Commentary

Want a better way to control antibiotic resistance? Fight the corruption

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Invited commentary on 'Antimicrobial resistance: the major contribution of poor governance and corruption to this growing problem' by P. Collignon et al.

Bacterial resistance to antibiotics has long left the scientific and professional laboratories to become a rather dramatic public health emergency. It is now perceived as a problem that affects the general public inasmuch as the number of multidrug resistant bacteria is rapidly growing and consequently the treatment options for these bacteria are very few. This phenomenon is not limited to hospitals and nursing homes, where it is certainly more acute, but involves the entire community.

Similarly, the corruption in most societies is also perceived as a devastating phenomenon that increases inequality and puts at risk the progress if not the whole peaceful survival of civil societies. In Europe, for instance, the efforts made to build up economic and in perspective a political union based on the same general governmental rules are severely threatened by, among other factors, the huge difference in the level of corruption perceived by the citizens of the different European countries.¹

While both antibiotic resistance and corruption perception appear to be on the rise, that the two phenomena could be under statistical correlation in Europe could sound as a surprise. In the March issue of PLoS One, an article authored by Collignon and collaborators² highlights the possible relationship existing between antibiotic resistance and corruption. To investigate this relationship, the authors move from the working hypothesis of the existence of additional factors other than the well-investigated ones (such as, for instance, the use or rather the abuse of antibiotic usage) outlining the continuous rise of antibiotic resistance. For this reason, they include in their analysis other political, social and economic variables assuming that these factors could influence the development of antibiotic resistance.

In order to test their hypothesis, the authors developed a mathematical model that was applied to retrospectively evaluate several parameters including the gross domestic product (GDP) and the quality of governance (G) as an expression of the control of corruption in 28 European countries over the period 1998-2010.³ The choice of Europe was because this is the only world region where it is possible to obtain complete and reliable data necessary for developing a valuable and predictive mathematical model.⁴

Several economic, political and social parameters were related to the major pathogens resistant to several classes of antibiotics, i.e. MRSA, third generation cephalosporin-resistant, gram negative bacteria, MDR *Pseudomonas aeruginosa*, vancomycin resistant *Enterococcus*, penicillin-resistant pneumococci. The quality of governance was defined as control of corruption in the civil society and it was measured by a scale of 0 to 6, where 0 is the lowest level of control of corruption and 6 the highest one.

Comparing the level of antibiotic resistance in the different European countries with the level of governance as a proxy of the control of corruption in an individual nation, a statistically significant negative correlation ($r=-0.77$) between a low degree of control of corruption and the incidence of a high degree of antibiotic resistance has clearly emerged. In other words, in the countries where the control of corruption is more effective, antibiotic resistance is lower, while the opposite is true in countries where less control is exercised. The correlation between consumption of antibiotics and development of resistance in the 28 European countries does not reach the level of statistical significance ($r=0.40$) although there is a tendency to support this correlation. There is no correlation between the GDP and the development of antibiotic resistance.

The authors conclude that the quality of corruption governance is responsible more than the consumption of antibiotics for the development of antibiotic resistance in the European country. They speculate that the reasons for this do not only depend on the development but also on the spread of resistant strains in humans as well as in animals as a consequence of the failure to control corruption. In fact, it is also considered that an increase of one unit in the index of control of corruption (G) would lead to a consequent significant reduction of antibiotic resistance in an individual nation. The logical and natural consequence of all this is

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that fighting corruption and improving governance are effective measures for reducing antibiotic resistance in a country, perhaps better than other measures that have not been so effective, so far.

The authors correctly admit that the same correlation between corruption and antibiotic resistance could have been observed in other areas of the world were the quality of data available is the same as in Europe. This consideration allows hypothesizing that the conclusions reached in Europe may be applicable in other areas of the world and that the control of corruption as a measure of control of antibiotic resistance may play a universal role. Although the mathematical model is well designed, it is still a retrospective study and by no means could provide a demonstration about the causality of the link between corruption and antibiotic resistance.

In conclusion, the most relevant aspect of this article is that for the first time a correlation between a political and social factor such as corruption and a biologic factor such as antibiotic resistance is statistically assessed and proved to correlate. The authors of this article have launched a provocation:

it will be interesting if the government, especially of those countries where corruption is higher, will promote studies to validate or reject the results of this study. We add another provocation: looking at the countries with low and high scores in corruption and knowing the reported levels of tax evasion in those countries, could a positive correlation be found also between the level of tax evasion and antibiotic resistance? Maybe it is that the levels of respect of the general rules of living and reasoning together underscore and explain the potential relationships of such different phenomena?

References

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