Table 1. Published deposition values for the rabbit using direct measurement approaches

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| --- | --- | --- | --- |
| **Study** | **Reported Value** | **Measurement Approach and Material** | **Potential Bias in Outputs** |
| Gutting, et al. (2013) | Pooled value of 4.63% from two data set values: 4.33% (±2.2%) and 4.93 % (±0.8%), represents whole lung deposition | Homogenization of New Zealand white rabbit lung tissue and extrapolation to the whole lung after inhalation exposure to *B. anthracis* spores, particle size MMAD of 1.0 µm ± 0.3 µm | Potential for underestimation of deposition if epithelial cell internalization of deposited particles is rapid (e.g., see Jenkins and Xu (2013) data in mouse animal model) |
| Gutting, et al. (2012) | 3.07% ± 0.9% and 1.33% ± 0.2%, represents whole lung deposition | Bronchoalveolar lavage to wash out deposited *B. anthracis* spores in New Zealand white rabbit, particle size MMAD of 1.0 µm ± 0.3 µm | Deposited doses reported from bronchoalveolar lavage may be biased low if inability to wash out all deposited spores or rapid transport across epithelial cell lining takes place (Gutting, et al., 2012) |
| Raabe, et al. (1988)  Note:. Raabe, et al. (1988) data were the basis for U.S. EPA’s RDDR model as described in U.S. Environmental Protection Agency (1994) | Ranging from 6.6 ± 0.6 % at 0.97 µm to 1.1 ± 0.2 % at 4.86 µma pulmonary deposition only | Measurement of deposition to pulmonary region of the rabbit after inhalation of monodisperse 169Yb aluminosilicate aerosol with aerodynamic resistance diameters of particles ranging from 0.18 to 8.65 µm | Use of Guyton’s formula to estimate minute volume for calculation of deposition would bias results if actual animal inhalation rate differed (Raabe, et al., 1988) |

a Aerodynamic resistance diameter measurement

MMAD - mass median aerodynamic diameter

RDDR – Regional Deposited Dose Ratio

Table 2. Deposition efficiencies for different annotated regions in the rabbit and the human nasal model.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Case** | **MMAD** (μm) | **Concentration**  (Spores/m3) | **Location** | **% Relative Deposition\*** | |
| **Rabbit** | **Human** |
| Case 4 | 1.12 | 3.97E+11 | Nose | 22.29 | 41.32 |
| Pharynx | 13.30 | 10.24 |
| Larynx | 18.09 | 30.24 |
| Trachea | 3.82 | 2.16 |
| Bronchi & Bronchioles | 18.50 | 7.81 |
| Deep Lung | 24.00 | 8.22 |

MMAD – mass median aerodynamic diameter

\*The total particle deposition for the rabbit and the human was 69.23% and 83.77%, respectively.

**Table 3. Deposition efficiencies for the three different cases for the rabbit model. The spores that escaped through the outlets of the 3D geometry were assumed to have deposited in the distal lung. The escaped spores were not re-introduced during the exhalation phase of the breathing cycle.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Case** | **MMAD** (μm) | **Concentration**  (Spores/m3) | **Location** | | **% Relative Deposition\*** | |
| Case 1 | 0.92 | 1.18E+08 | | Nose | | 28.32 |
| Pharynx | | 12.19 |
| Larynx | | 11.56 |
| Trachea | | 0.19 |
| Bronchi & Bronchioles | | 15.08 |
| Deep Lung | | 32.66 |
| Case 2 | 0.87 | 1.23E+09 | Nose | | 27.21 | |
| Pharynx | | 12.41 | |
| Larynx | | 12.89 | |
| Trachea | | 0.14 | |
| Bronchi & Bronchioles | | 18.74 | |
| Deep Lung | | 28.61 | |
| Case 3 | 1.12 | 1.00E+10 | Nose | | 24.18 | |
| Pharynx | | 12.36 | |
| Larynx | | 16.18 | |
| Trachea | | 0.17 | |
| Bronchi & Bronchioles | | 18.18 | |
| Deep Lung | | 28.93 | |

MMAD – mass median aerodynamic diameter

\*The total particle deposition for the rabbit was 69.23%.

Table 3 was generated by mining published data from the following published sources identified below. There were no computations performed on the data presented from the table beyond identification of ranges as reported in the original citing documents.

Gutting, B. W., D. Marchette, R. Sherwood, G. A. Andrews, A. Director-Myska, S. R. Channel, D. Wolfe, A. E. Berger, R. S. Mackie, B. J. Watson and A. Rukhin (2013). Modeling Low-Dose Mortality and Disease Incubation Period of Inhalational Anthrax in the Rabbit. J Theor Biol 329: 20-31.

Gutting, B. W., T. L. Nichols, S. R. Channel, J. M. Gearhart, G. A. Andrews, A. E. Berger, R. S. Mackie, B. J. Watson, S. C. Taft, K. A. Overheim and R. L. Sherwood (2012). Inhalational Anthrax (Ames Aerosol) in Naive and Vaccinated New Zealand Rabbits: Characterizing the Spread of Bacteria from Lung Deposition to Bacteremia. Front Cell Infect Microbiol 2: 87.

Jenkins, S. A. and Y. Xu (2013). Characterization of *Bacillus anthracis* Persistence In Vivo. PLoS One 8(6): e66177.

Raabe, O. G., M. A. Al-Bayati, S. V. Teague and A. Rasolt (1988). Regional Deposition of Inhaled Monodisperse Coarse and Fine Aerosol Particles in Small Laboratory Animals. Annuals of Occupational Hygiene 32: 53-63.

U.S. Environmental Protection Agency (1994). *Methods for Derivation of Inhalation Reference Concentrations (RfCs) and Application of Inhalation Dosimetry*. Washington, DC. EPA/600/8-90/066F.