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# Can UV radiation and cadmium exposures induce tumors in freshwater invertebrates ?

Jordan MELIANI, Sophie TISSOT, Lena GUIMARD, Océane RIEU, Justine BOUTRY, Antoine M. DUJON & Frédéric THOMAS

## Introduction

Because ecosystems on our planet are now polluted by mutagenic substances to a greater extent than ever before, it is increasingly suggested that human activities are oncogenic for wildlife species. To improve our knowledge on these timely issues, experimental evidence should however complete correlative field studies. Hydras and Planarians are freshwater invertebrates which sometimes develop tumors. Hydras tumors (fig 1) are able to be vertically transmitted during asexual reproduction. Because the etiology of these atypical tumors is unknown, our objective is to explore the extent to which they could be, at least partially, linked to human activities. Specifically, this project aims at testing if UV radiation (both UV-A and UV-B, see materials & methods) and/or cadmium exposure can promote tumorigenesis, and to evaluate how transmissible these inducible tumors are. A second objective is to explore the extent to which UV & cadmium exposures induce tumors in planarians. This project not only represents an original contribution to the field of ecology in human-altered habitats, but also improves our knowledge on the evolutionary ecology of transmissible malignant cell lines, and host-tumor interactions.

## Materials & Methods

UV	UV-A (365nm)	UV-B (280nm)
Power	71.5 mw.cm <sup>2</sup>	1.6 mw.cm <sup>2</sup>
Exposure time	15 min	15 s
Exposure schedule	Five times a week	Five times a week
Individuals	Hydra : <i>Hydra Oligactis</i> (x36) Planarian : <i>Dugesia Gonocephala</i> (x36)	

Reagent	Cadmium
Concentration	0.15 ppm
Exposure time	Continuously
Exposure schedule	Daily
Individuals	Hydra : <i>Hydra Oligactis</i> (x36) Planarian : <i>Dugesia Gonocephala</i> (x36)

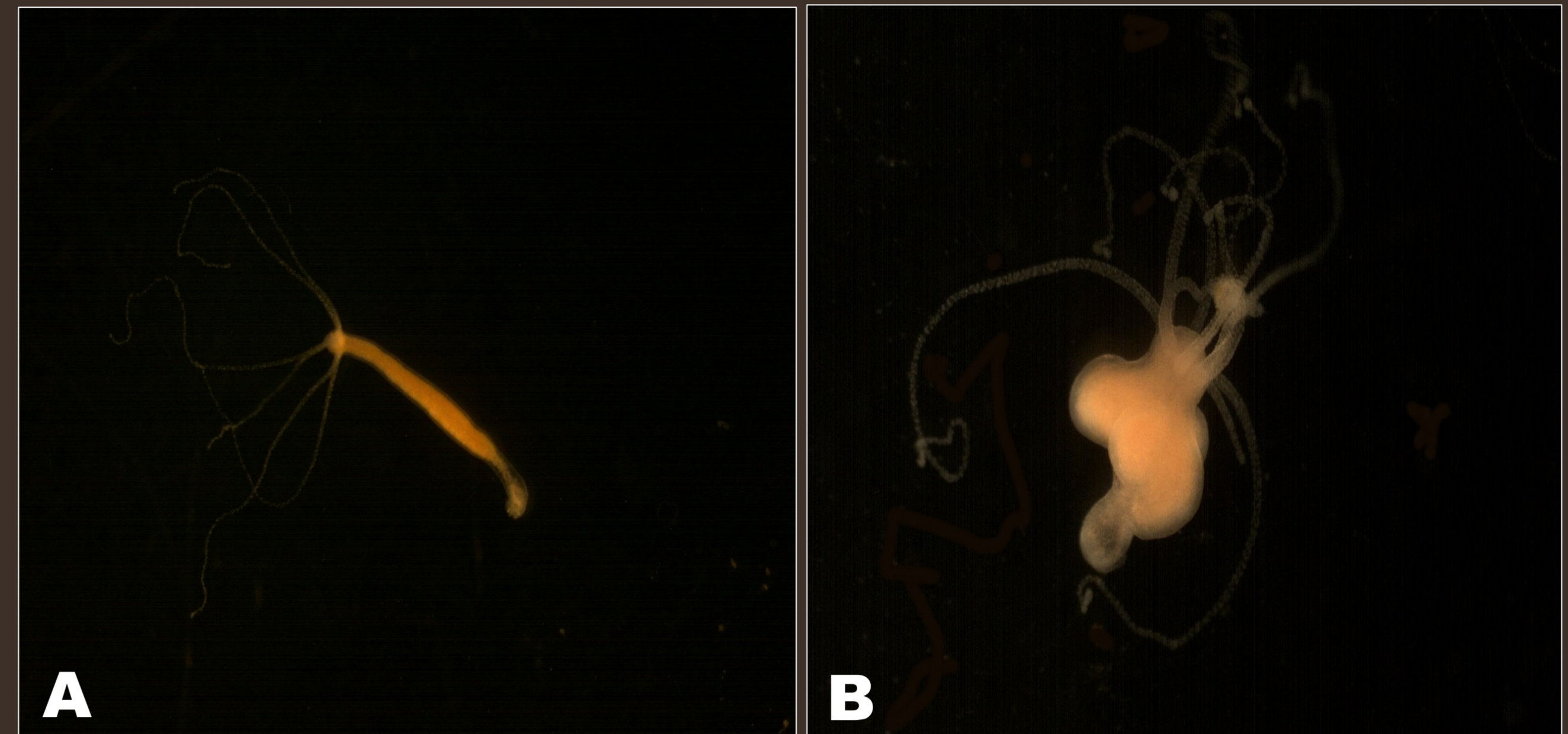


Fig 1. Healthy phenotype (A) & Tumor phenotype (B) of *Hydra oligactis*



Fig 2. Healthy phenotype of *Dugesia gonocephala*

## Preliminary results , Conclusions & Prospects

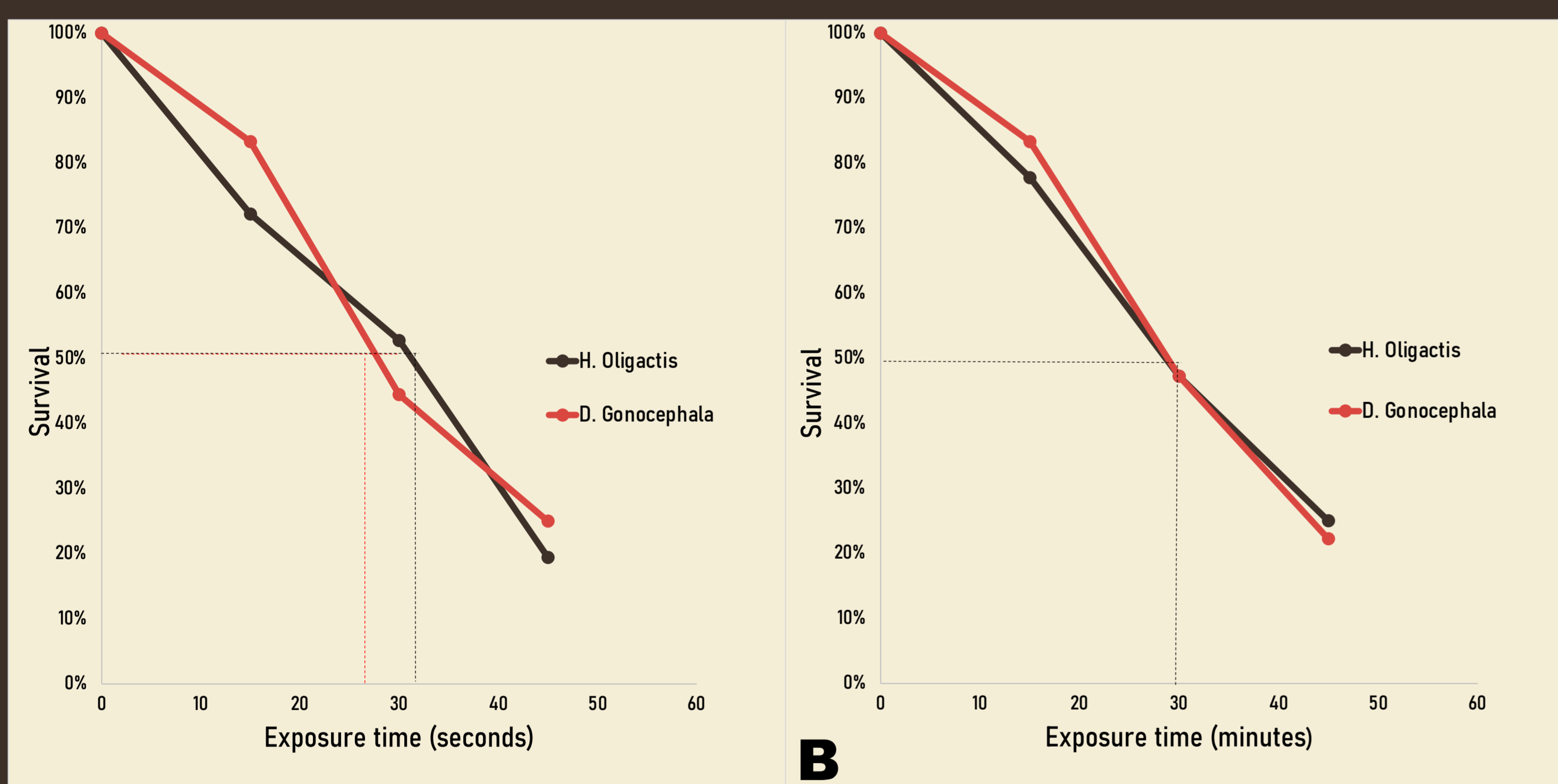


Fig 3. Determination of LC-50 value under UV-B (1.6 mw.cm<sup>2</sup>) (A) & UV-A (71.5 mw.cm<sup>2</sup>) (B) exposure

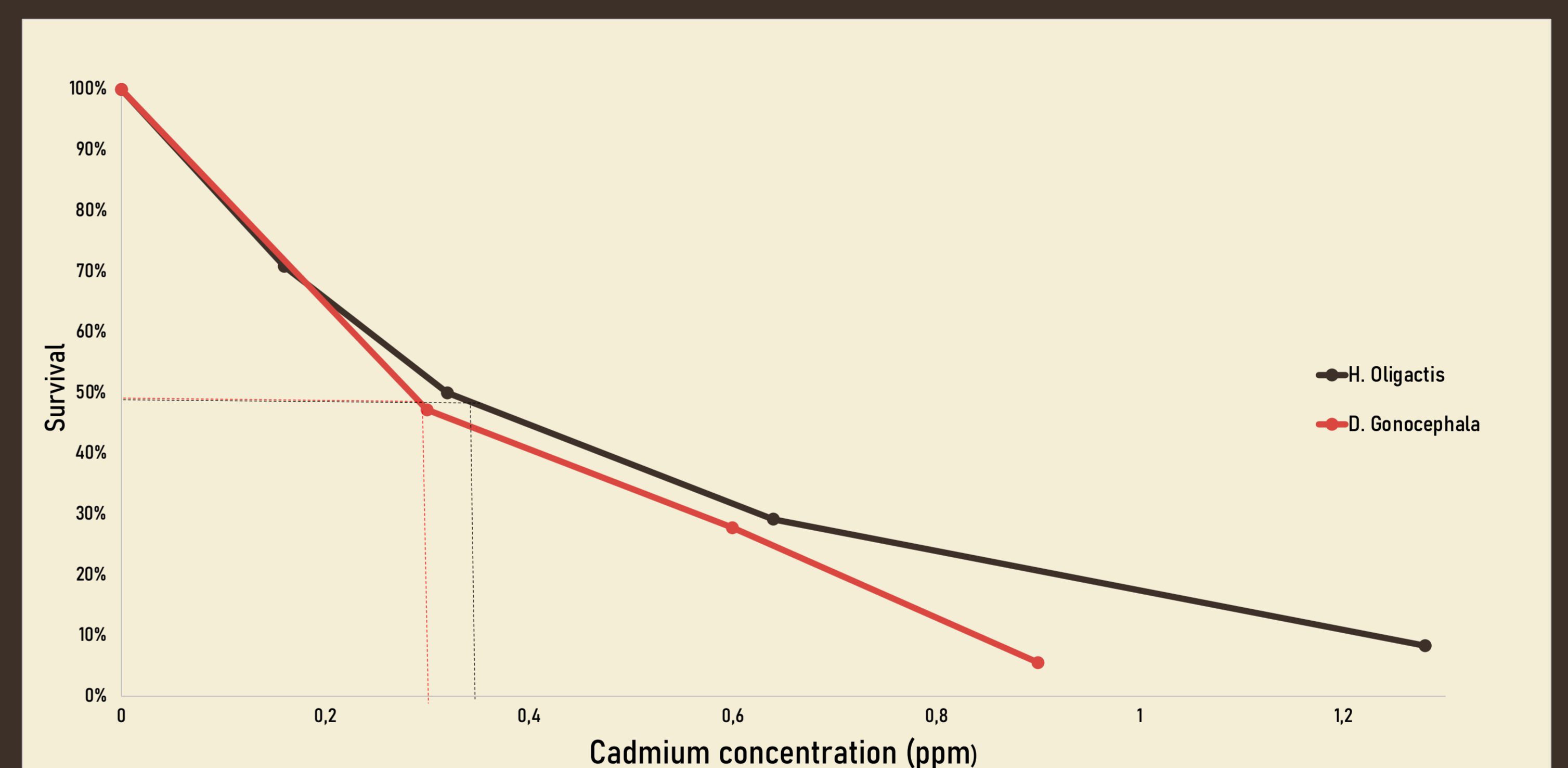


Fig 4. Determination of 96-hr LC-50 value of cadmium for *H. oligactis* & *D. gonocephala*



Fig 5. Abnormal *H. oligactis* (A & B) & *D. gonocephala* (C & D) exposed to UV-B (1.6mw.cm<sup>2</sup>)

LC-50 value for UV & cadmium on *H. oligactis* & *D. gonocephala* are presented in fig 3 & 4. To date, UV-A does not induce any visible deformation that could be linked to a phenotypic change in a healthy individual. In contrast, UV-B induces visible changes in *D. gonocephala* as well as in *H. oligactis* (fig 5). In order to know if the presence of deformations in *H. oligactis* leads to the formation of a tumor, macerations and histological sections must be performed in order to define the type of cell that has proliferated. In order to understand what type of changes are observed in *D. gonocephala*, histological observations will be performed. Exposure to a heavy metal (cadmium) does not cause visible abnormalities in *D. gonocephala* and *H. oligactis*. A plausible explanation for the non-development of malformations in our cadmium-exposed individuals would be the absence of a promoting agent such as PMA (12-O-Tetradecanoylphorbol-13-acetate) (Voura *et al.* 2017). It would be interesting to understand how different anthropogenic factors may impact tumorigenesis. This would require determining the relative contribution of the environmental changes studied here versus other anthropogenic factors.