Associate Professor Richard Douglas
Auckland

Saturday, August 12, 2017
11:30 - 11:45  The Role of Antibiotics in Sinusitis- New Thoughts
Antibiotics for CRS - are we making our patients worse?

Richard Douglas

Department of Surgery
The University of Auckland
New Zealand
rhinitis and sinusitis

acute

acute viral rhinitis

acute sinusitis

chronic
rhinitis and sinusitis

- acute
  - acute viral rhinitis
  - acute sinusitis

- chronic
  - rhinitis
  - sinusitis
normal nose
chronic rhinitis
chronic sinusitis
chronic sinusitis without polyps
culture techniques identify bacteria that grow in media not necessarily pathogenic
culture results not greatly different between normals and CRS
what is the evidence that antibiotics work in CRS?

why is it so hard to kill bacteria?

is it bad to kill bacteria?
what is the evidence that antibiotics work in CRS?

why is it so hard to kill bacteria?

is it bad to kill bacteria?
almost none
International Consensus Statement on Allergy and Rhinology: Rhinosinusitis

Richard R. Orlandi, Todd T. Kingdom and Peter H. Hwang

International Forum of Allergy & Rhinology, Vol. 6,S1
February 2016
CRS without nasal polyposis

macrolide, long course

3 RCTs

roxithromycin - symptomatic improvement, not sustained

azithromycin - no difference
antibiotics clearly help in acute sinusitis

many patients find relief for exacerbations of CRS

effective for acute exacerbations?
what is the evidence that antibiotics work in CRS?
what is the evidence that antibiotics work in CRS?

why is it so hard to kill bacteria?
SPECIMEN: LEFT NOSTRIL SWAB

CULTURE:
Heavy growth of Staphylococcus aureus

SUSCEPTIBILITIES
Erythromycin  S
Fusidic Acid   S
Mupirocin     S
Flucloxacillin S
Penicillin    R
Rifampicin    S
Cotrimoxazole  S
Tetracycline  S
most of bacteria are in a third space
biofilms
intraepithelial bacteria
intraepithelial bacteria

interstitial micro-colonies
interstitial microcolonies

cystic fibrosis
intramucosal bacteria
mucosal commensal community
16S amplified sequenced compared to database
mucosal swabs
what is the evidence that antibiotics work in CRS?
why is it so hard to kill bacteria?
is it bad to kill bacteria?
what is the evidence that antibiotics work in CRS?

why is it so hard to kill bacteria?

is it bad to kill bacteria?
10 bacterial cells for every human cell
100 bacterial genes for every human gene
quadrillion viruses
passive or active?
normal microbiome alters immune function
antibiotics lay waste to the microbiome
gut microbiome before and after antibiotics for one week
first description of allergic rhinitis in 1819
Jonathan Bostock

10 years to find another 28 cases
prevalence of allergic illnesses
Antibiotics, Pediatric Dysbiosis, and Disease

Pajau Vangay, Tonya Ward, Jeffrey S. Gerber, and Dan Knights

1Biomedical Informatics and Computational Biology, University of Minnesota, Minneapolis, MN 55455, USA
2Biotechnology Institute, University of Minnesota, Saint Paul, MN 55108, USA
3Division of Infectious Diseases, Children's Hospital of Philadelphia, Philadelphia, PA 19104, USA
4Department of Computer Science and Engineering, University of Minnesota, Minneapolis, MN 55455, USA

*Correspondence: dknights@umn.edu
http://dx.doi.org/10.1016/j.chom.2015.04.006
mucosal commensal community
protection against pathogens
effect of antibiotics
loss of biofilm complexity
establishment of pathogens
changes in the microbiome have been linked to

asthma and allergy

autoimmune diseases

infectious diseases

obesity

CRS??
role of antibiotics in CRS in 2017?
restraint
research
THE GARNETT PASSE AND RODNEY WILLIAMS MEMORIAL FOUNDATION
### The Microbiome of the Middle Meatus in Healthy Adults

Ramakrishnan, Feazel, Gitomer, Ir, Robertson, Frank

PLOS ONE 2013

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Prevalence</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firmicutes</strong></td>
<td>100%</td>
<td>48.1%</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>96%</td>
<td>11%</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>68%</td>
<td>8%</td>
</tr>
<tr>
<td>Propionibacterium acnes</td>
<td>93%</td>
<td>15%</td>
</tr>
<tr>
<td>Corynebacterium stearicum</td>
<td>71%</td>
<td>2%</td>
</tr>
<tr>
<td><strong>E.coli</strong></td>
<td>36%</td>
<td>2%</td>
</tr>
</tbody>
</table>

### Normal Middle Meatus

#### Prevalence vs. Abundance

<table>
<thead>
<tr>
<th></th>
<th>Prevalence</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S.epidermidis</em></td>
<td>96%</td>
<td>11%</td>
</tr>
<tr>
<td><em>S.aureus</em></td>
<td>68%</td>
<td>8%</td>
</tr>
<tr>
<td><em>P.acnes</em></td>
<td>93%</td>
<td>15%</td>
</tr>
<tr>
<td><em>C.tuberculosis</em></td>
<td>71%</td>
<td>2%</td>
</tr>
<tr>
<td><em>E.coli</em></td>
<td>36%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Jonathan Bostock

1819

9 years to find another 28 cases
Although 86.8% of otolaryngologists prescribe oral antibiotics as part of routine postoperative care following ESS, the literature supporting this role is scarce.

bacteria are always present in our sinuses
systemic antibiotics

concentration in mucosa

biofilms

intracellular
chronic sinusitis associated with cystic fibrosis
fungal sinusitis
dysbiosis

loss of keystone taxa
loss of diversity
shifts in metabolic capacity
blooms of pathogens
2010 children received 74.5 million outpatient antibiotic prescriptions

one for every child
antibiotic use has been associated with the emergence of antimicrobial resistance, identified by the World Health Organization (WHO) as “one of the three greatest threats to human health.”
Biofilms
Phylum-Level classified OTUs:
*De novo* OTU-picking at 97% similarity

microbiome composition and CRS phenotype
Phylum-Level classified OTUs:
*De novo* OTU-picking at 97% similarity
microbiome composition and CRS phenotype

**Phylum-Level classified OTUs:**
*De novo* OTU-picking at 97% similarity
microbiome composition and CRS phenotype

Phylum-Level classified OTUs:
De novo OTU-picking at 97% similarity
Phylum-Level classified OTUs:

De novo OTU-picking at 97% similarity
microbiome composition and CRS phenotype

Phylum-Level classified OTUs:
De novo OTU-picking at 97% similarity

Genus-Level classified OTUs:
De novo OTU-picking at 97% similarity
loss of species diversity with phenotype severity
mucosal commensal community
effect of antibiotics
ray kim