OMVs - Vaccine against Pasteurellaceae

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market potential

- the vaccination market is growing: 18 bn US$ in 2009, 28 bn US$ in 2018
  → mentality is changing towards prevention versus treatment
- several vaccine opportunities (human and veterinarian) for *Pasteurellaceae*
- most relevant indications:

<table>
<thead>
<tr>
<th>species</th>
<th>disease</th>
<th>vaccine</th>
<th>burden</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>human pathogens</strong></td>
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<tr>
<td>non-typeable <em>Haemophilus influenzae</em> (NTHi)</td>
<td>otitis media, exacerbations in COPD patients, upper respiratory tract infections</td>
<td>NONE</td>
<td>COPD: 3 million deaths in 2004, 3rd leading cause of death by 2030 (source: WHO)</td>
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<tr>
<td>HACEK group</td>
<td>infective endocarditis, exacerbations in COPD patients, upper respiratory tract infections</td>
<td>NONE</td>
<td></td>
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<tr>
<td><em>Haemophilus ducreyi</em></td>
<td>chancroid</td>
<td>NONE</td>
<td>increases risk of HIV infection by 10-fold</td>
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<td><strong>veterinary pathogens</strong></td>
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<td><em>Mannheimia haemolytica</em></td>
<td>Bovine respiratory disease (BRD), respiratory disease in cattle and sheep</td>
<td>available, but narrow range protection</td>
<td></td>
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</tbody>
</table>

- strains of species within the *Pasteurellaceae* are too heterogeneous for a broad range vaccine
Outer membrane vesicles - OMVs

- naturally released
- spherical structures (20 -250 nm)
- non-living facsimiles of the bacteria
OMVs as vaccine candidates

1. Grow bacteria
2. Harvest medium
3. Purify OMVs
4. Resuspend OMVs

Yield: 3-7 mg/l

Timeline:
- Initial immunization: day 0
- Boost 1: day 14
- Boost 2: day 28
- Challenge: day 38-39

Route: intranasal (oral)
Dose: 25 µg/immunization (down to 0.25 µg/immunization)
OMVs as vaccine candidates

coating antigen strain 1

coating antigen: heterologous strain

challenge with strain 1

challenge with heterologous strain

co: PBS treated mice
IM-1: mice immunized with OMVs from NTHi strain 1
IM-2: mice immunized with OMVs from NTHi strains 1, 2 and 3
advantages of the OMV-based vaccine

highly immunogenic
• induction of a solid, protective immune response
• highly immunogenic (protective immune response with <1 µg per animal)

simple production
• simple manufacturing process with high yield (3 to 7 mg/l)

easy storing
• no need for cold chain – stable for one year at RT
• no need for complex buffer solutions or adjuvants

simple administration
• non-invasive administration (i.e. intranasal or oral)

broad protection
• cross-strain and cross-family protection - mixtures are applicable
• presentation of a variety bacterial surface-exposed antigens in their native conformation (most immunogenic antigens identified)
• research status


• IP status

Pending PCT patent application, filed on March 30, 2012
Publication number: WO 2012/131066
Priority date: April 1, 2011
University of Graz offers Technology for

- licensing and commercialization
- collaborative future development
  - improve immunization protocol
  - use of OMVs as antigen delivery vehicles
  - test OMVs in a more relevant model (human or animal)

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