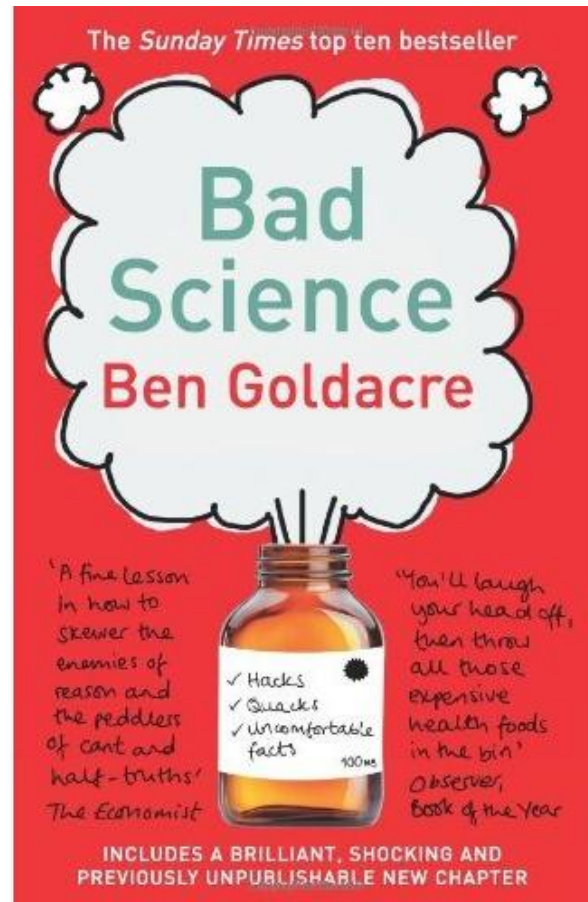


Bad Science, Ben Goldacre, Fourth Estate, London, 2008

The author of this book, Ben Goldacre, is a campaigning, investigative journalist. He is also a scientist and a doctor, which he uses to give his work a sound scientific rationale based on presented evidence. Readers may be familiar with his 'Bad Science' column in the Guardian (also available online) [1]. His mission is to inform the public about evidence-based medicine and trial design so that they can see how science and health myths are created and how they can be refuted due to lack of evidence, mistakes in interpreting evidence and the selective use of evidence. In this he shares the aim of many science teachers to produce scientifically literate citizens who can evaluate scientific issues, apply critical thinking and make informed decisions. He writes in an entertaining, amusing and combative style making his books a 'good read' as well as having serious science content. *Bad Science* is relevant to the Higher Human Biology Unit Immunology and Public Health (clinical trials) and the Higher Biology Unit Sustainability and Interdependence (field trials). It is also relevant to the Advanced Higher Biology Unit Investigative Biology.



"My whole purpose in writing this book is to teach good science by examining the bad"
Ben Goldacre

The first three chapters introduce the principles of scientific experimentation to the lay reader by debunking the pseudoscience around 'detox' regimes, 'Brain Gym' and moisturising creams and their ingredients. Homeopathy (chapters 4 and 5) is used as the context to discuss the design of clinical trials and the placebo effect. The misinterpretation of scientific evidence is explored in relation to nutritional antioxidants (chapter 6). The strategies and errors of these 'complementary and alternative medicines' are obvious and transparent and as a consequence they make for a good teaching context for the more complex ideas of gathering and interpreting scientific evidence through randomised control trials. Teachers are likely to be attracted to the chapter dealing with the effect of fish-oil pills on improving school performance (chapter 8 'Pill Solves Complex Social Problem'). This may strike a chord with teachers on the extent to which education initiatives are supported by a systematic review of evidence rather than unsubstantiated whim and opinion! In chapter 11 he moves on to badly designed and conducted clinical trials and the tricks of the trade of the pharmaceutical industry – a topic further explored in his book *Bad Pharma*, [2] also reviewed in this series. He also discusses the poor reporting of science in the media and its impact on promoting the public misunderstanding of science. In chapter 13 he explains the need for statistics in scientific research. This is useful as often statistics are presented as a *fait accompli* or a requirement without the reader (or student) understanding why they are necessary. The abuse of statistics by the media is covered in chapter 14, further underlining

the importance of using statistical tests that are appropriate for the trial's experimental design. The final two chapters deals with two case studies where scare stories in the press were brought about by deliberate (if at best unknowing) abuse of the scientific process - MRSA contamination in hospitals and the link between autism and MMR vaccine.

In his book Ben Goldacre makes the case for the methodology of obtaining and interpreting scientific evidence and the scientific basis of evidence-based medicine and epidemiology being taught in schools. In Scotland this is now the case in the course Units of Higher Human Biology, Higher Biology and Advanced Higher Biology mentioned above. The book is well referenced providing scope for developing additional learning resources. In addition there are a number of useful websites including the author's own 'Bad Science' site [1]. Eight of the topics covered in *Bad Science* have been turned into lessons (for GCSE level students) by Ed Walsh, Science Advisor for Cornwall Learning, available free from Collins UK [3]. The *NHS Choices* web-site has useful pages (including video clips) on 'Clinical trials and medical research' [4]; their 'Behind the Headlines' pages [5] provide scientific analysis of health stories in the media, useful for dealing with topical medical issues raised in the classroom. *Cochrane Summaries* [6] give definitive answers to medical queries entered into their search function based on systematic reviews of controlled trials through meta-analyses. Finally the book *Testing Treatments* [7], also reviewed in this series, and available as a free pdf download is a worthwhile companion volume to *Bad Science*.

References:

1. <http://www.badscience.net/> accessed 11 July 2014.
2. *Bad Pharma*, Ben Goldacre, Fourth Estate, London, 2013.
3. <http://www.collins.co.uk/page/Bad+Science> accessed 11 July 2014.
4. <http://www.nhs.uk/conditions/clinical-trials/pages/introduction.aspx> accessed 11 July 2014.
5. <http://www.nhs.uk/News/Pages/NewsIndex.aspx> accessed 11 July 2014.
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6. *Testing Treatments – Better Research for Better Health Care*, Imogen Evans, Hazel Thornton & Iain Chalmers, Pinter and Martin Ltd, London, 2010. Available at <http://www.testingtreatments.org/> accessed 11 July 2014.