

Polybia paulista Ihering, 1896

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Wasp is found mainly in the southeastern region of Brazil. This species of wasp gained international prominence when scientists discovered the MP1 substance in its venom, which has a high power to damage cancer cells. **Size:** About 1.5cm. **Black** color (Figure 1) [1-3].



Figure 1. *Polybia paulista* Ihering, 1896. Source: <https://oglobo.globo.com/saude/estudo-mostra-como-veneno-de-vespa-brasileira-pode-matar-celulas-de-cancer-17373131>.

Diet: The paulistinha wasp captures caterpillars and takes them to the nest to feed their larvae. They can also feed on insects and dead animals. **Habitat:** The wasp builds closed nests generally in soils. These strongholds are made from the fibers of dead wood trunks and branches. **Impact:** Wasps can cause health problems for people allergic to stings. It can even cause death in extreme cases. They can spread damage caused by other pests and diseases [3-5].

The species gained international notoriety after researchers found in its venom a toxin called MP1, with high power to destroy cancer cells. Considering that the toxin does not affect healthy cells, but only cells that harm the body, scientists believe that further studies on it could revolutionize cancer treatment. Its venom is so powerful and complex that it has captured the attention of scientists for decades (Figure 2) [5-7].

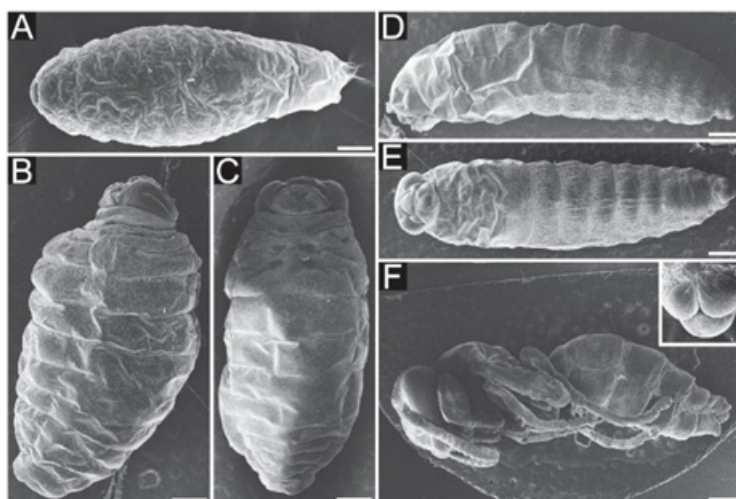


Figure 2. Immature stages of *Polybia paulista* Ihering, 1896: (A) ventral view of first instar larva; (B) side view of a fifth instar larva; (C) ventral view of a fifth instar larva; (D) lateral view of the prepupa; (E) ventral view of the prepupa, showing the last abdominal somite in insertion; (F) side view of the pupa. Scale bar sizes: (A) 0.185 mm; (B) 0.575mm; (C) 0.650mm; (D) 0.925mm; (E) 0.925mm; (F) 1,200mm. Source: https://www.researchgate.net/figure/Immature-stages-of-Polybia-paulista-A-ventral-view-of-a-first-instar-larva-B-side_fig2_262090938.

More than a hundred proteins and peptides smaller molecules have already been discovered and it is suspected that there are still more to be discovered. One of these peptides has a powerful antibacterial action, allowing the paulistinha to keep its nests protected against bacteria. Hence the scientific interest in its poison arose. It could be an alternative to overcome the growing resistance to antibiotics. This peptide, known as MP1, also attacks cancer cells of some types of cancer [8-9].

This cytotoxic effect is not uncommon, but the detail is that MP1 does this by binding with two lipids (fat molecules) that cells with some types of cancer prostate and bladder, as well as an especially drug-resistant variant of leukemia expressed on the outside of their membranes, and in healthy cells they remain “hidden” in their inner wall. That is why a medicine based on this compound has the potential to kill only diseased cells (Figure 3) [10-12].



Figure 3. *Polybia paulista* Ihering, 1896 observed in Brazil. Source: Joás (licensed under <http://creativecommons.org/licenses/by-nc/4.0/> and <https://www.inatu.../photos/351087139>).

References

- [1] Ángel M. The venom of a Brazilian wasp (*Polybia paulista*) can kill cancer cells [Internet]. Madrid: EL PAÍS; @2015 [cited 2024 Mar 22]. Available from https://brasil.elpais.com/brasil/2015/09/01/ciencia/1441100654_055665.html.
- [2] Souza CL, et al. Revisiting *Polybia paulista* wasp venom using shotgun proteomics – Insights into the N-linked glycosylated venom proteins. 2019; 200(30): 60-73.
- [3] Aragão M, Andena SR. The social wasps (Hymenoptera: Vespidae: Polistinae) of a fragment of Atlantic Forest in southern Bahia, Brazil. *Journal of Natural History*. 2016; 50(23-24): 1411-1426.
- [4] Perez-Riverol A. Wasp venom: Unravelling the toxins arsenal of *Polybia paulista* venom and its potential pharmaceutical applications. 2017; 161(24): 88-103.
- [5] Created MA. The venom of a Brazilian wasp can kill cancer cells [Internet]. City Mexico: The wasp '*Polybia paulista*' produces a toxin that only attacks tumor foci; @ 2023 [2024 Mar 22]. Available from https://brasil.elpais.com/brasil/2015/09/01/ciencia/1441100654_055665.html.
- [6] Wine JFC. Trypanocidal action of a mastoparan from *Polybia paulista* and its possible mechanism of action [Ph.D. dissertation]. Fortaleza: Federal University of Ceará; 2015.
- [7] Baima C. Study shows how Brazilian wasp venom can kill cancer cells [Internet]. São Paulo: O Globo; @2015 [cited 2024 Mar 22]. Available from <https://oglobo.globo.com/saude/estudo-mostra-como-veneno-de-vespa-brasileira-pode-matar-celulas-de-cancer-17373131>.
- [8] Galeano ZJG. Morphological and glandular changes associated with age polyethism in *Polybia paulista* (Hymenoptera: Vespidae) [P.h.D. dissertation]. Ribeiro Preto: University of São Paulo; 2010.

- [9] Oliveira MRP, Reche PM, Bittencourt LS. Occurrence of accidents caused by wasp stings in Ponta Grossa. *Biological and Health*. 2020; 26(1): 6-15.
- [10] Bernd LA. Anaphylaxis: practical guide to management. *Brazilian Journal of Allergy and Immunopathology*. 2006; 29: 283-291.
- [11] Bischof RO. Seasonal incidence of insect stings: "Autumn yellow jacket delirium". *Journal of family practice*. 1996; 43(3): 271-273.
- [12] Alves DJ. Genetic analysis of natural populations of *Polybia paulista* Ihering, 1896 (Hymenoptera: Epiponini). [P.h.D. dissertation]. Maringa: Maringá State University; 2011.