ABSTRACT. Livestock houses are an important source of particulate matter (PM) and bioaerosols. These substances can have a detrimental effect on human and animal health and the environment, as well. Knowledge on the origin of PM and bioaerosols in livestock houses and the factors affecting their generation and aerosolization is necessary to reduce them. The present PhD thesis addresses issues related with the concentration, origin and physical, chemical and biological properties of airborne PM in rabbit and poultry farms, their relationship with pathogenic bioaerosols and techniques to reduce them. This work aims to contribute to alleviate the negative effects of these substances both indoor and outdoor livestock houses.

The specific objectives within this PhD thesis were *i).* to characterize airborne PM in rabbit farms in terms of morphology, chemical composition and bacterial concentration in different size fractions, *ii).* to quantify airborne PM10 and PM2.5 concentrations and emissions in rabbit farms, and to identify the main factors related with farm activities influencing PM generation, *iii).* to assess the spatial distribution of mesophilic aerobic bacteria in the air during a broiler cycle and examine their relationship with the concentration and evolution of PM, *iv).* to compare the performance of techniques to sample and detect airborne *Salmonella* spp. in broiler farms and *v).* to evaluate the application of an air disinfectant to reduce airborne microorganism in a commercial laying hen house, with focus on its effect on *Mycoplasma* spp.

The results of this thesis suggest that poultry and rabbit houses generate and emit relevant amounts of PM and bioaerosols which can exceed the limit values established in Directive 2008/50/EC on ambient air quality and cleaner air for Europe, especially in poultry farms. Therefore, these substances must be controlled and reduced to protect the environment and the health and welfare of humans and animals. In rabbit houses, PM showed a complex morphology and chemical composition, being fragmentation type particles with irregular and acute edges, rich in S, Ca, Mg, Na and Cl the most abundant. The concentration of mesophilic aerobic bacteria per cubic meter in the air varied between $3.1x10^3$ and $1.6x10^6$ colony forming units, CFU. The main sources of PM were skin, animal feed and faeces from cleaning activities, specially sweeping and the animals themselves. The average concentration of PM10 (particles smaller than 10 μm in diameter) was 0.08 ± 0.06 mg/m^3 for fattening rabbits and 0.05±0.06 mg/m^3 for reproductive does and the average concentration of PM2.5 (particles smaller than 2.5 μm in diameter) was 0.01±0.02 mg/m^3 for fattening rabbits and 0.01±0.04 mg/m^3 for reproductive does. Emissions ranged from 6 to 15 mg/animal/day for PM10 and from 0.2 to 3.0 mg/animal/day for PM2.5. In broiler houses, the concentration of bacteria ranged from 3.0 to 6.5 log UFC/m^3. Most bacteria were associated with particles between 3.3 and 7.0 μm in diameter existing a positive correlation between the concentration of PM10 and PM2.5 and airborne bacteria. Regarding the detection of pathogens in the air of an experimentally infected broiler room, cultivable *Salmonella* spp. was not recovered using impingement and traditional culture methods, but could be detected with impaction and molecular techniques. Therefore, the use of impingers and traditional culture methods are not recommended for the detection and/or quantification of airborne cultivable *Salmonella* spp. In laying hen houses, the average concentration of PM10 was 0.55±0.38 mg/m^3 and 0.02±0.03 mg/m^3 for PM2.5. The concentration of bacteria ranged from 4.1 to 5.7 log CFU/m^3. The application of a thermonebulized wide spectrum disinfectant in the air was not effective in reducing the concentration of airborne mesophilic aerobic bacteria nor *Mycoplasma* spp. It would be desirable to evaluate different air disinfection doses, products and application methods.

Overall, the results presented in this PhD Thesis provide necessary information about the PM and bioaerosols in the air of livestock housing and their relationship, which is useful to design and implement effective measures to reduce PM and bioaerosols to improve air quality in livestock housing and reduce their emissions to the outside.