Curriculum vitae

**David Martin Livermore**

**Personal details**

***Sex*** Male ***Nationality:*** British

***Marital status****:* Married ***Date of birth:*** 11 June 1958

**Addresses**

***Professional***Norwich Medical School, University of East Anglia, Norwich, NR4 7TJ

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**Qualifications**

**1978** BSc, (1st. Class Hons) Microbiology, Heriot-Watt University, Edinburgh.

**1983** PhD, Medical Microbiology, University of London. Thesis: **Resistance mechanisms of *Pseudomonas aeruginosa* to -lactam antibiotics**

**2003** State-Registered Clinical Scientist, Health Professions Council (CS1358)

**Employment**

**10/2011-date Professor of Medical Microbiology,** University of East Anglia (primary employer, 70% time, with 30% of this subcontracted to Public Health England)

 **Consultant on Antibiotic Resistance – advisory work for numerous diagnostic and pharmaceutical companies and potential investors**

(6/11-6/13 **Visiting Professor,** King Saud University, Riyadh, Saudi Arabia)

**9/1998-10/2018 Public Health England (formerly HPA), Microbiology Services**

9/11-6/18 Lead on Antibiotic Resistance (time sub-contracted from UEA)

 9/98-9/11 Director, Antibiotic Resistance Monitoring & Reference Laboratory, Colindale

 9/97-9/98 Head, Antibiotic Reference Unit, Colindale

**6/1980 to 8/1997 Department of Medical Microbiology, London Hospital Medical College**

 6/80-11/83 Research Assistant

 11/83-2/87 Postdoctoral Fellow (Wellcome Trust)

 11/85-5/86 Secondment, Lecturer, University of Hong Kong

 2/87-12/94 Lecturer in Medical Microbiology

 12/94-8/97 Senior Lecturer in Medical Microbiology

 9/97-9/00 Hon Senior Lecturer

**9/1978 to 6/1980 QC Microbiology Devt, Wellcome Foundation, Dartford, Kent.**

**Personal achievements**

I have worked on antibiotic resistance since starting my PhD in 1980, publishing over 400 papers, lecturing in the UK and worldwide, serving as an editor or board member on major antibiotic journals and as a Council and Working Party member for the British Society of Antimicrobial Chemotherapy as well as on various government committees.

My early research centred on β-lactamases and I showed how an apparently weak activity could protect a bacterium if the enzyme had high affinity and the β-lactam permeated only slowly. This led to showing that models supposedly describing the interplay of β-lactamase and permeability were adequate for *Escherichia coli* but not for *Pseudomonas aeruginosa*, and I contributed to work revealing that this inadequacy was because *P. aeruginosa* also effluxes β-lactams. My other early work explored the induction of AmpC -lactamases and the selection of AmpC-derepressed mutants from AmpC-inducible populations of *Enterobacter* and *P. aeruginosa*, showing selection to be the more important factor. I have been responsible for describing and investigating the properties of many new β-lactamases, showing that extended-spectrum activity can evolve by mutation in Class D as well as Class A enzymes and, latterly contributing to the discover of the NDM carbapenemases, which was much in the news during the summer of 2010.

After joining the HPA I became increasingly involved in investigating the epidemiology as well as investigating its molecular basis. I led to groups that demonstrated the dramatic rises in MRSA prevalence in the late 1990, the rise of ciprofloxacin-resistant gonococci around 2002-3, the rises in carbapenemase-producing *Acinetobacter* spp. and community *E. coli* with CTX-M cephalosporins from around 2003 and the recent rise in carbapenemases, partly linked to the repeated import of strains with NDM-1 enzyme via patients previously hospitalised on the Indian subcontinent.

In my ongoing role at PHE, in time seconded from UEA I have led work (i) evaluating new diazabicyclooctane -lactamase inhibitors, with several paper published in 2015-16 (below) and (ii) have shown a rising public health issue with multiresistant non-vaccine lineages of pneumococci, particularly serotype 15A, with a major paper now under review.

**Achievements at UEA**

Jointly with colleagues John Wain and Justin O’Grady, I have initiated work on the rapid detection of pathogens and their resistance directly in clinical specimens without the need for culture. The rationale is that such data will lead to earlier refinement of the patient's therapy, benefitting both the individual patient and, through better antibiotic stewardship, society as a wrong. This latter aspect is critical given the proliferation of resistance coupled with the widely-reported slowing of antibiotic development.

During 2015-16 some of this work as started to come to fruition. Firstly, research by my PhD student (Katarzyna Schmidt, anticipated to complete in late 2016/early 2017) has shown that pathogenic bacteria and their acquired resistance genes can be sequenced directly from infected urine, This was presented at the 2015 ICAAC meeting, with press releases by the American Society for Microbiology and UEA, and a major paper is now submitted for publication. Secondly, along with UEA colleagues and those at University College London and University College Hospital, London, I have obtained a major NIHR Programme Grant to examine the performance, cost benefit and acceptability of rapid pathogen-profiling systems for hospital and ventilator associated pneumonia. In the first phase three such systems will be compared for agreement to conventional methodology; in the second, the best of these will be taken into a diagnostic trial comparing patient outcome is diagnostic-guided treatment vs conventional empirical therapy.

**Grants & Contracts**

Programmes on which I am, or have been a grantee or co-grantee are tabulated below. I also negotiate £200,000-£250,000 p.a. of funding from pharmaceutical company to fund evaluations of new antibiotics against multi-resistant bacteria. This work is undertaken at the PHE, since they have the necessary collections of strains.

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| --- | --- | --- | --- |
| **Project** | **Funder** | **Period** | **Value £ , 000** |
| British Soc. for Antimicrobial Chemotherapy bacteraemia surveillance\*! PI, **PHE based;**  | BSAC | 2001 to date | £110-200 p.a. |
| British Society for Antimicrobial Chemotherapy, Respiratory Surveillance, PI **PHE based** | BSAC | 2013-date | £150-200 |
| Studies on multi-resistant gram-negative bacteria\*! | Wyeth | 2002-4 | 40 |
| Mutational resistance to glycopeptides and oxazolidinones in staphylococci\*! | Pfizer | 2003-6 | 84 |
| Does hypermutability underlie the rapid clinical emergence of resistant mutant types that are vanishingly rare *in vitro*?!  | DoH | 2003-6 | 178 |
| Antimicrobial Resistance and Prescribing (AmRAP): Sentinel Surveillance using spotter practices – a feasibility study, **Hayward *et al.* (UCL)** | DoH | 2003-6 | 182 |
| Routine National Surveillance of Antibiotic Prescribing for Common Infections using the General Practice Research Database and PACT Data, **Hayward *et al.* (UCL)** | DoH | 2003-6 | 166 |
| Cost-effective surveillance for hospital antibiotic resistance **Howard *et al.,* (PHLS Wales)** | DoH | 2003-6 | 385 |
| Mechanisms involved in maintenance of antibiotic resistance, Hall, Livermore **(St Barts & Royal London SMB)** | DoH | 2003-6 | 204 |
| Hypermutability in *S. pneumoniae* antibiotic resistance, Hall, Livermore **(St Barts & Royal London SMB)** | London Hospital | 2002-5 | 60 |
| Molecular & biochemical investigation of carbapenem-resistant isolates of *Acinetobacter baumannii\**! | AstraZeneca (PhD ) | 2002-5 | 71 |
| COBRA – Combating Antibiotic Resistance\* | EU/FP6 | 2004-7 | 75  |
| BSAC- Reverse line blots PCR for identifying ESBLs **(with Peter Hawkey, U of Birmingham)** | BSAC | 2004-5 | 40,000 |
| Strain epidemiology and pathogenicity of CTX-M β-lactamase producing *E. coli\**! | AstraZeneca (PhD) | 2004-7 | 90 |
| Interplay of impermeability with AmpC & extended-spectrum -lactamases in carbapenem resistance\*! | Merck & Co | 2006-7 | 107 |
| Outcome analysis for infections due to carbapenem-resistant *Acinetobacter* spp.\*! | Dept of Health | 2006-8 | 45 |
| Mechanisms of tigecycline resistance in the Enterobacteriaceae and Acinetobacter spp.\* | Wyeth (PhD studentship) | 2007-10 | 149 |
| Translational research on combating antibiotic resistance (TROCAR)\* | EU FP7 | 2009-12 | 207 Euro |
| Clinical outcomes of EMRSA bacteraemia treated with vancomycin in relation to vancomycin MICs\*!  | Novartis | 2009-11 | 125 |
| Extra-intestinal pathogenic *Escherichia coli* causing bacteraemia in the United Kingdom: population biology and genome sequences\* **Programme lead, Neil Woodford, PHE. (PHE based)** | PHE (competitive) | 2011-4 | 626 |
| The role of international clonal lineages of Pseudomonas aeruginosa in the emergence of metallo-carbapenemases in the UK (PhD studentship)\* **Programme lead, Neil Woodford, PHE; I am co-supervisor and student is registered at UEA** | PHE (competitive) | 2011-4 | 90 |
| Defining community reservoirs of high-risk clones and high-risk plasmids for the spread of ESBL-producing *E. coli* in the UK\* **Programme lead, Neil Woodford, PHE. This is a multi-centric study with work at UEA/NNUH** | DoH | 2012-4 | 500 |
| Next-generation-sequencing-based diagnosis of sepsis directly from blood (SepsiSeq) – a feasibility study PI – Justin O’Grady | UEA-Med | 2013 | 50 |
| The Efficacy and Mechanism Evaluation of Treating Idiopathic Pulmonary fibrosis with the Addition of Co-trimoxazole (EME-TIPAC) Co-investigator: PI – Andrew Wilson, UEA | NIHR-EME | 2015-19 |  |
| Development, evaluation and implementation of molecular diagnostics for hospital-acquired and ventilator-associated pneumonia in diverse UK hospital settings. Joint PI with Vanya Gant, UCLH | NIHR-PGfAR | 2015-20 | 2493 |
|  A Point of Care Antimicrobial Resistance test for *Neisseria gonorrhoeae* and *Mycoplasma genitalium* infection. Ensuring accurate therapy and antibiotic stewardship in sexual health medicine i4i **Consultant.** **PI Sayed Tariq, SGUL** | NIHR- i4i | 2015-18 | 1324 |
| Gram-negative bacteria: outer membrane biogenesis, drug resistance and the development of novel antibiotics. **Co-applicant,** **PI C Dong** | MRC UK China Newton fund | Bid made outcome pending |  |

**Teaching, Research Supervision and Research Assessment**

I have supervised or co-supervised 12 PhD and MD candidates to completion, with 3 ongoing:

**Youjun Yang,** Chromosomal -lactamase expression & antibiotic resistance in Enterobacteriaceae, *University of London* 1990.

**Paul Majcherczyk**, The post-antibiotic effects of carbapenems, *University of London* 1993.

**Franck Danel,** Studies on extended-spectrum -lactamases in *Pseudomonas aeruginosa* isolates collected in Turkey, *University of London* 1997.

**Mei Yuan,** Extended-spectrum -lactamases in klebsiellae collected in European ICUs. *University of London* 1999.

**Jenny Child**, A study of -lactamase-mediated antibiotic resistance in clinical isolates of *Escherichia coli* originating from Punjab, India, *University of London* 2001 (MD – I acted as ‘London Supervisors’).

**Gioia Babini,** Prevalence and epidemiology of -lactam resistant klebsiellae in European ICUs, *University of London* 2001.

**Vikki Enne,** Sulphonamide resistance & its relationship to sulphonamide use. *University of London,* 2002.

**Mariya Afzal-Shah,** Resistance to carbapenems & other antimicrobials in *Acinetobacter* spp. *University of London*, 2002.

**Juliana Coelho,** Molecular and biochemical investigation of carbapenem-resistant isolates of *Acinetobacter baumannii*. Open University 2005.

**Sarah North,** Mutational resistance to linezolid and other anti-gram-positive antibiotics in staphylococci. Open University, 2006.

**Edi Karisik,** The emergence of *Escherichia coli* with CTX-M extended-spectrum -lactamases in the United Kingdom. Open University, 2007.

**Stephanie Henderson-Begg,** Hypermutability and gene exchange in multi-resistant pneumococci- external. University London, 2007.

**Michael Hornsey.** Mechanisms of tigecycline resistance in the Enterobacteriaceae and *Acinetobacter* spp. Open University, 2010

**Hiran Dhanji.** Epidemiological and molecular studies on ESBL producing *Escherichia coli* from the community. *Open University,* 2010.

**Paolo Benedetti,** Resistance patterns in relation to prescribing in Italian intensive care units –external, University of London, 2012.

**Laura Wright,** Carbapenemase producing clones of *P. aeruginosa* in the UK. PHE-funded UEA registered, based at PHE, commenced 2012; awarded 2016 (Co-supervisor).

**AnnaPaula Corriea**, Gene expression in P. aeruginosa biofilms. UEA-funded and based at UEA, awarded 2016 (Co-supervisor).

**Katarzyna Schmidt,** Rapid detection of pathogens and resistance in urinary tract infections. UEA-funded and based at UEA, awarded 2017 (Primary supervisor).

At the then London Hospital Medical College, I was much involved with teaching on the Department's MSc course in Clinical Microbiology, being responsible for lectures, practical and assessments for components on antibiotics, resistance, and basic cell structure/metabolism. I was also responsible for intensive courses in Medical Microbiology for BSc students from Queen Mary Westfield College, with which the LHMC became affiliated. I supervised many research projects by the MSc students. I continue to lecture widely at taught courses, including to clinical microbiology MSc students at Barts & the Royal London School of Medicine, to Infection Pharmacy MSc students at Imperial College and to BSc Biochemistry Students at the University of Cambridge.

I have undertaken teaching visits of 1 week to 1 month to the Institute of Pharmacology, Beijing (1984), Institute of Antibiotics, Shanghai (1997), Hacettepe University, Ankara (1992) and the university of the West indies (2001, 2005 and 2010) as well as teaching on methods of investigating resistance at courses run by the British Society for Antimicrobial Chemotherapy and the European society for Clinical Microbiology and Infectious Disease.

I have undertaken research laboratory assessment visits for the Taiwan National Institute of Health Research (2008) and the Singapore Department of Health (2009).

I have acted as examiner on several PhD and MSc thesis, including in 2016 for University of the West of England.

**Editorships & Editorial Boards**

1987-90 Assistant Editor, *Journal of Antimicrobial Chemotherapy*

1987-91 Editorial Board, *European Journal of Clinical Microbiology*

1991-2003 Editor, *Journal of Medical Microbiology.*

1992-95Editorial Board, *Journal of Antimicrobial Chemotherapy*

1996-date Editorial Board, *Antimicrobial Agents and Chemotherapy*

2001-dateInt’l Advisory Board, *Journal of Microbiology, Immunology & Infection*

2002-2016 Editor, *International Journal of Antimicrobial Agents*

2011-date Editorial Board, *Korean Journal of Internal Medicine*

Referrals also for *Journal of Antimicrobial Chemotherapy, Journal of Hospital Infection* and occasionallyfor others including the *Lancet and Journal of Infectious Diseases*

**Contribution to Committees, Societies, Guideline Groups *etc***

1997 - 98 Standing Medical Advisory Committee: Subgroup on Antibiotic Resistant Bacteria (Co -Secretary). Produced report *‘The Path of Least Resistance’*, (Department of Health), Sept, 1998

1997 - 00 Council: British Society for Antimicrobial Chemotherapy (BSAC).

1997 - date BSAC Working Party on Surveillance of Antibiotic Resistance.

1997 - date BSAC, Working Party on Susceptibility Testing. Co-edited Supplement on Susceptibility Testing (*J. Antimicrob Chemother* 2001, **48** Suppl S1).

1998-2002 PHLS/BSAC Co-ordinating Group on Surveillance of Antibiotic Resistance

1999-2002 UK Inter-Departmental Steering Group on ‘Resistance to Antibiotics and Other Antimicrobial Agents’, disbanded following institution of SACAR (below).

1999 –date Advisory Board of Asia-Pacific Research Foundation on Infectious Diseases

1999-date Organising committee of International Symposium on Antimicrobial Agents and Resistance (ISAAR)

2000-7 UK Government Specialist Advisory Committee on Antibiotic Resistance (SACAR)

2001-2 Scientific Committee of 4th European Congress of Chemotherapy (Paris, May 2002).

2004-5 Scientific Committee of 7th European Congress of Chemotherapy (Florence, October 2005).

2003-4 European Commission Working Group on Antibiotic Resistance Genes in genetically modified organisms

2004-7 National Steering on Healthcare Associated Infection

2005-6 Joint British Society for Antimicrobial Chemotherapy/Hospital Infection Society working group on extended-spectrum -lactamases

2007-13 Advisor to Govt’s Antibiotic Resistance & Healthcare Associated Infection (ARHAI) committee on new resistance development / horizon scanning

2008-10 European Committee on Antimicrobial Susceptibility Testing expert rules sub-group.

2009-10 British Society for Antimicrobial Susceptibility Testing working party on the Urgent Need for New Antibiotics

2010-date DEFRA Antibiotic Resistance Co-ordinating group (DARC)

2011-date Joint British Society for Antimicrobial Chemotherapy / British Infection Association / Infection Prevention Society Working Party on multiresistant pathogens. Guidelines being written: two major document, one on therapy and one of infection control anticipated.

2011-14 European Conference Infections in Leukaemia (ECIL) guidelines group on antimicrobial resistance- Outputs, 3 guideline and one review papers, see refs 416-9 below.

2012-2015 Advisory Board for British Society for Chemotherapy Antibiotic Action Initiative

2012-14 Society for General Microbiology Expert Panel on Sexually Transmitted Infections. Policy document published: http://www.sgm.ac.uk/en/publications/policy-docs.cfm/publication/2013-sexually-transmitted-infections

2013 CMO’s working group on genomics (Science Group). Policy output document available via https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/210829/CMO\_Science\_priorities\_letter\_with\_annexes.pdf

2013-date Full Member: UK Govt’s Antibiotic Resistance & Healthcare Associated Infection (ARHAI) committee

2012-13 Public Health England Guideline group on carbapenem-resistant resistant Enterobacteriaceae. ‘Toolkit’ published http://www.hpa.org.uk/Publications/InfectiousDiseases/AntimicrobialAndHealthcareAssociatedInfections/1312Toolkitforcarbapenementero/

2013-2015 DoH Group for inclusion of antimicrobial resistance on National Risk Register

2014-date PHE Gonococcal Resistance to Antibiotics Surveillance Programme; Steer Group Chairman.

2014-2015 ARHAI sub-group on exceedance data to detect outbreaks/clusters (Chair)

2015-date DoH Antimicrobial Resistance Diagnostics Sub-Group

2016 ARHAI Quality Measures sub-group on gram-negative hospital-acquired bloodstream infections

**Contribution to Scientific Meetings**

I have spoken widely on my research and resistance in general at many international congresses. I enjoy public speaking and conveying messages to audiences with more and less background knowledge.

In every year since 1987 I have presented at the American Society for Microbiology’s Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC), widely agreed to be the premier international meeting on antibiotics and resistance. I have been a congress-invited speaker or session chairman for ICAAC on many occasions, including in 2003, 2004, 2009, 2010, 2012, 2014 and 2015. In 2011 I gave a keynote address to ICAAC.

 Likewise I have presented at virtually every European Congress on Clinical Microbiology and Infectious Disease (ECCMID) since 1985, often as a congress-invited speaker, including in 2010 and 2011. I gave a plenary ECCMID lecture as early as 1987 and, in 2010, was the Opponent in key congress debates in 2010 and 2015. I have also been an invited speaker many other international congresses, including International Congresses of Chemotherapy in 1997, 1999 2009 and 2013; European Congress of Chemotherapy in 1987, 1998 and 2005.

**Contribution to Treatment Guidelines**

From 2011-15 I contributed heavily to national guidelines on management of infections due to multiresistant gram-negative pathogens; the first part of these, on infection control (ref 436 below), has now been published with the second part, on therapy, in final draft.

**Publications**

1. Livermore DM, Williams RJ, Williams JD. Comparison of the -lactamase stability and in-vitro activity of cefoperazone, cefotaxime, cefsulodin, ceftazidime, moxalactam and ceftriaxone against *Pseudomonas aeruginosa. J Antimicrob Chemother* 1981; **8:**323-31
2. Livermore DM, Williams RJ, Williams JD. In-vitro activity of ceftazidime against *Pseudomonas aeruginosa* and its stability to pseudomonal -lactamases. *J Antimicrob Chemother* 1981; **8 Suppl B:** 163-7.
3. Livermore DM, Williams RJ, Williams JD. In-vitro activity of MK-0787 (N-formimidoyl thienamycin) against *Pseudomonas aeruginosa* and other Gram-negative rods and its stability to their -lactamases. *J Antimicrob Chemother* 1981; **8:** 355-62.
4. Livermore DM, Williams JD. In-vitro activity of a monobactam, Squibb 26776 against Gram-negative bacteria and its stability to their -lactamases. *J Antimicrob Chemother* 1981; **8 Suppl E,** 29-37.
5. Livermore DM, Williams RJ, Lindridge MA, Slack RCB, Williams JD. *Pseudomonas aeruginosa* isolates with modified chromosomal -lactamase inducibility: effects on -lactam sensitivity. *Lancet* **I;** 1982**:**1466-7.
6. Livermore DM. -Lactamases of *Pseudomonas aeruginosa*. *J Antimicrob Chemother* 1982; **10:** 168-171.
7. Livermore DM. Kinetics and significance of the activity of Sabath and Abrahams’ -lactamase of *Pseudomonas aeruginosa* against cefotaxime and cefsulodin. *J Antimicrob Chemother* 1983; **11:** 169-79.
8. Jacobs JY, Livermore DM, Davy, KWM. Role of *Pseudomonas aeruginosa* -lactamase as a defence against azlocillin, mezlocillin and piperacillin. *J Antimicrob Chemother* 1984; **14:** 221-9.
9. Livermore DM. Penicillin-binding proteins, porins and outer membrane permeability of carbenicillin-resistant and -susceptible *Pseudomonas aeruginosa. J Med Microbiol.* 1984; **18:**261-270.
10. Williams RJ, Livermore DM, Lindridge MA, Said AA, Williams JD. Mechanisms of –lactam resistance in British isolates of *Pseudomonas aeruginosa. J Med Microbiol.* 1984; **17:**283-293.
11. Williams RJ, Lindridge MA, Said AA, Livermore DM, Williams JD. National survey of antibiotic resistance in *Pseudomonas aeruginosa*. *J Antimicrob Chemother* 1984; **14:** 9-16.
12. Livermore DM, Maskell JP, Williams JD. Detection of PSE-2 -lactamase in enterobacteria. *Antimicrob Agents Chemother,* 1984; **25:** 268-272.
13. Livermore DM. Do -lactamases “trap” cephalosporins? *J Antimicrob Chemother* 1985; **15:** 511-4.
14. Ng WS, Chau PY, Leung YK, Livermore DM. In-vitro activities of Ro 17-2301 and aztreonam compared with those of other new -lactam antibiotics against clinical isolates of *Pseudomonas aeruginosa*. *Antimicrob Agents Chemother* 1985; **27:** 872-73.
15. Livermore DM, Pitt TL, Jones CS, Crees-Morris JA, Williams RJ. PSE-4 -lactamase: a serotype specific enzyme in *Pseudomonas aeruginosa. J Med Microbiol* 1985; **19:** 45-53.
16. Livermore DM, Williams JD, Davy, KWM. Cephalosporin resistance in *Pseudomonas aeruginosa*, with special reference to the proposed trapping of antibiotics by -lactamase. *Chemioterapia* 1984; **4:** 28-35.
17. Livermore DM. Class I -lactamase expression in *Pseudomonas aeruginosa* and cephalosporin resistance. *Lancet* 1986; **i:** 450.
18. Livermore DM, Jones CS. NPS-1: a novel plasmid-mediated -lactamase from two isolates of *Pseudomonas aeruginosa*. *Antimicrob Agents Chemother* 1986; **28:**99-103.
19. Livermore DM, Moosdeen F, Lindridge MA, Kho P, Williams JD. Behaviour of TEM-1 -lactamase as a resistance mechanism to mezlocillin, ampicillin and azlocillin in *Escherichia coli.* *J Antimicrob Chemother* 1986; **17:**139-46.
20. Livermore DM, Riddle SJ, Davy, KWM. Hydrolytic model for cefotaxime and ceftriaxone resistance in -lactamase derepressed *Enterobacter cloacae. J Infect Dis* 1986. **153:** 619-622.
21. Livermore DM, Pitt TL. Dissociation of surface properties and “intrinsic resistance” in *Pseudomonas aeruginosa. J Med Microbiol* 1986; **22:**217-24.
22. Williams RJ, Yang Y-J, Livermore DM. Mechanisms by which imipenem may overcome resistance in Gram-negative bacilli. *J Antimicrob Chemother* 1986; **18 Suppl E:** 9-14.
23. Livermore DM, Yang Y-J. -Lactamase lability and inducer power of newer -lactams in relation to their activity against -lactamase inducibility mutants of *Pseudomonas aeruginosa. J Infect Dis* 1987; **155:** 775-82.
24. Livermore DM. Radio-labelling of penicillin-binding proteins (PBPs) in intact *Pseudomonas aeruginosa* cells: consequences of -lactamase activity by PBP-5. *J Antimicrob Chemother* 1987; **19:** 733-42.
25. Livermore DM. “Covalent trapping” and latamoxef resistance in -lactamase-derepressed *Pseudomonas aeruginosa. J Antimicrob Chemother* 1987; **20:** 7-13.
26. Said AA, Livermore DM, Williams RJ. Expression of H1 outer membrane protein of *Pseudomonas aeruginosa* in relation to sensitivity to EDTA and polymyxin B.  *J Med Microbiol* 1987; **24:** 267-74.
27. Livermore DM. Clinical significance of -lactamase induction and stable derepression in Gram-negative rods. *Eur J Clin Microbiol* 1987; **6:** 439-45.
28. Livermore DM, Chau PY, Wong AJW, Leung YK. -Lactamase of *Pseudomonas pseudomallei* and its contribution to antibiotic resistance. *J Antimicrob Chemother* 1987; **20:** 313-21.
29. Livermore DM. Mechanisms of resistance to cephalosporin antibiotics. *Drugs* 1987; **34 Suppl 2:** 64-88.
30. Yang Y-J, Livermore DM, Williams RJ. Chromosomal -lactamase expression and antibiotic resistance in *Enterobacter cloacae*.  *J Med Microbiol* 1988; **25:** 227-33.
31. Livermore DM. 1988. Chromosomal -lactamase induction and stable derepression in relation to antibiotic resistance in Gram-negative bacteria. In *-Lactamases: Current Perspectives.* p 13-29. Livermore DM (Ed). Theracom Press, Winchester.
32. Powell M, Livermore DM. Mechanisms of chloramphenicol resistance in *Haemophilus influenzae* in the United Kingdom.  *J Med Microbiol* 1988; **27:** 89-93.
33. Livermore DM. Permeation of -lactam antibiotics into *Escherichia coli, Pseudomonas aeruginosa* and other Gram-negative bacteria. *Rev Infect Dis* 1988; **10:** 691-8.
34. Yang Y, Livermore DM. Activity of temocillin and other penicillins against -lactamase inducible and -stably derepressed enterobacteria. *J Antimicrob Chemother* 1988; **22:** 299-306.
35. Yang Y, Livermore DM. Chromosomal -lactamase expression and resistance to -lactam antibiotics in *Proteus vulgaris* and *Morganella morganii*. *Antimicrob Agents Chemother*1988; **32:** 1385-91.
36. Yang Y, Jacoby GA, Livermore DM. LXA-1, a new plasmid mediated -lactamase giving low-level resistance. *FEMS Microbiol Lett* 1988; **52:** 97-102.
37. Yang Y, Livermore DM. Interactions of FCE22101 with Class I -lactamases. *J Antimicrob Chemother* 1989; **23 Suppl C:** 85-94.
38. Said AA, Livermore DM. In-vitro interactions of FCE22101 with aminoglycosides against Gram-negative rods. *J Antimicrob Chemother* 1989; **23 Suppl C:** 103-8.
39. Livermore DM. Trapping and hydrolysis of latamoxef by -lactamase from *Pseudomonas aeruginosa*. *J Antimicrob Chemother* 1989; **24:** 819-21.
40. Yang Y, Livermore DM. Interactions of meropenem with Class I -lactamases. *J Antimicrob Chemother* 1989; **24 Suppl A:** 207-17.
41. Livermore DM, Yang YJ. Comparative activity of meropenem against *Pseudomonas aeruginosa* strains with well characterised resistance mechanisms. *J Antimicrob Chemother* 1989; **24 Suppl A:** 149-59.
42. Livermore DM, Akova M, Wu P-J, Yang Y. Clavulanate and -lactamase induction. *J Antimicrob Chemother* 1989; **24 Suppl B:** 23-33.
43. Powell M, Davy KWM, Livermore DM. Reaction products of chloramphenicol acetyltransferases from enterobacteria and *Haemophilus influenzae*. *J Antimicrob Chemother* 1989; **24:** 897-903.
44. Livermore DM 1989. Role of -lactamase and impermeability in the resistance of *Pseudomonas aeruginosa*. In *Pseudomonas aeruginosa Infection*. p 257-63. Hoiby N, Pedersen SS, Shand GH *et al.* (Eds) Karger, Basel.
45. Wu P-J, Livermore DM. Response of chemostat cultures of *Pseudomonas aeruginosa* to carbapenems and other -lactams. *J Antimicrob Chemother* 1990; **25:** 891-902.
46. Akova M, Yang Y, Livermore DM. Interactions of tazobactam and clavulanate with inducibly and constitutively-expressed Class I -lactamases. *J Antimicrob Chemother* 1990; **25:** 199-208.
47. Yang Y, Wu P-J, Livermore DM. Biochemical characterization of a -lactamase hydrolysing penems and carbapenems from two *Serratia marcescens* isolates. *Antimicrob Agents Chemother* 1990; **34:** 755-8.
48. Powell M, Livermore DM. Selection and transformation of non--lactamase-mediated insusceptibility to -lactams in *Haemophilus influenzae:* lack of cross-resistance between carbapenems and other agents. *J Antimicrob Chemother* 1990; **26:**741-8.
49. Daikos GL, Jackson GG, Lolans VT, Livermore DM. Adaptive resistance to aminoglycoside antibiotics from first-exposure down-regulation. *J Infect Dis* 1990; **162:** 414-20.
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