In 2002 an increased number of cochlear implant related meningitis cases was reported by the U. S. Food and Drug Administration (FDA). The most commonly identified causative agent was Streptococcus pneumoniae. Although most cases of meningitis were related to a special electrode design, the risk for post-operative pneumococcal meningitis might nonetheless be enhanced by opening of the cochlea during implantation. In the present study, a threshold model for middle ear inoculation of S. pneumoniae was established in the guinea pig after cochlear implantation to assess the post-operative risk of meningitis. Guinea pigs were implanted unilaterally with a silicone cochlear implant electrode dummy. Five weeks after implantation, animals were challenged via the middle ear with a clinically relevant strain of S. pneumoniae and monitored over a period of five days for signs of meningitis. Meningitis was confirmed by clinical outcome in the animals, histological investigation of brains, as well as by pleocytosis and presence of bacteria in cerebrospinal fluid (CSF). By inoculation of varying numbers of bacteria (between $1 \times 10^4$ and $1 \times 10^9$ CFU/ml in 10 μl), a threshold model was established. The attack rate, pattern and onset of meningitis depended on number of inoculated bacteria. An increased meningitis rate in different experimental groups shows that greater bacterial burden leads to an increased attack rate after...
intratympanal inoculation. The established animal model provides a potential tool to assess the meningitis risk after cochlear implantation. Its implementation in future studies will allow the investigation of existing and newly developed prostheses for postoperatively infection risk.