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Phage therapy: A crosslink between human and plants bacterial infection

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Bacteria are under constant attack by bacteriophages (phages), the most abundant life forms in the biosphere. This work describes how the phage therapy is an efficient way to contrast the bacterial infection regardless the host. Here, we describe the activity of phage in both plant and chicken meat. All the experiment carried out are with phage complex with the hydroxyapatite, since many years, hydroxyapatite is being explored as vehicle for drug targeting, transfection, bone scaffolds and implant coating materials and for these reasons we evaluated the effect of this mineral for the bacteriophage therapy. At first, we validated the antimicrobial activity of the phage and its possible direct administration into the plant xylem. We next performed both *in vivo* and *in vitro* experiments to assess the activity of the bacteriophage in association with hydroxyapatite (Figure 1); secondly, we demonstrate that the hydroxyapatite/bacteriophage complex was able to reduce the bacterial load of *Salmonella* Rissen in previously infected minced meat, respective to bacteriophage or hydroxyapatite alone (Figure 2).

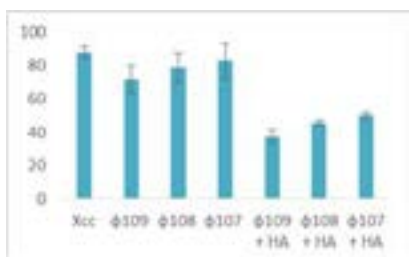


Figure 1: Kohlrabi seeds, cv Morre – very sensitive to the disease – were seeded in 60 holes styrofoam trays filled with steamed peat mixture. All of the experiments were carried out in a glasshouse with a temperature of $15\pm 2^{\circ}\text{C}$ (night) and $25\pm 2^{\circ}\text{C}$ (day). Seedlings were inoculated using a hand-held plastic sprayer with saline, phage, Xcc, or bacterium- phage suspension supplemented with Tween 20 (one drop per 100 ml). Ten-12 days after inoculation, infection symptoms were

rated according to a four degrees empirical scale: 0 (no symptom) to 3 (all leaves with symptoms and/or strong defoliation). The non-transformed values of the McKinney indexes were submitted to analysis of variance (ANOVA) and the significance of the differences was calculated by Tukey's (multiple range) test ($p=0.05$).

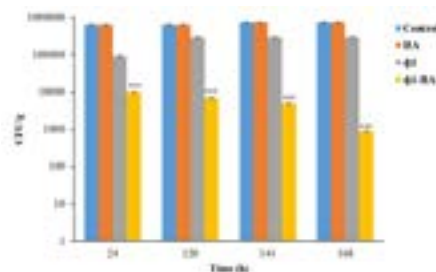


Figure 2: Bacterial reduction assay on minced meat. The samples of the meat were infected with S.Rissen (103 CFU/mL) and were treated with: hydroxyapatite (HA; 100 mg/mL) or bacteriophage (1; 108 PFU/mL) or bacteriophage-hydroxyapatite complex (1+HA; 108 PFU/mL and HA; 100 mg/mL). Positive control (Control) was represented by S. Rissen infected meat. *** $p < 0.001$. Each value is the mean \pm DS of 3 independent experiments with 3 replicates each. Statistical analysis was performed with Student's t test.

Recent Publication

1. Papaiani M, Contaldi F, Fulgione A, Woo S L, Casillo A, Corsaro M M, Parrilli E, Marcolungo L, Rossato M, Delledonne M, Garonzi M, Iannelli D and Capparelli R (2018) Role of phase 1 in two strains of *Salmonella* Rissen, sensitive

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- and resistant to phage 1. BMC microbiology 18(1):208.
2. Carrieri R, Manco R, Sapio D, Iannaccone M, Fulgione A, Papaiani M, de Falco B, Grauso L, Tarantino P, Ianniello F, Lanzotti V, Lahoz E and Capparelli R (2017) Structural data and immunomodulatory properties of a water-soluble heteroglycan extracted from the mycelium of an Italian isolate of *Ganoderma lucidum*. *Natural Product Research* 31(18):2119-2125.
 3. Papaiani M, Cosenza G, Borriello G, Galiero G, Grasso F, Della Ventura B, Iannaccone M and Capparelli R (2016) The tumor necrosis

factor g1022G>A polymorphism is associated with resistance to tuberculosis in water buffalo (*Bubalus bubalis*). *Animal Genetics* 48(2):250-251.

Biography

M Papaiani received her Bachelor's Degree from Biology at the University of Naples "Federico II" and Master Degree from Biology at the University of Benevento "Università del Sannio" her study experiences continued thanks to PhD student in Biotechnology of the XXXII cycle. Her scientific curiosity and the strong attitude for research have always allowed me to distinguish myself in my projects.

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