



Daniel S. Kohane, MD, PhD

Young Clinician Award 2006

Investigator Profile

Education

- BA, University of Pennsylvania, Biology
- MD, Boston University School of Medicine
- PhD, Boston University School of Medicine, Physiology



Clinical /Professional Appointment

- Assistant Professor in Pediatrics, Harvard Medical School
- Staff Intensivist, Pediatric ICU, MGH
- Visiting Scientist, The Langer Lab, Dept of Chemical Engineering, MIT

Honors and Awards:

- NIGMS RO1 – Prolonged duration of local anesthesia
- CIMIT-Chemoembolization for hepatocellular carcinoma
- DuPont DeNemours—Prevention of peritoneal adhesions (Langer PI)
- NSF BES –Novel antifungal materials and surfaces (Langer PI)

Impact on Care

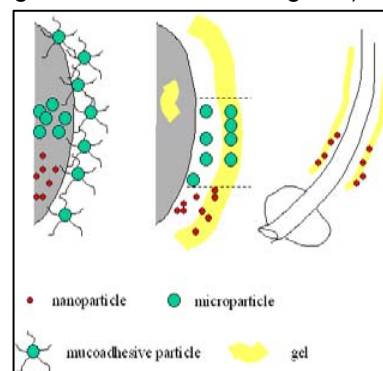
- Tracheal stenosis occurs in 1-8% of neonates after prolonged intubation
- 70% of pediatric tracheal surgeries are for tracheal stenosis
- There is a high incidence of restenosis following surgery, resulting in repeating procedures
- Affected children also commonly require prolonged tracheal cannulation with its attendant risks of further tracheal scarring, infection, pneumonia and developmental delay due to the inability to speak
- Localized drug delivery would reduce systemic effects of the drugs including hypertension, hyperglycemia, and gastrointestinal bleeding
- Technology would also be applicable to a range of clinical problems that are encountered in the OR and ICUs, where focal drug delivery is desired. Examples include papillomatosis, post-extubation stidor, croup, bacterial infections, and many others outside of the airway.

Abstract

Intubation, especially in the neonates, can result in airway stenosis. Repair of that stenosis can be defeated by subsequent scarring. Currently, systemic administration of anti-inflammatory agents is the standard of care for these problems. Some investigators have tried “painting” drug solutions on the surgical site. Here we propose to use controlled release technology to develop a set of devices or approaches to cure these or even prevent these problems.

Our principal hypothesis is that providing sustained high local drug levels will be therapeutic, and minimize systemic side effects. The devices will consist of micro- or nanoparticles with or without a hydrogel. They could be applied by minimally invasive methods, or placed directly in the site at the time of surgery.

One ultimate goal is the development of a drug-eluting stent or endotracheal tube that would release drugs to treat or perhaps even prevent the problem. In addition to providing high local levels of drug, these methods would reduce systemic effects of those drugs (e.g. hypertension, hyperglycemia, gastrointestinal bleeding, etc).



Left: particles in or on the airway  
Center: gels in or on the airway  
Right: endotracheal tube with gel with or without particles on surface