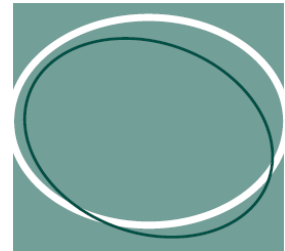


Science Advice, Impartiality and Policy



sense about science

Speaker: **Sir John Krebs FRS**
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Chair: **Lord Browne of Madingley**
Chief Executive, BP plc

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in association with



Introduction

Science advice should be approached by

- encouraging dialogue between scientists and others
- acknowledging uncertainties within science
- acknowledging different perspectives on the acceptability of risk

Science and policy

Translating science into policy is frequently messy. Factors other than science come into play, such as cost effectiveness, ethics and politics. Furthermore, evidence is often incomplete and scientists may disagree over its interpretation. These problems, compounded with differing perceptions of risk, mean that science policy is not just about science. Risks may not be quantifiable and actions to reduce them may or may not be clear cut.

Government must weigh up a number of factors when deciding whether to intervene on issues of risk. They must consider

- the benefits against the costs
- the autonomy of the individual against the benefits of the population
- the equity of impact

What can the government do?

One option is to do nothing. But assuming some action is required, **educating and informing the public** is one way of reducing risk. The Food Standards Agency (FSA) took this approach over salt by commissioning a series of adverts featuring Sid the Slug. Alternatively, the government can **enable people to make their own decisions**; for example the FSA is planning to introduce a traffic light system on food packaging, which will help people to make

informed choices about what they eat in terms of fat, sugar and salt content. Finally, where necessary, it can **introduce regulation** that protects consumers, for instance by banning smoking in public places.

Before introducing regulation one should consider

- if it will work
- if it is proportionate
- if it the most effective way
- if there public accountability

Regulation

Is regulation cost effective?

Viscusi & Gayer (2002) calculated the value of a life by dividing the costs of various regulations by the number of lives that they save. This results in an enormous range of what it costs to save one life:

- seatbelt/airbag = \$100,000
- car side-impact standards = \$1,000,000
- asbestos¹ = \$24,700,000
- formaldehyde¹ = \$256,373,000,000

Whose responsibility is it to decide which risks get legislative attention?

This in part depends on what the risk is. Consider the food we eat: for every death from an allergic reaction to food there are

- 5,600 deaths from cancer
- 3,500 from coronary heart disease
- 50 from food borne disease
- 15 from choking
- 2 from vCJD
- 0 from pesticides

It is interesting that regulation tends to be introduced on the low-risk end of the scale.

¹ Occupational Exposure Limits

Evidence and regulation

No evidence: junk food in schools

Jamie Oliver has successfully lobbied for better quality good food in schools. Last year, Ruth Kelly MP, Secretary of State for Education, said: "I am absolutely clear that the scandal of junk food served every day in school canteens must end... we will ban poor quality processed bangers and burgers from next September" (28th September 2005).

But we shouldn't rush to regulate school meals because (1) there is no evidence it will work (2) there is no scientific definition of junk food (3) there has been no cost benefit analysis and (4) there has been no public engagement.

Ignoring evidence: water shortages

In southeast England there is incontrovertible evidence that the region is receiving less rainfall than formerly, yet the government is planning to build 500,000 new homes with no 'grey water' requirement, that is, to reuse water that has been through the home – the washing machine, dishwasher, shower and sink, (but not the toilet) for irrigation.

Ironically, where there is no evidence the government is planning to regulate (e.g., school meals), but where there is good evidence it is not (e.g., water shortages in the southeast). So how should we expect it to act when there is incomplete evidence?

Incomplete evidence: badgers and bovine TB

It is known that badgers contribute to cattle infections of bovine TB (bTB) but it is not known how important a role they play or how effective a cull would be.

Between 1982 and 1985, Lord Zuckerman's 'clean ring' approach was used, by which areas were cleared of infected badgers and kept clear. A clean ring was extended around an infected farm until uninfected badgers were found. That area would then be kept clear of badgers for six months.

In 1986, Professor Dunnet recommended the implementation of an interim strategy that involved the removal of badgers from farms where a infected badgers were found and where it was thought that they were the most likely cause of the disease.

But cases of bTB rose steadily and in 1996 Sir John was asked to carry out a further review. The 'Krebs

trial' (Randomised Badger Culling Trial²) set aside thirty 10x10 km plots and tested three treatment methods

- Reactive: badgers were culled only on and around farms following bTB outbreaks.
- Proactive: as many badgers as possible were culled in the whole area and badger numbers were kept as low as possible
- Control: no badgers were culled but the land was surveyed for details of their presence

Reactive culling was associated with a 27% increase in infected cattle. Proactive culling was associated with a 20% decrease of bTB within the study areas, but a 30% increase just outside them.

Other studies have produced different results. In Ireland, for example, proactive culling was associated with a 60% decrease in bTB. And in the UK it has recently been shown that cattle movement accounts for 80% of the presence or absence of bTB in 5km² squares.

Conclusions

- culling badgers works on a large scale
- cattle movements and husbandry are important risk factors
- net reproduction is ~1.1 so a modest change will control the disease

Scientists disagree: pesticides

Sometimes scientists disagree on how scientific evidence should be interpreted. Should people living near farms worry about pesticide sprays?

There are 4.6 million (m) hectares of arable/horticultural land in the UK, with 1m to 1.5m people living next to fields. There are 253,000 km of paths, tracks and roads next to fields and 30m kg of pesticide used per year. The number of reported adverse effects vary: the Health & Safety Executive says 1 to 14 cases (2003/2004) but various pressure groups say the real figure is in the hundreds (2001 to 2005).

The Royal Commission on Environmental Pollution (RCEP) concluded in its 2005 report on 'Crop Spraying and the Health of Residents and Bystanders'³ that it is "plausible that there could be a link between pesticide exposure and ill health", for example, chronic fatigue syndrome (CFS) or multiple chemical sensitivity (MCS), and they "recommend a more precautionary approach" by implementing five metre buffer zones around fields.

² www.defra.gov.uk/animalh/tb/culling/index.htm

³ www.rcep.org.uk/cropspraying.htm

The Advisory Committee on Pesticides (ACP) issued a response⁴ which concluded that “the RCEP’s recommendation for a 5m buffer zone is disproportionate”, that “pesticide toxicity is unlikely to contribute importantly to CFS or MCS” and that the RCEP’s conclusions were reached after “incomplete consideration of the evidence”.

What underlies these differences? They agree that there is uncertainty in the data and that a proportionate response is a matter of judgement, but they disagree on

- whether toxicological risk assessment takes into account enough of the uncertainty
- whether the response to this is consistent with other areas of risk management
- how much weight public perception of risk should be given
- what the epidemiological data mean

Science versus perception of risk: GM foods

Scientific evidence and public perception often do not agree. For example, public perception that the MMR vaccine causes autism is not supported by evidence, nor is the claim that organic food is more nutritious than conventionally farmed food.

Public perception of genetically modified foods has been extensively studied, with mixed findings. The GM Nation? debate (n = 36,557) indicated that the public perceives GM technologies as a great risk with little or no benefits. But a UEA/Mori poll (n = 1,363) revealed a much more distributed reaction, with many people recognising both risks and benefits.

Risk perception is of course relative. For example, many more people die in the UK from smoking and obesity-related illness than from vCJD or measles. However, media interest in a vCJD death is about 23,000 times that in an obesity-related death, as shown in these figures:

Number of deaths per news story⁵

- Smoking 8,571
- Obesity 7,500
- Alcohol 4,724
- Mental health 1,222
- vCJD 0.33
- Measles 0.25

Various societal issues have been placed in the context of ‘dread risk’ (that is, uncontrollable, involuntary, inequitable and catastrophic) and ‘unknown risk’ (that is, new, not observable, delayed and poorly understood). The public rates DNA technology and radioactive waste highly on both dread and unknown risk, whereas smoking and riding a bicycle, despite being substantially more dangerous than either of the first two examples, rate lowly⁶.

The public largely agrees that decisions about science and technology should be based primarily on the advice of experts and trust in scientists is generally favourable. However, 78% of people trust scientists who work for environmental organisations, compared with 48% and 44% who trust industry and government scientists respectively⁷.

It is wrongly perceived that scientists working for environmental organisations don’t have vested interests: they have as many vested interests as any other scientist.

A Eurobarometer survey⁸ of knowledge and enthusiasm for science showed the following:

Country	Knowledge about scientific methods	Country	Faith in science to resolve any problem
1. Sweden	70%	1. Greece	37%
2. = Denmark Netherlands	64%	2. Spain	25%
4. Finland	56%	3. Portugal	20%
12. = Greece Germany	28%	12. Finland Netherlands	8%
14. Spain	27%	14. Denmark	7%
15. Italy	24%	15. Sweden	3%
EU15 Average	37%	EU15 Average	17%

In other words, those with the most knowledge in science have least faith in it to solve any problem.

The lecture was followed by a lively session of question, comment and answer.

It was sponsored by BP, the Institute of Physics, the Royal Academy of Engineering and New Scientist .

⁴ www.pesticides.gov.uk/acp_temp/RCEP_Response_vfinal.pdf

⁵ *Health News in the Mass Media*, King’s Fund 2003

⁶ Slovic, P. (1992) ‘Perception of risk: reflections on the psychometric paradigm’ In S. Krimsky and D. Golding (Eds.), *Social theories of risk* (pp. 117-152) Westport: Praeger

⁷ MORI – UK survey, 2002

⁸ Eurobarometer 55.2, December 2001