# The role of age, neutrophil infiltration and antibiotics timing in the severity of *Streptococcus pneumoniae* pneumonia. Insights from a multi-level mathematical model approach

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Supplementary material

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| --- |
| Young: 11 bacteria, 12 h. |
|  |
| Young: 11 bacteria, 20 h. |
|  |
| Aged: 11 bacteria, 12 h. |
|  |
| Aged: 11 bacteria, 20 h. |
|  |

Figure S1. Diffusing variables of selected solutions from Figure 4.

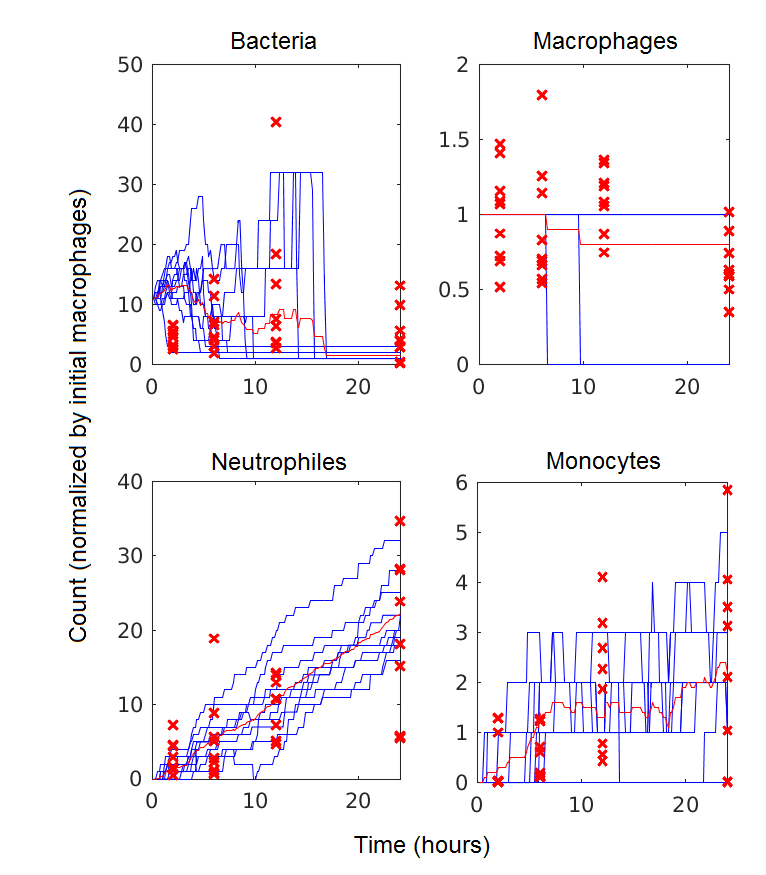


Figure S2. Parameter fitting with *in vivo* data. All the parameters labelled with “calibrated” in Table S1 were fitted to reproduce the experimental data from Berger et al., 2018[25](https://www.zotero.org/google-docs/?broken=jw9kJW). Y axis unit are counts normalized by the initial macrophage number, and X axis unit accounts for hours.

Table S1. Parameter values of nominal solution of the model.

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Source** |
| Alveolar radius | 100 μm | Ochs et ali, 2004[28](https://www.zotero.org/google-docs/?broken=woY4nQ) |
| Lining liquid width | 1 μm | Lindert et al., 2007[29](https://www.zotero.org/google-docs/?broken=y6TRYe) |
| Diffusion constants of chemokines | Estimated from their molecular weight | Tang et al., 2016[30](https://www.zotero.org/google-docs/?broken=gskdAK) |
| Lining liquid flow rate | 4.2·10-2 min-1 | Lindert et al., 2007[29](https://www.zotero.org/google-docs/?broken=Pf93Qh) |
| *S. pneumoniae doubling time* | 200 min | Jakubovics, 2008[31](https://www.zotero.org/google-docs/?broken=wNdlcc) |
| *S. pneumoniae doubling diameter (without capsule)* | 0.5 μm | Todar, 2003[32](https://www.zotero.org/google-docs/?broken=Ba95l0) |
| *S. pneumoniae doubling diameter (with capsule)* | 0.75 μm | Todar, 2003[32](https://www.zotero.org/google-docs/?broken=0slVFx) |
| Time to change pneumolysin production after infection | 15 hours | Feldman et al., 1990[33](https://www.zotero.org/google-docs/?broken=r53EYs) |
| Probability of surviving in presence of penicillin during 24 hours | 0.0035 | Tateda et al., 1996[26](https://www.zotero.org/google-docs/?broken=ppmG0X) |
| Number of macrophages at resting | Normalized to 1 | Wallace et al., 1992[34](https://www.zotero.org/google-docs/?broken=peOY5f) |
| Macrophage diameter | 21 μm | Krombach et al., 1997[35](https://www.zotero.org/google-docs/?broken=qjjg5c) |
| Monocyte half life | 6.62 hours | Doherty et al., 1988[36](https://www.zotero.org/google-docs/?broken=fcuicl) |
| Movement velocity of phagocytes in the alveolus | 2 μm/min | Khang, 2015[37](https://www.zotero.org/google-docs/?broken=kjaubT) |
| Phagocytosis rate | 0.048 min-1 | Athamna and Ofek, 1988[38](https://www.zotero.org/google-docs/?broken=gWbeKV) |
| Number of bacteria to produce macrophages apoptosis | 87 | Srivastava et al., 2005[39](https://www.zotero.org/google-docs/?broken=irDicS) |
| Time of exposition to pneumolysin to trigger apoptosis in macrophages | 105 min | González-Juarbe[40](https://www.zotero.org/google-docs/?broken=vx8NyE) |
| Kinetic constant of monocyte recruitment | 87 min-1 | Calibrated |
| Chemokine threshold to recruit monocytes | 97 (arbitrary units) | Calibrated |
| Maximal monocyte recruitment rate | 6 cells/min | Calibrated |
| Kinetic constant of neutrophil recruitment | 212.88 min-1 | Calibrated |
| Chemokine threshold to recruit neutrophils | 0.1944 (arbitrary units) | Calibrated |
| Maximal neutrophil recruitment rate | 7.5809 cells/min | Calibrated |
| Neutrophil half life | 2.6285 hours | Calibrated |
| Capsule production half time | 19.81 hours | Calibrated |