Doubt has been cast on the paper that started the MMR-and-autism scare

A FEW years ago Richard Dawkins, an evolutionary biologist at Oxford University, came up with the idea of the “meme”. He was trying to make the slippery problem of the evolution of human culture as tractable as that of biological evolution, and he thought that if cultural information could somehow be divided into separately transmissible elements, in the way that biologically heritable information is divided into genes, the rest might follow. A successful meme, he speculated, might pass from person to person like a virus.

Few recent memes have been more successful than the one which causes many people, particularly in Britain, to believe that the combined measles, mumps and rubella (MMR) vaccine can cause autism in children. That meme has been responsible for a fall in vaccination rates in Britain from more than 90% to less than 80% over the past six years (see chart). The consequence has been a rise in the incidence of measles and mumps, as the so-called “herd immunity” which mass vaccination brings has broken down. As the meme has spread, so have the viruses.

The MMR-causes-autism meme originated in the early 1990s, in the wake of suggestions that measles itself is a cause of autism. But it really started spreading in 1998, after the publication in the *Lancet* of a paper by Andrew Wakefield, of the Royal Free Hospital in London, and his colleagues. The paper examined the cases of 12 children who had two things badly wrong with them, a conjunction that the authors considered was a new syndrome (the fancy name for a set of symptoms that reflect a single underlying disease). The children in question had chronic intestinal disease, and they also had a history of normal behavioural development followed by a loss of behavioural skills that had already been acquired. In the majority of cases, the behavioural problems had been diagnosed as autism. And in eight of the 12 cases, the onset of the behavioural problems was associated by the child's parents with MMR vaccination.

The authors clearly state in the paper’s discussion that “We did not prove an association between measles, mumps and rubella vaccine and the syndrome described.” Nevertheless, the suggestion was there, and that was enough. No amount of official reassurance could persuade the sceptics. Nor did the results of other studies, including one carried out in Finland, which looked at all the children vaccinated with MMR in that country over a 14-year period and failed to find any association. Then a larger study in which Dr Wakefield was involved produced evidence that children with the new syndrome had measles viruses in their guts more often than healthy children did.
The measles component of MMR consists of living, though "attenuated", viruses—so the implication was that this was the source of the viruses in the children's guts. However, the presence of the virus does not indicate that it caused the disease. Indeed, there is reason to suspect that having this syndrome might make it harder for someone's immune system to get rid of the virus once it was introduced. In that case, the cause would be the other way around. Meanwhile, in America, a completely different meme is circulating. This also blames MMR for causing cases of autism, but the guilty component is alleged to be a mercury-containing compound called thimerosal, which is used as a preservative.

Now there is a new twist in the tale. On February 20th, the *Lancet* issued a carefully worded statement (in other words, one that looked as though it had been thoroughly examined by the publication's lawyers). It said that certain allegations about Dr Wakefield's paper had been brought to its attention (by a journalist on the *Sunday Times*, as it turned out). It rejected some of these allegations after investigating them. But some it accepted. In particular, it seemed as though Dr Wakefield had had an undeclared conflict of interest. In the light of this Richard Horton, the *Lancet*’s editor, said that if he had known then what he knew now, the paper would have been significantly modified before publication.

**Correlation or causation?**

Dr Wakefield's conflict of interest was that he had received £55,000 ($90,000) from England's legal-aid board to carry out a second study on the relationship (if any) between MMR and autism. This board was the body responsible for giving financial support to people involved in legal action who were too poor to pay for it. The board wanted to know if claims by parents that their children had suffered because of an MMR vaccination had any scientific validity. Not making this clear at the time was, perhaps, a little foolish. Nor was Dr Wakefield the only common factor between the two studies. Several children participated in both as well, though Dr Wakefield says he was not responsible for this.

In one sense, parental response to the scare has been rational. The real benefit of vaccination against the three diseases involved is that it denies the viruses a place to hide in the population. This is the phenomenon referred to as herd immunity. But if everyone else's child is immunised, there is no need to immunise your own. So even a small risk is not worth taking, until herd immunity falls so far that the threat of infection (and measles is a disease that can cause serious brain damage) outweighs the risk of vaccine damage.

The actual pattern of response, however, does not suggest such a cool and Machiavellian assessment of risk. That is because the reaction of many parents has been to have (or want to have) their children vaccinated one disease at a time. Indeed, such a course of action was recommended by Dr Wakefield at a press conference held at the time the *Lancet* paper was published.

But besides leaving those children at risk of infection longer, this course of action does not seem to square with the idea that the risk factor for the alleged new syndrome is measles. There is no obvious reason to believe that a shot of pure live-virus measles vaccine would be less risky than MMR. (Killed-virus vaccines exist, but give less protection.) Although there have been claims that multi-disease vaccines somehow put more pressure on the immune system than single-disease ones, there is no actual evidence to support this.

So what is going on? One problem with the first study, apart from its tiny sample size, was that the original association between the administration of the vaccine and the onset of symptoms was, in most cases, made by a child's parents. In these circumstances, a parent is unlikely to be a rational observer. Indeed, he or she may be actively looking for something to blame for what in earlier times might simply have been regarded as an act of God.

The age at which the symptoms of autism generally manifest themselves is similar to the age at which MMR is first administered (14 months; a second dose comes later). Given that the MMR-causes-autism meme already existed, the link would be easy to make retrospectively. But correlation is not causation. At least, not always.

Dr Wakefield seems unrepentant. He points out (correctly) that his undeclared conflict of interest does not automatically discredit the original paper's science. And he says that he welcomes the inquiry into his research that has now been set in motion by the General Medical Council, the governing body of Britain's doctors. Whether the incident will serve as an effective pro-vaccine meme remains to be seen. If it does, it might yield an interesting result in cultural epidemiology, as well as casting light on the more traditional sort.