

Parasitism as a positive relationship for the host from the perspective of larval therapy

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Recibido para publicación: 27-02-2026. Versión corregida: 28-02-2026. Aprobado para publicación: 27-03-2026.

Modelo de citación

Bastidas Pacheco G. **Parasitism as a positive relationship for the host from the perspective of larval therapy**. Arch Med (Manizales). 2026;26(1). <https://doi.org/10.30554/archmed.26.1.5603.2026>

EDITORIAL COMMITTEE ARCHIVOS DE MEDICINA (MANIZALES)

Parasites (etymologically, referring to those that feed off others), organisms that in order to survive live inside or outside another being (the host) temporarily or permanently, almost always to the detriment of the latter, can also have positive effects on those who harbour them, by interacting in their different evolutionary forms (even their molecules) with various mechanisms in human and non-human animals, in a symbiotic relationship for mutual benefit [1, 2].

Parasitic evolution in response to the host's immune system has allowed it to manipulate it to its advantage, based on the production of immunomodulatory molecules against specific immunity and even against much of its entire immune system, in search of the best parasitic state, one that does not excessively harm its host or that contributes to improving it [2, 3].

In this regard, the beneficial role of parasites on the host is mentioned in larval therapy, biosurgery or debridement therapy (controlled myiasis) are mentioned, which are crucial in the healing of wounds infected with antibiotic-resistant microorganisms because they develop (specifically feed) in decomposing and putrefying environments or tissues without affecting healthy tissue, and can reach deep cavities and crevices in wounds that are difficult to access for manual debridement because they are photophobic. The larvae generally used in this therapy belong to the Calliphoridae family, and the preferred species is *Lucilia sericata* (syn. *Phaenicia sericata*) [2, 4].

Furthermore, in vitro experimental trials with *L. sericata* larvae have demonstrated the antibacterial activity of their secretions, as they contain the enzyme chymotrypsin, which inhibits biofilm; in addition, larval secretions increase angiogenesis and vascular endothelial cell migration (by promoting the migration of fibroblasts and keratinocytes). Larval therapy has also been used in the treatment of ulcers (due to pressure or venous stasis), burns, neuropathies, polycythaemia, thalassaemia, Buerger's disease and inflammations such as mastoiditis and bone marrow inflammation [5].

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It should be noted that there is a synergistic effect between drug therapy and biosurgery (with larval waste and secretions), i.e., the antimicrobial action of antibiotics is enhanced, especially with gentamicin, flucloxacillin, daptomycin, and ciprofloxacin. At the same time, larval therapy modulates the complement system (inhibiting its pathways and degrading its proteins) to prevent its inappropriate activation from seriously damaging the tissue by remaining in the inflammatory healing phase. added to this is the ability of larval secretions to inhibit neutrophils and monocytes (in their pro-inflammatory response) without affecting phagocytosis [6].

In summary, laboratory tests and clinical trials have unequivocally demonstrated the usefulness of larval therapy in the selective and safe treatment of inflammatory pathologies, as it allows rapid debridement of necrotic tissue, enhances the effect of antibiotics, modulates the harmful effect of complement on the cellular matrix, stimulates healing through angiogenesis and the migration of vascular endothelial cells (granulation tissue, i.e., new and healthy tissue), and is a therapy that reduces treatment costs for the affected individual and for the healthcare system of countries, as it reduces hospitalisations and surgical interventions and favours outpatient treatment.

Conflict of interest

The author declares that there are no conflicts of interest.

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