

From: edo_mcgowan@hotmail.com
To: thomas.dana@epamail.epa.gov
Subject: RE: Response to email of 9/20/09; CMS (AX-09-001-4162)
Date: Tue, 20 Oct 2009 21:49:42 +0000

Dr. Thomas, thank you for opening up communication, but I think you or your agency misconstrue my concerns. My main concern is the lack of standards in this area of wastewater treatment dealing with antibiotic resistant microbes and the materials that foster resistance or virulence transfer. This is a long standing failing on the part of EPA that warrants critical review and an explanation to the American public. Certainly the Agency has been aware that sewer plants generate resistance and the discharge from sewer plants sees the resistant microbes spread into the environment. In the 1982 EPA paper [<http://aem.asm.org/cgi/reprint/43/2/371.pdf>], the author notes:

It is evident from this work as well as the work of others (10,13-15,29) that antibiotic resistant coliforms are entering the aquatic environment via treated municipal wastewater effluence. When bacteria which carry transmissible R-factors (R+ bacteria) (R=resistance) are ingested by a human host, the R-factors may transfer into commonly occurring bacteria of the gastrointestinal tract (32).

Since then, others have noted that sewer plants are generators of resistance and also (Pruden) antibiotic resistant genes (ARGs) that are not easily stopped by typical filters utilized in the wastewater industry or for that matter the drinking water industry. The ARGs are also essentially unaffected by chlorine. Thus the question to EPA, where are the standards dealing with this, what new engineering designs are coming on line to deal with the release of these resistant microbes and the materials that foster resistance. In other words, please direct me to such standards and papers produced by EPA that discuss this issue----what designs and papers/reports discuss such since the publication of the Meckes paper in 1982? I am challenging the agency to show some progress---I would like specific answers. I fear that bailout moneys for infrastructure improvement will again see the misuse of funding for expansion rather than the needs of the Clean Water Act---a reenactment of the squandering of Title II grant moneys that Congress so often commented upon in the 1970s. Using existing designs to merely expand treatment capacity does nothing to correct the problem of spreading resistance.

Meckes, thus continues making this far-reaching statement --- These organisms may subsequently transfer this resistance to pathogenic organisms, resulting in reduced efficacy of antimicrobial chemotherapy in the event of an infection. In vivo studies have shown that when individuals carrying R+ bacteria are subjected to antibiotic therapy, these organisms flourish and transfer their resistance to other bacteria (25).

Next, how does one deal with the lack of information within non-federal agencies that are entrusted with protecting the public health--where is the EPA guidance to these agencies. Because his paper was generally sequestered by EPA, other regulatory agencies at the state and local level would be deprived of these key findings. If I am wrong here and there has been an active discussion between federal agencies and state-local agencies on the production of antibiotic resistance by sewage treatment, then please demonstrate the level of effort and please indicate where the state-local agencies have been trained in these areas by EPA. Absent this critical information the, non-federal regulatory community assume that that if EPA has no information, they also have no information, hence these non-federal agencies fail to appreciate the situation. As an example, the state of California's various regulatory agencies were queried on this subject and each merely punted the issue back to EPA which saw a dead end. Thus approximately three decades would pass before the issue of antibiotic resistance and sewage reached sufficient attention within the public, mainly through the lay press, to bring the topic forward. The lay press, however would not likely discuss the more complex issue of genetic transfer of sewage generated antibiotic resistance into the gut flora. Thus by the removal of Meckes paper from its websites and data bases, the agency was able to carry out a subterfuge.

Maria Sjölund, [1] writing in CDC's journal, *EID (2005)* makes similar findings to Meckes above in noting that, through genetic exchange within the gut flora, higher level pathogens could be generated, see:

[PMID: 16229767 EID. 2005 Sep;11(9):1389-93]. She points out that once the genetic information has been accepted by the local flora, it may persist for years. Additionally, she notes --- Stably resistant populations increase the risk for treatment failure. Second, resistance in the normal micro-biota might contribute to increased resistance in higher-grade pathogens by interspecies genetic transfer. Since the population size of the normal micro-biota is large, multiple and different resistant variants can develop, which increases the risk for spread to populations of pathogens. Persisting populations of resistant micro-biota further enhance transfer risk, especially if the selecting agent is used for treatment. Third, anti-microbial drugs may affect the stability of residential populations. Whether a resistant population persists is mostly determined by the fitness and transmission costs of resistance (19,20). Most resistance involves a cost (21-24), but resistance may occur without deductible cost (25).

Now, for a moment, allow us to return to the 1982 Meckes paper --- Several researchers have pointed out that waste water, treated or untreated, is a primary contributor of bacteria to the aquatic ecosystem (12,16,17,20,27,29). Studies have been conducted which demonstrate that significant numbers of multi-drug-resistant coliforms occur in rivers (17), bays (9), bathing beaches (28) and coastal canals (13). Waters contaminated by bacteria capable of transferring drug resistance are of great concern since there is the potential for transfer of antibiotic resistance to a pathogenic species. Available information documents that conventional wastewater purification methods without disinfection are not adequate for removal of antibiotic-resistant bacteria (14,15,29). Wastewater disinfection is, therefore, the only means whereby communities can limit the number of antibiotic-resistant bacteria in the water environment since it seems unlikely that antibiotic chemotherapy will be reduced.

Knowing this and the above since 1982, please demonstrate where the EPA is now in the development of programs to quell these adverse public health issues. Again, it would be helpful to receive specifics on this so one can track progress on the topic since 1982. Thus where are the standards and guidelines for those operating and/or building wastewater treatment plants that would enable them to use the Meckes findings to accomplish their mandates as protectors of public health?

With all due respect to your agency,

Dr Edo McGowan

> Subject: Response to email of 9/20/09; CMS (AX-09-001-4162)
> To: edo_mcgowan@hotmail.com
> From: Thomas.Dana@epamail.epa.gov
> Date: Tue, 20 Oct 2009 16:13:14 -0400

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> Dear Edo McGowan,

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> Thank you for your email dated September 20, 2009; it has been forward to me for a response. In this
> letter, you are bringing to EPA's attention your concern about the potential for disseminating antibiotic
> resistance (AR) and virulence to terrestrial and aquatic environments via land-applied biosolids. As I
> understand, your specific interest is in the potential for spread of AR to human microbiota, with
> potentially negative impact on human health. We have reviewed the current literature (1999-present)
> related to these issues, and have reached conclusions consistent with those of the best scientific review
> panels in the nation.

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> Your letter is timely, in that a new colloquium report on the spread of AR resistance – Antibiotic
> Resistance: An Ecological Perspective on an Old Problem (Sept. 2009) -- is now available to the public.
> This colloquium was sponsored by the American Academy of Microbiology (AAM), a nonprofit

> organization closely linked to the American Society for Microbiology. We routinely use AAM materials in interpreting the scientific literature, some of which was generated by AAM members.

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> I believe that you will find AAM's colloquia reports generally useful in addressing your questions about horizontal gene transfer, microbial virulence, and ecological aspects of the AR challenge. A list of potentially useful colloquium reports follows. You will find each document at <http://academy.asm.org> (click on "Colloquium Reports" tab at top of page).

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> Antibiotics and disease control

> o Antibiotic Resistance (see above for full title and publication date)

> o Vaccine Development: Current Status and Future Needs (2005)

> o The Role of Antibiotics in Agriculture (2002)

> o Antimicrobial Resistance: An Ecological Perspective (2002)

> o The Scientific Future of DNA for Immunization (1997)

> Public health

> o From Outside to Inside: Environmental Microorganisms as Human Pathogens (2005)

> o Resolving the Global Burden of Gastrointestinal Illness: A Call to Action (2002)

> o Basic Research for the Future: Opportunities in Microbiology for the Coming Decade (1997)

> Horizontal gene transfer

> o Reconciling Microbial Systematics and Genomics (2007)

> o The Genomics of Disease-Causing Organism: Mapping a Strategy for Discovery and Defense (2004)

> o An Experimental Approach to Genome Annotation (2004)

> o Microbial Genomes: Blueprints for Life (2000)

> Environmental microbiology

> o Uncharted Microbial World: Microbes and Their Activities in the Environment (2008)

> o The Global Genome Question: Microbes as the Key to Understanding Evolution and Ecology (2004)

> o Microbial Ecology and Genomics: A Crossroads of Opportunity (2002)

> o Microbial Communities: From Life Apart to Life Together (2002)

> Water quality

> o Clean Water: What is Acceptable Microbial Risk? (2007)

> o Reevaluation of Microbial Water Quality: Powerful New Tools for Detection and Risk Assessment (2001)

> o A Global Decline in Microbiological Safety of Water: A Call for Action (1995)

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> We believe that these reports summarize our thoughts on the issues that you have broached. We encourage you to browse these documents, with particular attention to the recommendations brought forward. These are the action steps that EPA is taking with response to your questions.

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> Thank you for your correspondence.

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> Sincerely,

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> Dana A. Thomas, Ph.D.

> Chief, Ecological and Health Processes Branch

> Health and Ecological Criteria Division

> Office of Science and Technology

> Office of Water

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> [attachment "AL-09-001-4162.pdf" deleted by Dana Thomas/DC/USEPA/US]

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