

**Title page**

**‘The antibiotic apocalypse’ and the ‘war’ on superbugs: The risks and benefits of catastrophe discourse**

**With a reply by Richard James**

**Brigitte Nerlich (corresponding author)**

Professor Brigitte Nerlich

Institute for Science and Society

University of Nottingham

Law and Social Sciences Building,

University Park,

Nottingham NG7 2RD, United Kingdom

Phone +44 (0) 115 84 67065 Fax +44 (0) 115 846 6349

Email: [brigitte.nerlich@nottingham.ac.uk](mailto:brigitte.nerlich@nottingham.ac.uk)

**Richard James**

Professor Richard James

School of Molecular Medical Sciences

Centre for Biomolecular Sciences

University of Nottingham

University Park

Nottingham NG7 2RD, United Kingdom

Email: [richard.james@nottingham.ac.uk](mailto:richard.james@nottingham.ac.uk)

## **‘The antibiotic apocalypse’ and the ‘war’ on superbugs: The risks and benefits of catastrophe discourse**

**With a reply by Richard James**

**Abstract:** This article has two parts. Part one assesses the use of the metaphors of war and apocalypse in scientific and media discourses about the threats posed by the rise in antibiotic resistance and the increase in healthcare associated infections. It studies a corpus of articles in which the metaphor of the ‘post-antibiotic apocalypse’ was first used and points out the advantages and disadvantages of using this type of language. It advocates that microbiologists engage in dialogue with climatologists who have begun to reflect on ‘catastrophe discourse’ in their own field. The second part is devoted to a reply by a microbiologist who discusses his own reasons for using this type of language. Overall, the article wants to stimulate debate about certain types of language use when speaking about the threat posed by emergent infectious diseases.

**Key words:** antibiotic resistance, methicillin resistance

**Article summary line:** When talking to the media microbiologist tend to frame issues of antibiotic resistance and healthcare associated infections in terms of war and catastrophe, but this might not be the best way to warn the general public of the threat they pose.

**Text:**

In 1998 the sociologist Peter Weingart observed with relation to climate change that ‘catastrophe discourse’ was a tool used by scientists in order to gain public support and

public funding – an issues which has recently attracted the attention of scientists dealing with climate change (1, 2). Weingart noted that “[w]hat appears here as a recent and unique development can be demonstrated to be a recurrent pattern. In policy-relevant areas the emergence of new research fields follows the path of climate change research: In the beginning is the claim of an impending danger if not catastrophe. A small group of scientists (from different disciplines) who proclaims this danger also provides suggestions for a solution. The promise to be able to avert the threat comes with the authority of scientific expertise in a brand new research area and is tied to the condition of needed financial support.” (3)

The discourse signalling a potentially catastrophic scenario related to the emergence of antibiotic resistance and healthcare associated infections, such as MRSA, seems to follow this template. This has advantages and disadvantages that need to be explored.

### **‘Catastrophe discourse’ in microbiology**

In recent years the issues of antibiotic resistance the rise in healthcare associated infections have seldom been out of the news. Antibiotic resistance emerged almost simultaneously with the use of antibiotics, such as penicillin, after the Second World War, but only became a real problem during the 1990s. The rise in antibiotic resistance led to the emergence of so-called superbugs and the ‘war’ against microbes, which many thought had been won in the 1960s, had to start all over again. In 1998 Richard Smith warned that “[i]ncreasing resistance to antimicrobial agents is health care's version of global warming.” (4)

Early warnings about the dangers posed by a rise in antimicrobial resistance and a concomitant rise in superbugs had been issued from the mid-1990 onwards, mainly in

popular science books and articles in medical journals such as the *British Medical Journal* and *The Lancet*. Some of these warnings were framed by reference to ‘plague’, some by reference the ‘apocalypse’. In the spring of 2005 Richard James, Professor of Microbiology at the University of Nottingham, entered the apocalyptic battle ground with an article for the University of Nottingham’s *Vision* magazine entitled “Battling bacteria”, in which he talked for the first time of a ‘*post-antibiotic* apocalypse’ (5) – a novel discourse metaphor intended to change the discourse and the practices surrounding the use antibiotics and the treatment of healthcare associated infections. On 7 January 7 2006 *The Guardian* published a lengthy interview with James entitled “War on Terror” in which he outlined “his vision of an apocalypse”, followed a month later, on 1 February, by an article in the *Nottingham Evening Post* entitled “Our future at mercy of deadly superbugs”. As in 2005, competition and war-metaphors abound. James was ‘on the warpath’. His aim, it seems, was to change policy makers’ perceptions of how to deal with antibiotic resistance and superbugs and to promote new research into this issue. To achieve this aim he chose a powerful ‘discourse metaphor’ (6) which framed the issue of antibiotic resistance in a very negative ‘end of the world’ way, but he also employed a number of more commonplace war metaphors.

On 5 January 2007 the University of Nottingham opened a new *Centre for Healthcare Associated Infections* (CHAI) at the University of Nottingham (of which I am a member) and issued a press release that quotes James as saying: “Quite frankly, the impending crisis on the horizon can be called the ‘*post-antibiotic* apocalypse’.” This time in the context of the opening of a centre, a launch conference and a press conference the phrase reverberated through the regional, national and international press.

In order to study the discourse of the apocalypse relating to antibiotic resistance and superbugs 25 articles were examined. Using Lexis Nexis Professional (UK) a first

batch of articles were found using *apocalypse* and *antibiotic* as key words. Articles using these keywords appeared between 1996 and 2007, with the compound 'antibiotic apocalypse' coming onto the scene in 2005; some articles had to be discarded as they dealt with topics unrelated to the focus of this article. Another batch of articles was retrieved using a Lexis Nexis Professional version that gives access to articles published in English speaking newsoutlets world wide. This time the keywords used were *Richard James* and *Nottingham*, so as to capture the media output after the opening of the *Centre for Healthcare Associated Infections*, between January 5 and February 12. Most of the articles studied were based on interviews with Professor Richard James, with additional information gleaned from Dr Martin Westwell (Oxford) Professor Paul Williams (Nottingham) and Dr Pete Greenberg (Washington). Like many others, these three microbiologists used the language of war extensively, but only James used the phrase 'post-antibiotic apocalypse' a deliberate discursive move used to attract attention to a situation that needed urgent political attention and action. In talking about this apocalyptic scenario, James also used war metaphors which are commonplace in infectious disease discourse. However, the combination of the consciously used metaphor of the 'post-antibiotic apocalypse' and the unconsciously used war metaphors is a potent mix and might have unexpected consequences.

The following metaphors of war were used between 2005 and 2007 by scientists and journalists in relation to the announcement of a *post-antibiotic apocalypse*:

**DEALING WITH HEALTHCARE ASSOCIATED INFECTIONS IS A WAR:**

fight against healthcare associated infections

combat superbugs

fighting the 'impending crisis' of bugs like MRSA and clostridium difficile

centre dedicated to the fight against spread of infections

battle against MRSA 'apocalypse'

spearhead the fight against killer superbugs

win battle against bacteria

fight back

defeat MRSA and other superbugs

to fight killer superbugs  
fighting a losing battle

#### **DEALING WITH BACTERIA IS A RACE**

race between human beings and their microbial foes  
racing to find new ways to fight vancomycin-resistant MRSA  
arms race  
struggle to keep up

#### **BACTERIA ARE AGENTS IN A WAR**

microbes really fight back  
the battle is swinging back in favour of the bacteria  
disease-causing organisms have a range of weapons  
warfare where bacteria kill other bacteria using their own protein antibiotics  
an army going into battle [...] needs strength in numbers and good lines of  
communication so that it knows when to deploy its weapons for maximum effect  
they have a mechanism for deciding how long to wait before firing their weapons  
just waiting to bite  
we're not fighting guerrillas taking pot shots here  
this is a sophisticated army with astonishing weapons  
each time we develop something new, they develop a defence for it  
battle between antibiotics and bacteria  
another triumph for the world of germs  
amazing combination of weapons  
resistance to our major-weapon antibiotics  
camouflage themselves  
new defences against bacterial infections  
bacteria are a bit like an army going into battle  
only when they've got strength in numbers do they tell their troops to start firing  
We're not fighting guerrillas taking pot shots here. This is a sophisticated army  
with astonishing weapons. And each time we develop something new, they  
develop a defence for it.

#### **BACTERIA ARE ENEMIES/KILLERS**

single-celled foes  
microbial foes  
enemy  
dangerous enemies at large  
our deadliest enemy  
incredibly sophisticated enemy  
formidable enemy  
under attack from a far more dangerous enemy [than bird flu]  
new killer in our midst  
killer superbugs etc.

#### **SCIENTIFIC METHODS ARE WEAPONS IN A WAR**

[w]e work on biological warfare  
expert in biological warfare  
new ways to beat the bacteria at their own game  
winning the war is not always about killing the invader

preventing bacteria from mounting an attack on the body  
war on terror  
urgently find new weapons  
hunting down new antibiotics  
wipe out  
the carpet-bombing approach  
new weapons against superbugs  
new strategies to fight bugs

**SCIENCE IS A WEAPON IN THE WAR AGAINST BACTERIA**

break down the lines of communication  
intervene in the battle by blocking bacterial communication  
exploit this inter-bacterial warfare  
if we can break them up, we can kill them  
switch off the attack signals  
if bacteria start attacking the body too early when they are too few in number,  
showing their toxins to the immune system when there are only a few of them  
there, they'll get wiped out

This is a long list of metaphors of war and competition in which the bacteria are portrayed as rather clever agents whose ingenuity scientists can all but admire, albeit rather grudgingly. As one can see, one way of waging this 'war' is to develop new types of treatment, in this 'quorum sensing' – that is, the use of antibiotics to break down bacteria's 'lines of communication'. This new scientific technique is itself based on conceptualising bacteria as 'talking to each other', but a talk that is part of a 'battle'. As pointed out by James in article for the University of Nottingham's *Vision* magazine: "It's like a battlefield communication system. When bacteria like *Staphylococcus aureus* infect the body, their toxin genes are switched off under the control of the quorum sensing system. Only when there are enough bacteria to cause a serious infection do they switch on the toxin genes and go all out to attack." (7)

'War' and 'competition' metaphors have been a long-standing currency in medical discourse. From the times of Louis Pasteur onwards dealing with bacteria or germs has been framed in terms of waging war—what Montgomery (8) calls 'biomilitarism'. From the 1940s onwards when antibiotics became widely available the

use of antibiotics too was framed in terms of war against invading bacteria – they seemed to be a ‘silver’ or ‘magic’ bullet in the fight against infectious diseases. And, in a sense they were literally a weapon in a war as the first really significant antibiotic penicillin was seen as vital to the allies winning the 2<sup>nd</sup> World War. For a time they were hugely successful, to such an extent that the dominant war frame that accompanied the use of antibiotics might have obscured the exploration of and investment in other technologies, such as therapies to boost or supplement the immune system or immune.

When highlighting the diminishing powers of antibiotics in this war against bacteria the metaphor of the *apocalypse* can be useful, but it might have disadvantages too. Although it raises the profile of this problem and gets it on the public agenda, it might be counterproductive in the long term, as the apocalypse is usually seen as something that is inevitable, ‘the end of the world’ and against which one cannot do anything.

However, this is perhaps not what James and others want to imply. They stand instead in a tradition of a more secular view of the apocalypse, as popularised in various apocalypse films, which stress the importance of creative thinking in saving humanity from the impending apocalypse. Ingenuity is needed to develop new diagnostic technologies to improve and speed up the detection of pathogens, but political acceptance of the scale of the problem and then implementing the strategy that will significantly reduce the scale of the problem is also essential. By advocating a new, albeit dark, vision of future health care James wants to spur politicians into action and create expectations: expectations that scientists can do something to alleviate the problem of antibiotic resistance. This discourse is also intended to reverse older expectations, regarding for example the miracle properties of antibiotics which led to the overuse of these drugs and



expectations that increased cleanliness will ‘wipe out the bug’. Creating new expectations and reversing old ones should lead to changes in behaviour and practice.

There might be a danger though that the language used, including the salient metaphor of the apocalypse and the surrounding war metaphors, actually impede those desired behavioral changes. As Hulme has pointed out with relation to climate change and ‘catastrophe discourse’: “The language of fear and terror operates as an ever-weakening vehicle for effective communication or inducement for behavioural change. [...] Framing climate change as an issue which evokes fear and personal stress becomes a self-fulfilling prophecy. By "sexing it up" we exacerbate, through psychological amplifiers, the very risks we are trying to ward off.” (1) And: “Campaigners, media and some scientists seem to be appealing to fear in order to generate a sense of urgency. If they want to engage the public [...] this is unreliable at best and counter-productive at worst. [...] such appeals often lead to denial, paralysis, apathy or even perverse reactive behaviour.” (2)

The results achieved by early warnings framed in terms of fear might be similar to those achieved by early promises framed in terms of hope – if unfulfilled they can both lead to public cynicism, loss of trust and disengagement.

## **Conclusions**

Using the metaphor of the ‘post-antibiotic apocalypse’ when talking about the situation regarding HCAs has advantages and disadvantages. Its alarmist tone alerts politicians and funding bodies to a situation that needs urgent attention and might reverse ordinary people’s expectations regarding ‘miracle drugs’ and ‘cleanliness’. However, it might also induce fears which could stifle behavioural change. The focus on fighting a ‘war’ against

bacteria in order to avert the apocalypse might also make scientists prioritise one type of approach over others.

It might be the right time for microbiologists to talk to climatologists who have just begun to reflect on the risks and benefits of 'catastrophe discourses'. Are there better ways of warning politicians and the public about real and potential threats to health and the environment that would avoid the pitfalls of 'catastrophe discourse' highlighted in this article? This is an issue that needs urgent attention.

**Reply from Richard James:**

I plead guilty to using metaphors but offer the following mitigating circumstances.

(a) Some metaphors especially those used in newspaper headlines are inserted by the journalist and not the scientist; (b) scientists are often accused of talking to other scientists rather than having a dialogue with the public. The use of metaphors makes it easier to present complex biological systems such as why inhibition of quorum sensing in bacteria is an exciting alternative to conventional antibiotics; (c) I have studied the problems caused by antibiotic resistant superbugs for 31 years and, despite the multitude of objective scientific reports that describe the problem and the strategies needed to contain it, I still await an integrated strategy by the UK government to significantly reduce the problem of healthcare associated infections; (d) there is direct experience of a world without antibiotics since they only became available less than 70 years ago. I have a photograph that I use in my lectures on the problem of antibiotic resistance that was taken in 1932 outside Springfield House Open Air School in London that shows children sleeping out in the open in three rows of beds that stretch away into the distance. This was the treatment for TB in the age before antibiotics, fresh air!!!; (e) Politicians are faced all the time with requests from pressure groups to spend large sums of money in order to

solve a serious problem. To even get an issue onto the political agenda therefore needs considerable skills that scientists rarely if ever need for writing research grant applications in order to harness the power of the media. If that process has to include the use of metaphors that present the problem in easy to understand terms then I will play the game. It should not be forgotten that, despite the criticism of the use of war metaphors by advocates of global warming, all the political parties in the UK now accept the scale of the problem of global warming and the significant financial cost of the solutions.

A detailed analysis of the problem of hospital infections in the USA was presented in a book entitled “Unnecessary Deaths: The Human and Financial Costs of Hospital Infections 2<sup>nd</sup> edition” by Betsy McCaughey who is Chairman of the US Committee to Reduce Infection Deaths<sup>1</sup>. The essential facts quoted in the book are the estimated number of deaths from hospital infections is now 103,000 every year, which equates to the fourth largest killer in America and equals the number of deaths from AIDS, breast cancer and auto accidents combined. The estimate of \$30.5 billion in additional medical care costs does not include the additional impact on the wider economy which may be significantly larger. The really shocking claim in the book is that “nearly all these infections are preventable”. Evidence is presented in the book on the well documented strategies that are needed to reduce deaths from hospital infections.

From the UK perspective deaths from hospital acquired infections are estimated at 5,000 per year, and are increasing due to the problems caused by MRSA and *C.difficile*, whilst the additional costs to the NHS are £1 billion per year. It is widely believed by medical microbiologists that, despite the recent large increase in funding for the UK health service, the over-riding government attention on achieving targets to reduce hospital waiting lists is incompatible with the requirements for effective infection control

procedures. Compelling support for this comes in the UK Healthcare Commission Investigation into outbreaks of *Clostridium difficile* at Stoke Mandeville Hospital<sup>2</sup>.

McCaughey argues that the problem of hospital acquired infections is the next asbestos, where worker exposure to this agent eventually led to enormous legal settlements. A similar situation happened in the UK with respect to coal miners exposed to coal dust. Solicitors in the UK are now trying to use health and safety legislation to make claims against individual hospitals on behalf of patients who have been infected. It would be sad if it requires high legal payouts against single hospitals to force UK politicians to change their priorities and concentrate on the quality of the treatment outcomes rather than the number of patients who are operated upon.

Comparisons might be made between the billions of pounds made available in the last few years in the UK to improve train safety and to contain the foot and mouth outbreak when compared with the much smaller amounts that have been found for hospital acquired infections. Why is it that the tragic death of commuters in the recent UK train crashes can open the Treasury coffers whereas the death of >100 patients per week does not seem to merit such attention. Back to the war analogy, if the UK army suffered deaths at that rate in Iraq then that war would have been over sometime ago.

Perhaps I could offer a new analogy for hospital acquired infections. If we imagine that the millions of people who are treated in UK hospitals each year are the equivalent of the great herd migrations over the plains of Africa then hospital infections are the alligators waiting at the river crossing points to pick off the weak. Wildlife photographers filming the river crossing always make the point that this is nature and we should not interfere. I and others argue that we need to “interfere” and make a significant reduction in the number of deaths due to hospital acquired infections by an integrated strategy that includes (a) screening of patients for MRSA on/before hospital admission;

(b) isolation of MRSA carriers; (c) reintroducing small isolation rooms into existing hospitals; (d) better buy-in of staff for the need for improved handwashing compliance; (e) wide availability of hand wash gels that do not dry the skin; (f) a reduction in bed occupancy rates to <85%; (g) improvement in the resourcing of NHS diagnostic microbiology laboratories to allow earlier detection of infections; and (h) ring-fenced funding for a UK healthcare associated infections research programme. The latter would include funding for the development of novel antibiotics that do not kill the pathogen but disable it and thus would not be expected to select for antibiotic resistance; a laudable homage to the Gaia hypothesis.

I believe that it is now only a matter of time before politicians finally have to accept the real scale of this struggle with bacterial pathogens like MRSA and *C.difficile* that are a very significant threat to our healthcare system.

<sup>1</sup>[www.ncpa.org/pub/special/pdf/RIDBooklet\\_120605.pdf](http://www.ncpa.org/pub/special/pdf/RIDBooklet_120605.pdf)

<sup>2</sup>[www.healthcarecommission.org.uk/\\_db/\\_documents/Stoke\\_Mandeville.pdf](http://www.healthcarecommission.org.uk/_db/_documents/Stoke_Mandeville.pdf)

## **Acknowledgement**

The study was supported by a grant from the Economic and Social Research Council (RES000231306).

## **References**

1. Hulme, M. Chaotic world of climate truth. BBC News [serial online], 4 November, 2006 [cited 2007 January 21]. Available from <http://news.bbc.co.uk/1/hi/sci/tech/6115644.stm>
- (2) Hulme, M.. Newspaper scare headlines can be counter-productive. Nature 2007; 445, 818 (22 February 2007).

3. Weingart, P. Science and the media. *Research Policy* 1998; 27(8): 869-879.
4. Smith, R. Action on antimicrobial resistance: Not easy, but Europe can do it. *BMJ*. 1998; 317: 764-70.
5. James, R. (2005). Battling bacteria. *Vision Magazine* [serial online]. Spring 2005 [cited 2007 January 30]. Available from <http://research.nottingham.ac.uk/Vision/display.aspx?id=1119&pid=211>
6. Zinken, J., Hellsten, I., Nerlich, B.. Discourse metaphors. In: Frank, R., Dirven, R., Ziemke, T., and Zlatev, J. (eds.). *Body, Language and Mind*. Volume 2: Interrelations between biology, linguistics and culture. Amsterdam: John Benjamins; in press.
7. James, R. (2007). Battle of the superbugs. *Vision Magazine* [serial online]. Spring, 2007 [cited 2007 March 23]. Available from: <http://research.nottingham.ac.uk/Vision/display.aspx?pid=178>
8. Montgomery, S. C. *The Scientific Voice*. New York: The Guilford Press; 1996.

### **Biographical sketch**

#### **Brigitte Nerlich**

Professor of Science, Language, and Society at the Institute for Science and Society, University of Nottingham, UK. Research interests in cognitive linguistics, applied linguistics, science and technology studies, especially the linguistic and cultural background of public fears concerning scientific controversies and issues of health, illness and disease.

#### **Richard James**

Professor of Microbiology, University of Nottingham, UK; Head of School of Molecular Medical Sciences in QMC; Director of the Centre for Biomolecular Sciences and the

Centre for Healthcare Associated Infections, Research on protein antibiotics; developing novel antimicrobials active against MRSA and a rapid, economical diagnostic test for identification of MRSA and detection of antibiotic resistance and virulence genes.