**English Summary:**

This thesis addresses a potential public health problem of irrational use of medicine (IRM). IRM may involve the failure of a patient to adhere to the prescribed dose or the concomitant consumption of other medications that may affect the therapeutic effect of the prescribed drug. An LC–MS-based integrated drug monitoring approach is developed, which does not only determine the drug level, but also simultaneously monitors other medications that may affect the effect of the prescribed drug. This approach is demonstrated for antiepileptic drugs and warfarin. Other drugs subject to IRM are antibiotics (ABs). To this end, an analytical method was developed for assessment of AB residue in food of animal origin, which can in principle be applied in a non-laboratory setting. Finally, the use of nanoparticles as antibacterial and antibiofilm alternative was investigating in terms of factors contributing to these properties. Furthermore, the feasibility of their green synthesis was assessed.