

## Effect of Heavy Metals on Antimicrobial Resistance in *Acinetobacter baumannii* in Conflict Zones

The emergence of multidrug resistant bacteria is a severe threat to our health and healthcare systems worldwide and will be even more so in the near future. It is estimated that already by the year 2050, 10 million people die annually through multidrug resistant bacteria, exceeding for example deaths due to cancer (8.2 million) (1).

The drivers that will turn antimicrobial resistance (AMR) to such a thread in the future are manifold.

A big part plays the overall increase of consumption in humans, mainly by practices like misuse of antibiotics by patients or overprescribing by primary care physicians. But also access to quality antibiotics (or the lack thereof) play an important role. In order to prevent resistance a certain drug level needs to be reached and then kept over a defined period of time. Counterfeit antibiotics often tend to have less active metabolites, leading to decreased drug levels. But also fields like veterinary medicine have been increasing resistance rates in the last years. 72,5% of antibiotic consumption that are deemed as medically important for human health are used in live stocks as well. Another crucial role plays contamination of the environment. Subsequent pollution of waters through sewage and waste processing from pharmaceutical industries or the use of heavy metals in agriculture (for example copper as a bactericide or fungicide) an apparent effect on resistance (2, 3).

Consequently, this diversity in driving antimicrobial resistance needs to be tackled in a diverse approach. Based on this interconnectedness, the “One Health” concept tries to bring together not only an international consortium of experts, but also an interdisciplinary one.

Following the one health approach the Center for Global Health looks at drivers of resistance in war zones among a resettled population in the bacteria *Acinetobacter Baumannii* (Acba).

Acba is an opportunistic, gram negative bacterium, that mainly colonizes wounds and causes hospital acquired infections (HAI). More concerning is the fact that carbapenem-resistant Acba-strains (CRAB) have been isolated in high rates in the past years, especially in the Middle Eastern and North African region. Because more than 30% of wound infections in US soldiers in Iraq and Afghanistan in the early 2000s were caused by mainly imipenem resistant *A. baumannii*, it was nicknamed “Iraqibacter” (4). It is important to understand that Carbapenems are the last remaining class of broad-spectrum antibiotics which are crucial in the fight of multidrug resistant bacteria worldwide.

Because of the association of high concentrations of heavy metals in the environment with heavy artillery projectiles, destroyed infrastructure and bomb shells in war regions David Kamiab Hesari investigates together with partners from the Boston University and the American University of Beirut how exposure to heavy metal changes the susceptibility of Acba to Carbapenems.

Based on this project, the three partners decided to extend their cooperative efforts. So in the the Spring of 2020, they founded a new multidisciplinary and international consortium that deals with the topic of access to quality life-saving antibiotics among resettled refugees.

## References

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