

Title: RESPONSE SYSTEM TO 2,4-D HERBICIDE CAN SELECT MULTIPLE DRUG RESISTANCE IN BACTERIA

Authors: Salazar, S.M.C.H.¹, Oliveira, E.P.¹, Tullio, L.D.¹, Emiliano, J.¹, Albino, U.B.², Aleixo, M.¹, Fonseca, A.¹, Beltrame, F.L.¹, Pileggi, S.A.V.¹, Pileggi, M.¹

Institution: ¹UEPG – Universidade Estadual de Ponta Grossa, Programa de Pós-Graduação em Biologia Evolutiva (Avenida General Carlos Cavalcanti 4748 - 84030-900 – Uvaranas - Ponta Grossa - PR), ² Faculdade de Ciências Biológicas – Universidade Federal do Pará – Altamira – PA

Summary:

The herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) has systemic action for the control of broad-leaved weeds, and is also known for high toxicity to plants, animals and it is a in environmental contamination agent. The 6th edition of the Brazil Sustainable Development Indicators (SDI) from the Brazilian Institute of Geography and Statistics (IBGE) shows that the use of pesticides more than doubled between 2000 and 2012 and the 2,4-D is the fourth most traded commodity. Another public health problem, apparently not related to herbicides, is the development of antimicrobial multi-resistant organisms. There is a high amount of antimicrobial agents, mainly present in the hospital environment. Our research group has studied non-specific responses in bacteria subjected to stress in different environments. In this work, bacterial strains isolated from different environments, with different stressors, were studied for the interference between 2,4-D herbicide tolerance and antimicrobial resistance. The following bacterial strains were used in this work: isolates from water used for rinsing herbicides containers, maintained therein for six months; endophytes isolated from *Lolium multiflorum* (ryegrass); and strains related to nosocomial infection (*Escherichia coli*, *Staphylococcus aureus*, *Micrococcus luteus*, *Proteus mirabilis* and *Klebsiella pneumoniae*). Tolerance tests showed that the strains isolated from water have the highest levels of tolerance to the 2,4 D herbicide. Analyses by HPLC and culture media revealed the presence of strains in water collection with capacity to degrade 2,4-D and to use this herbicide as carbon source. However, antibiograms data indicated the most striking evidence that these strains also have a higher multiresistant profile than the other bacteria studied in this research. We suggest that a non-specific responses system, analyzed for herbicides in our laboratory, is also possible for antibiotic resistance in environmental bacteria. This system could provide an additional level of fast adaptation to environments with high turnover of herbicides, and antibiotics. Therefore, it is possible the existence of selection of antibiotic multi-resistant bacteria outside of the hospital environment, and without the presence of the antimicrobial substance. It is a serious problem for public health.

Keywords: 2,4-D herbicide, bacterial environment, bioremediation, microbial adaptation, oxidative stress

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