Ecology of tumour transmission in the freshwater cnidarian Hydra oligactis

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Résumé

While tumours, both benign and malignant, are ubiquitous in multicellular organisms, our understanding of the ecology and evolution of host-tumour interactions in the wild remains limited. This is particularly true in rare cases of transmissible tumours. The potential transmission of tumour cells suggests evolutionary parallels with infectious agents, classifying them as a "new species of parasite". However, this field remains largely unexplored, mainly due to the scarcity of biological models and/or difficulty of studying them in nature. These limitations hinder our understanding of the evolutionary ecology of host-transmissible tumour interactions. Transmissible tumours in freshwater cnidarian *Hydra oligactis* represent a unique case wherein tumour cells and the specific microbiome associated with them are transmitted vertically during asexual reproduction (i.e. from parental individuals to their buds). Due to its easy maintenance in the laboratory, the hydra-vertically transmissible tumour system serves as an appropriate model for providing new insights into the ecology and evolution of host-tumour interactions. By monitoring the offspring produced by the hydra tumoral strain at different stages of tumorigenesis, we address the following questions: **I**) To what extent polyps that are developing tumours while still asymptomatic present a risk of tumour transmission to their offspring? **II**) Once symptomatic, is there a correlation between the age of tumour onset, the degree of symptomatology exhibited by a polyp, and the age of tumor appearance in its descendant buds? **III**) Do the rare healthy descendants of tumoral polyps have particular life history traits compared to those that have been infected? **IV**) What is the microbiome trajectory before and after tumour development? We found that tumoral hydra are infectious at any age for their offspring, whether they were during their asymptomatic or symptomatic phases, with the microbiome composition and abundance remaining constant during both phases. Additionally, tumours developed earlier in offspring from parents the more advanced their tumoral progression was. Furthermore, in rare cases, despite being direct descendants of tumoral polyps, some hydras never developed tumoral phenotype. The latter exhibited a distinct microbiome composition, along with a decreased lifespan and a lower tentacle number increase over time compared to tumoral hydras. Interestingly the tumour cell transmission in these hydras, appears to be able to skip generations as transmission occurred at any age from parents to offspring. This study provides new insights into the biology of host-transmissible tumour interactions within the only known model of vertically transmitted tumours.

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Mots-Clés: Ecology, Host Tumour interactions, Hydra, Transmission, Life history traits, Microbiome