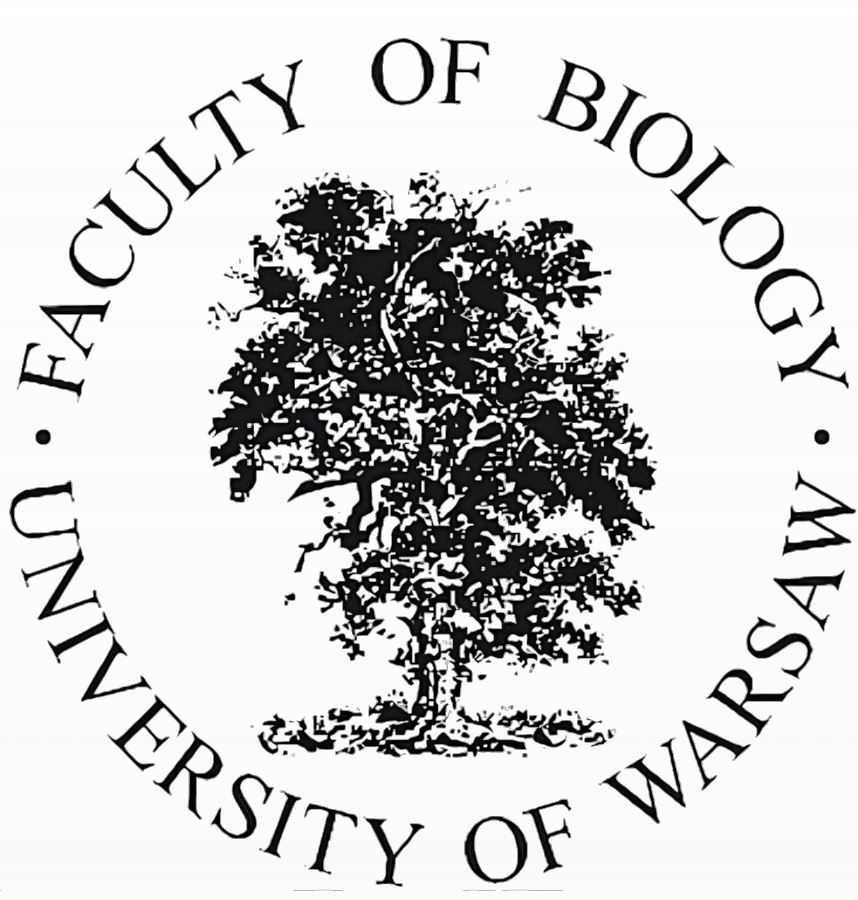




The virulence potential of *Prototheca* microalgae as assessed by histopathological and microbiological studies in a murine model



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Prototheca spp. are unicellular, non-photosynthetic microalgae, known to cause opportunistic infections in vertebrates¹. The aim of this work was to investigate the virulence potential of the *Prototheca* algae by assessing their ability to induce local or systemic infections in an experimental murine model.

Methods

Type strains of three pathogenic (*P. wickerhamii*, *P. bovis*, and *P. ciferrii*) and one saprophytic (*P. stagnora*)² species were used to experimentally infect immunocompetent (BALBc/AnNRj) and immunodeficient (BALBc/NUDE) mice. The study was carried out on 54 groups (6 individuals per each) depending on the inoculum (algae or PBS as a control), the challenging dose (i.e. 5×10^6 or 5×10^7 CFU/mL), and inoculation route (intramammary, intraperitoneal and subcutaneous). The inocula were applied to 10-week, female mice. The animals were euthanized 6 weeks post-infection, and their organs were explanted, weighed, and sent for microbiological and histopathological examination. For each organ relative severity of inflammatory changes were assessed with the use of standard inflammatory scales (INHAND – International Harmonization of Nomenclature and Diagnostic Criteria).

Relative severity of inflammatory changes [%] = obtained points/ maximum number of points to be obtained

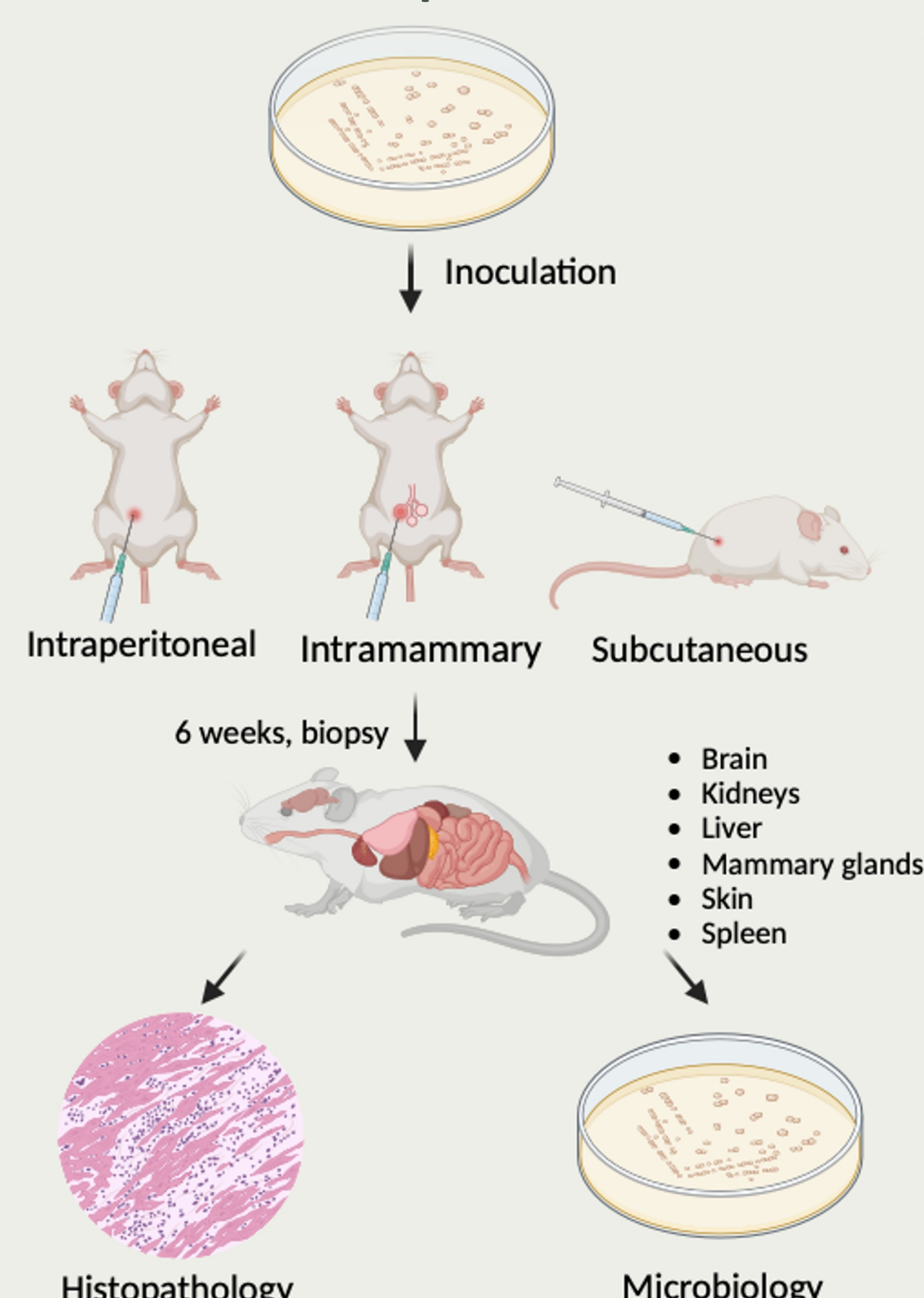


Fig. 1. *Prototheca* spp. infection model.

Conclusions

- ❑ The highest virulence potential was observed for *P. ciferrii*.
- ❑ Immunodeficient mice were more prone to develop *Prototheca* infection.
- ❑ Microbiological culture was more sensitive than histopathology.

References

- ¹Jagielski T, Lagneau PE. 2007. Protothecosis. A pseudofungal infection. J Mycol Médicale 17:261–270.
- ²Jagielski T, Bakula Z, Gawor J, Maciszewski K, Kusber WH, Dyląg M, Nowakowska J, Gromadka R, Karnkowska A. 2019. The genus *Prototheca* (Trebouxiophyceae, Chlorophyta) revisited: implications from molecular taxonomic studies. Algal Res 43:101639.

Results

A third (29.9%) of wild-type mice and nearly half (45.8%) of immunodeficient animals showed signs of infection. *Prototheca ciferrii* accounted for the majority of infections (40.4%), followed by *P. bovis* (30.3%), and *P. wickerhamii* (22%). Only 7.3% of infections were due to *P. stagnora*. All routes of inoculation yielded a similar number of infected individuals, with the efficiency of infection ranging from 31.2 to 35.8%. Mammary glands were the most commonly (53.2%) affected organs in both healthy and immunodeficient animals. Microbiological culture had an edge over the histopathological analysis in providing experimental proof of infection, with the level of detection of 75.2% and 66.1%, respectively. The most significant inflammatory changes were observed in the spleen and kidneys, whereas brain and liver were the least affected.

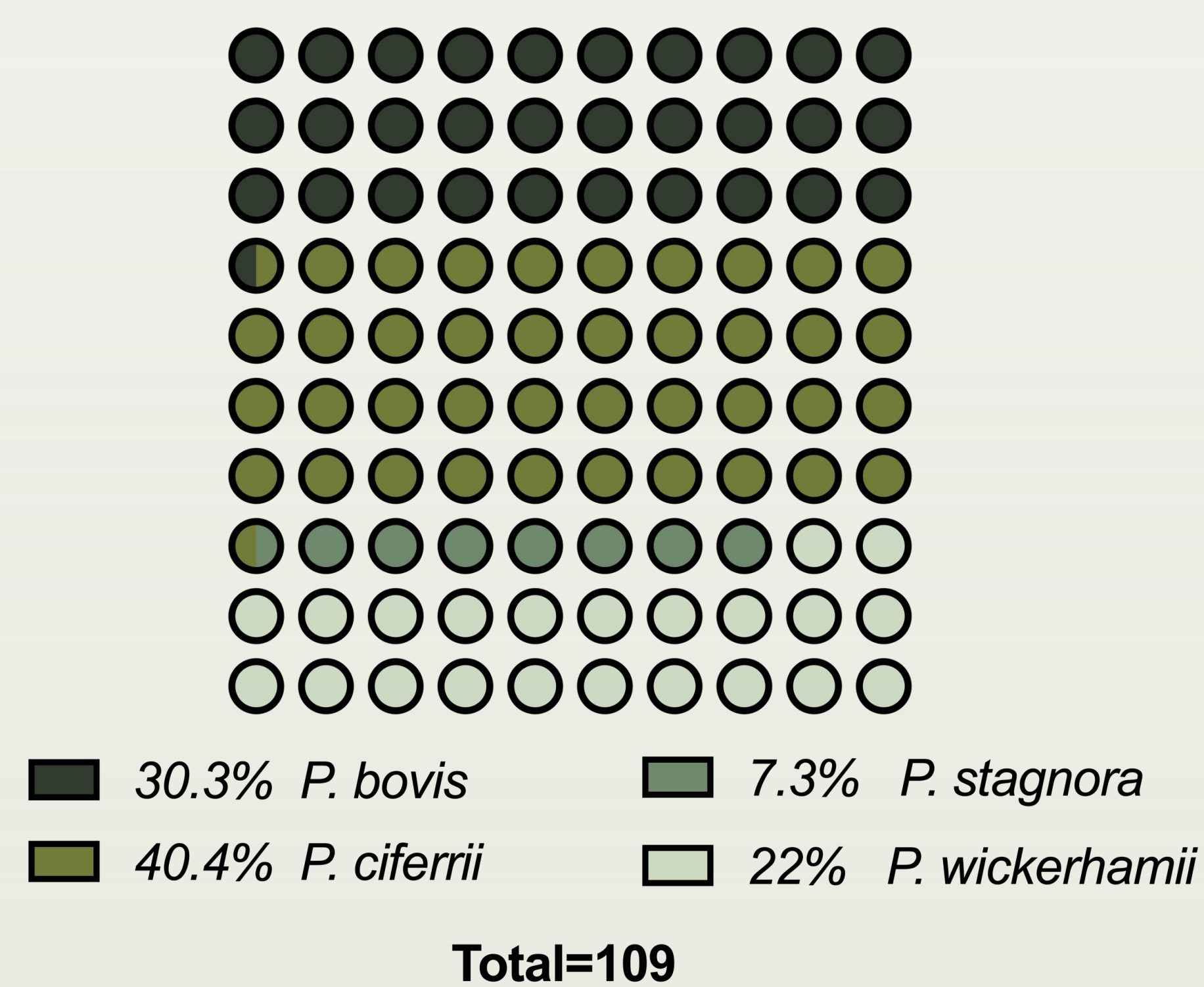


Fig. 2. Percentage of infected mice upon *Prototheca* sp. injection.

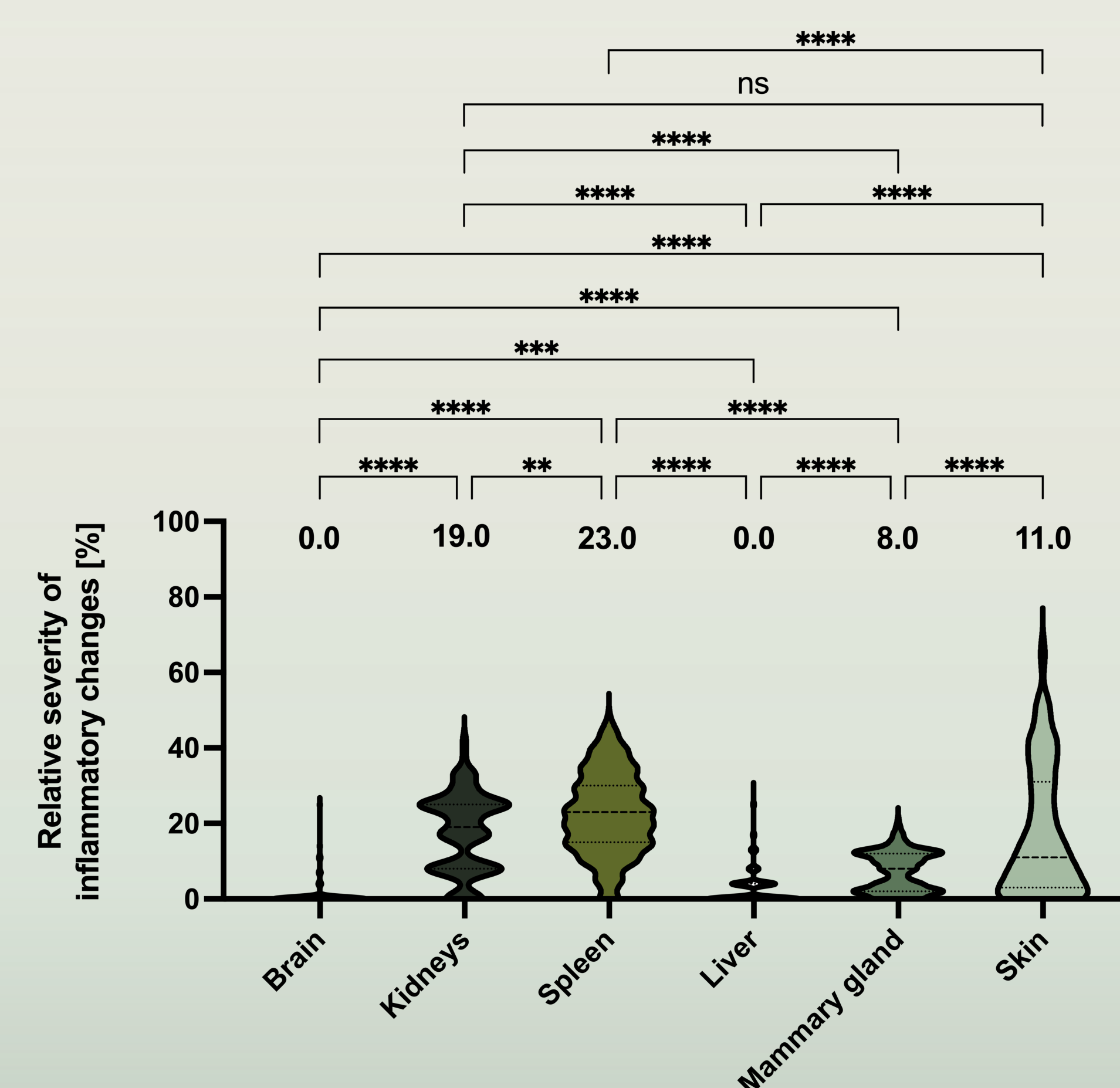


Fig. 3. Occurrence of inflammatory changes upon *Prototheca* sp. injection.

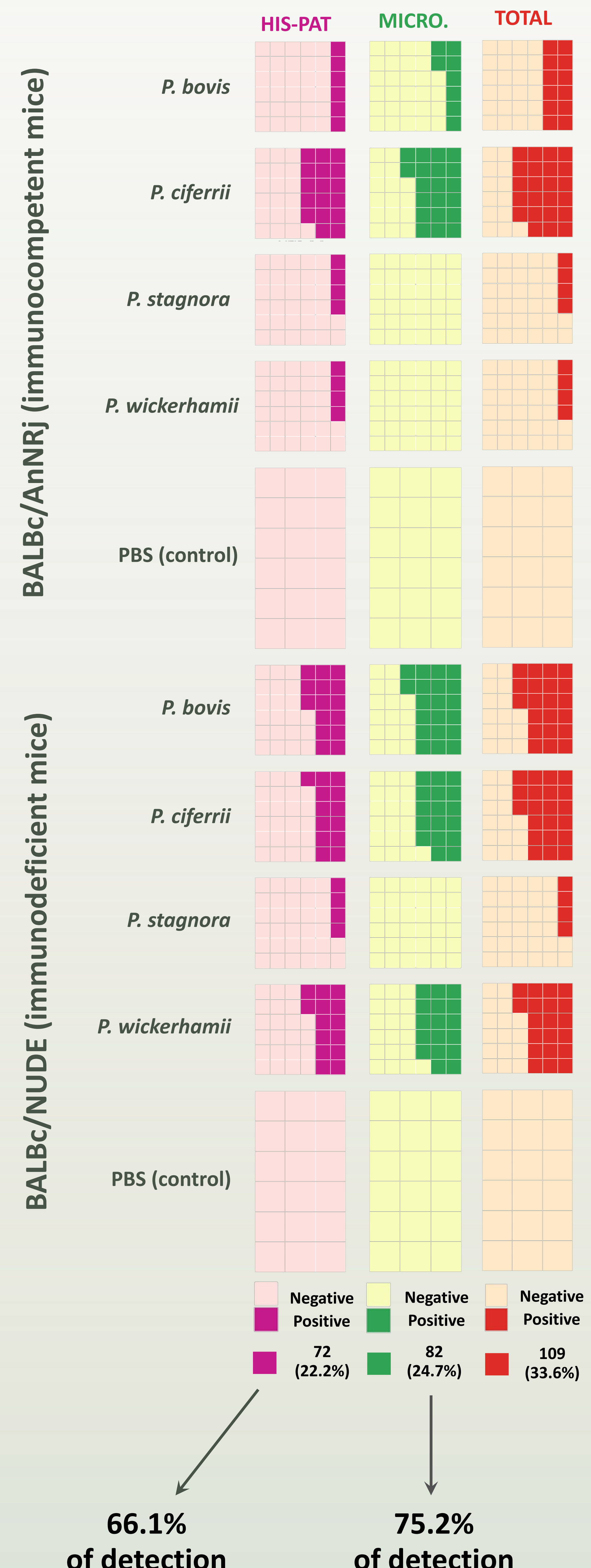


Fig. 4. Comparison of histopathological and microbiological detection of *Prototheca* sp. infection.

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