

Causality in Medicine and the Streptomycin Case

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In discussions of causality in medicine at the moment, there is a considerable debate between proponents of what is called the Russo-Williamson Thesis (or RWT) and its critics. One version of the RWT can be stated roughly as follows. In order to establish a causal claim in medicine, it is necessary to integrate two different types of evidence. The first is statistical evidence about human groups. This can either be from observational studies, as in much of epidemiology, or from interventional control trials. The second is evidence of mechanism, which usually comes from laboratory work of various kinds. The critics of the RWT are often associated with the evidence based medicine movement (EBM). They regard statistical evidence (particularly randomised control trials) as more important than evidence of mechanism; and, in particular, hold that mechanistic evidence is not required to establish causal claims.

In this paper, I examine this controversy in the context of a particular historical case study. This is the discovery of the first successful cure for tuberculosis. The first step was the discovery in the USA of a substance (streptomycin), which strongly inhibited tubercle bacilli in vitro. This led to the first ever randomised control trial (RCT) of a potential medicine, which was conducted in England by Austin Bradford Hill over a period of 6 months. The result of this RCT was that the patients who received streptomycin showed a remarkable improvement over the control patients, and this improvement was statistically significant.

This result seemed to indicate that streptomycin was indeed a satisfactory cure for tuberculosis, but Austin Bradford Hill was cautious because of some evidence of mechanism. The streptomycin took a long time to kill the tubercle bacilli, and this suggested that some tubercle bacilli might become resistant, and, in due course, cause a relapse among those patients who had improved dramatically in the first few months. Unfortunately this proved to be the case. To overcome this problem, it was decided to give patients not streptomycin on its own, but two different drugs together, namely streptomycin and PAS. This cocktail' of drugs was the first successful cure of tuberculosis.

This example shows that exclusive reliance on statistical evidence even on high quality RCTs cannot be satisfactory in medicine. It would have led to the wrong conclusion regarding streptomycin on its own as a cure for tuberculosis. This therefore constitutes a strong argument in favour of the RWT.