**Introduction**

- *Pseudomonas aeruginosa* (PA) develop as biofilms in chronic pulmonary infections in patients with cystic fibrosis.  
- Biofilms are aggregates of PA (50-100 μm) entrapped in a self-produced matrix of anionic polymers (alginate, DNA…), often surrounded by patient mucus.  
- The activity of cationic antibiotics "ATB" such as tobramycin (TOB) and colistin (COL) against these biofilms is low in-vivo because of their interactions with the matrix.

**Purpose**

- Develop an in-vitro model composed of anionic polymers to find an in-vivo model of pulmonary PA biofilms to evaluate the efficacy of inhaled ATB used to treat chronic pulmonary infections.

**Material & Methods**

- A bioluminescent strain of PA (PAO1-LUXCDEBA) was incorporated into large calcium alginate beads (σ = 1200 μm). These beads were dispersed in artificial sputum medium (ASM) to produce an in-vitro PA pulmonary biofilm model.
- The effectiveness of ATB (TOB and COL) was tested on the *in-vitro* PA pulmonary biofilm by measuring:
  - PA bioluminescence kinetics during 40H
  - Bacterial concentrations (log10 CFU/ml) after 40 h of exposure to ATB. These values were plotted as a function of ATB concentrations and modelled using the following inhibitor Emmax model:  

  \[ CFU(t) = CFU_0 \times \left(1 - \frac{C}{C_{50} + C}\right)^\gamma \]

  - The index with the best fit and low value of \( C_{50} \) is more effective.
  - The development of resistance to these ATBs among surviving PA was evaluated by measuring the MIC.

**Results**

**Evaluate the efficacy of ATB on the in-vitro model of PA pulmonary biofilm**

- Above 10 times the MIC, the decrease in bioluminescence was greater and faster with COL compared to TOB.

**Conclusion & Perspectives**

- Bioluminescence measurements and colony counts show that COL was more effective than TOB on an *in-vitro model of PA pulmonary biofilm*, suggesting a potential better clinical efficacy of COL than TOB when treating these biofilms.
- PA may persist in biofilms even when exposed to high concentration of TOB without developing resistance to this antibiotic.

**References**

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4. S.D. Dinesh, Artificial sputum medium, Protoco. excl, 2010  