptive paper about developmental disorders and diarrhea ended up becoming a flash point in the autism community and sparked a decline in childhood vaccination rates—and possibly an uptick in outbreaks of vaccinal diseases.

On February 2, 2010, the editors of *The Lancet* retracted the paper because the 12 children in the research were not recruited as described by the authors, and the work had apparently not been approved by an ethics committee.

The retraction came as little surprise to many observers of the vaccine–autism debate. Nevertheless, the paper's influence on the broader public may last for awhile, despite a growing body of contrary evidence (as well as many of the co-authors having stepped away from the indications). A survey conducted in 2009, published online March 1, 2010 in *Pediatrics*, found that about a quarter of the 1,552 parents surveyed thought that vaccines can cause autism in some children. And 12 percent of parents had declined at least one recommended vaccine for their children.

"It's hard to un-ring the bell," says Paul Offit, chief of the Division of Infectious Diseases and director of the Vaccine Education Center at The Children's Hospital of Philadelphia. "It's very hard to un-scare people once you've scared them."

Rising tide of retractions

For the 1.4 million scientific papers that are published each year, scant few are ever retracted—and even fewer of those events reach the public ear. Perhaps the most widely publicized retractions were those surrounding the now-discredited stem cell researcher Woo Suk Hwang, formerly of Seoul National University in South Korea, after proposing that he had cloned human embryonic stem cells. But his work and the recently retracted Wakefield paper have just been two in an accelerating trend of retracted papers.

In 1990 just five of the 689,752 scientific papers published were retracted, according to data from Thompson Reuters's "Web of Science" database, courtesy of *Times Higher Education*. By 2008, however, that number had increased to 95 papers out of the 1.4 million published.

Some of the increasing number of retractions might well result from a proliferation of journals worldwide. "There are countries that have very little infrastructure" to detect and investigate potential misconduct, says Liz Wager, chairperson of the Committee on Publication Ethics (COPE) in the U.K. "I think it is an international problem."

Despite these increasing numbers, however, science is not necessarily getting sloppier. "I really don't think you can conclude anything about the frequency of misconduct," Wager says. She notes the improved plagiarism detection software in the digital publishing age as well as improved investigations into allegations of misconduct—and even a greater willingness on the part of journals to retract papers.

But closer research shows that growing or not, these formal retractions are likely just the tip of the iceberg. A meta-analysis of studies on scientific misconduct by Daniele Fanelli of the Institute for the Study of Science, Technology and Innovation at the University of Edinburgh and published in May 2009 in the journal *PLoS ONE*, showed that "on average, about 2 percent of scientists admitted to have fabricated, falsified or modified data or results at least once…and up to one third admitted to a variety of other questionable research practices." When the blame was shifted to others, however, about 14 percent said they had observed fabrication, falsification and modification by colleagues and 72 percent said they had seen "other questionable research practices," Fanelli wrote. And because of fuzzy definitions and a reluctance to admit wrongdoing, these figures, she argued, are likely "a conservative estimate of the true prevalence of scientific misconduct."

Rarely does news of alleged scientific misconduct reverberate so widely—and deeply—in the public sphere as it has with the Wakefield paper. Even in the case of Hwang, Wager says, "it wasn't actually affecting clinical treatment of patients." Other retractions have, however, toyed with our understanding of public health issues. One 2002 primate study, published in the September 27 issue of*Science*, reported the drug ecstasy was neurotoxic. "People latched onto it," Wager notes, and it "fit into their political agendas." But the paper, which had been funded in part by the federal government, was retracted in 2003 after it was discovered that the lab's supplier had accidentally botched the labels so that, instead of giving the monkeys ecstasy, the researchers gave them methamphetamine, which caused the observed brain damage. Despite the public interest in that retraction, however, it did not touch a nerve as deeply as did the Wakefield paper, perhaps because it examined an illegal drug rather than a recommended treatment—and showed a clear misstep.

Slow to judge

As long and painstaking as the scientific process often is, so too can be the retraction process. Although some scientists have come forward when they realize an accidental error—or even to admit intentional data manipulation—journals often bear the responsibility of trying to set the record straight.

"A journal can make a retraction even if the authors aren't cooperative," COPE's Wager points out. In a case like Wakefield's, however, in which the lead author maintains the legitimacy of the paper (and continues to promote its propositions), completing a formal retraction can—and did—take years. Ten of the 12 co-authors of that paper submitted a partial retraction of their interpretations in 2004.

"We do not expect journals to conduct investigations themselves," Wager says. "They're not the right people to do it." Except in clear cases of plagiarism or duplicate publication, journals must often wait for institutions and government agencies to look into potentially incorrect research and come to a decision about what really happened.

In the U.K., which does not have an established investigative group—in contrast to the U.S. Public Health Service's Office of Research Integrity—Wakefield's case went through the country's General Medical Council's Fitness to Practice Panel.

Like the criminal justice system, finding a scientist or lab guilty of misconduct—especially if it is intentional—is no small accusation. "They do need to make sure they have proper evidence," Wager says of the journals in charge of deciding if and how to retract a

paper. "It is a serious step, and it will have serious effects on the author."

Nevertheless, she notes, "We encourage journals to retract in a timely manner."

Intractable retraction

Although the Wakefield paper has become the flagship piece for people on both sides of the vaccine and autism debate, it did not purport to establish causation for autism—or even a definitive link between the MMR vaccine and the digestive condition it was examining. And when the paper appeared, it came with a commentary by Robert Chen and Frank DeStefano (both of the National Immunization Program at the U.S. Centers for Disease Control and Prevention), who noted that it was "important to examine, critically and with an open mind, the report by Andrew Wakefield and colleagues."

But the nuances of scientific proceedings can be lost in translation to the broader populace.

From his vantage point in the pediatrics world, Offit says that the retraction does seem to have deterred some on the periphery of the issue from subscribing to the paper's suggestions. But "those that are committed to the notion," Offit says, "have what amounts to a nonfalsifiable hypothesis."

In the intervening years since it was published, he says, the paper itself caused some actual harm. "You can argue that this paper directly led to the death of children from measles," says Offit, who helped develop a vaccine for rotavirus. The childhood scourge killed some 197,000 children worldwide in 2007, and outbreaks of measles following a drop in vaccination rates have occurred in the U.S. and U.K. in the past several years. In 2008 the number of measles cases increased by 36 percent in England and Wales, killing an estimated 10 individuals in those countries between 1990 and 2008.

The debate rages on

Some in the autism community, however, maintain that the retraction has highlighted the need for more research—not less. "We are coming from a point of concern and [are] therefore interested in environmental causes of all kinds," says Mark Blaxill, a director ofSafeMinds, a group that advocates for more research on mercury's role in neurological disorders and is in favor of spacing out childhood vaccines, rather than combining them. "We're about an open and rigorous approach," says Blaxill, whose daughter was diagnosed with autism. He asserts that it is "legitimate and important to raise questions about the safety of what we're doing in an expanding childhood vaccine program."

He calls the retraction's impact "catastrophic" to parents. Rather than discounting the link suggested in Wakefield's 1998 case series report, the retraction represents "the suppression of science," says Blaxill, who asserts that the claims behind the reasons for the retraction are "patently false." He points to government settlements for parents whose children have been diagnosed with autism after being vaccinated as evidence for a broader acceptance of the link that the paper retraction cannot change.

If the past month is any indication, the retraction of the Wakefield paper is unlikely to quell the debate or establish common ground for discourse. "Until there's a clear cause of autism, it's hard to argue something with nothing," Offit says. And for those seeking a cause for their children's—or those of others—seemingly inexplicable regression or failure to develop in the vaccine hypothesis provided just that. "He offers hope," Offit notes, even though he thinks it is a false hope.

Shaky scientific steps

The retraction of controversial papers such as the Wakefield report can be problematic not only in the public health sphere but in the scientific one, as well. When a paper is retracted, subsequent and ongoing research that has relied in part on its findings can suffer. Wager notes this as another reason for swift retractions. "You don't want to be wasting other scientists' time and funding" pursuing incorrect reasoning, she says.

Since its publication at the end of February 1998 the Wakefield paper has been cited in more than 650 other published articles in the Scopus database, which tracks scholarly articles and citations.

But the paper's influence in the journal world is supposed to have come to an end, marked by online versions now rendered nearly

illegible by the digitally stamped word "retracted" over every page. Since the retraction was announced, "The pressure's off to do those kinds of studies," Offit says.

Blaxill does not disagree that less research is likely to be done in the field in the near future, but he thinks that is misguided. "As parents, we're calling for substantial research that has not been done to investigate the safety of our current vaccine practices," he says, noting that he is concerned that the retraction marks medical industry efforts to censor scientists, although he does say he would support retraction in cases "when there's documented scientific fraud." This retraction, however, was no such instance, he maintains.

Despite the original commentary piece that ran with the Wakefield study, Offit says the journal erred in publishing it at all. "I think you can lay this at the feet of the editor," Offit remarks, noting that many of the initial reviewers recommended it be rejected.

From working with journal editors who struggle with perpetual questions of what to publish, what to let stand and what to retract—or correct—Wager says that part of the burden could be lifted with a few changes in the research community itself. "We would love that everything was sorted out upstream," at the level of early scientific education, "so it wasn't the journal editors who had to sort out the mess," Wager says. "It's not an easy thing to change, but you can do a lot with education, mentoring and supervising."

Regardless of the swings of public opinion, the scientific process—publishing and all—will continue, and blips in the literature will likely persist. And even though a retraction can mar a career or a whole field, not everyone sees it as a bad thing. "I think that a retraction should be seen as a mark of honor for a journal," Wager says. "It's a sign that they did the right thing and corrected a problem."