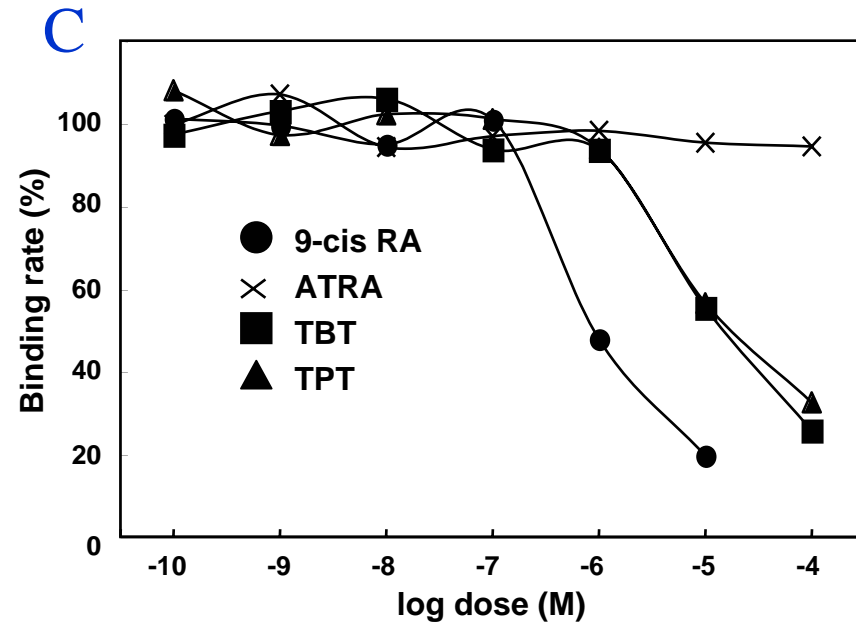
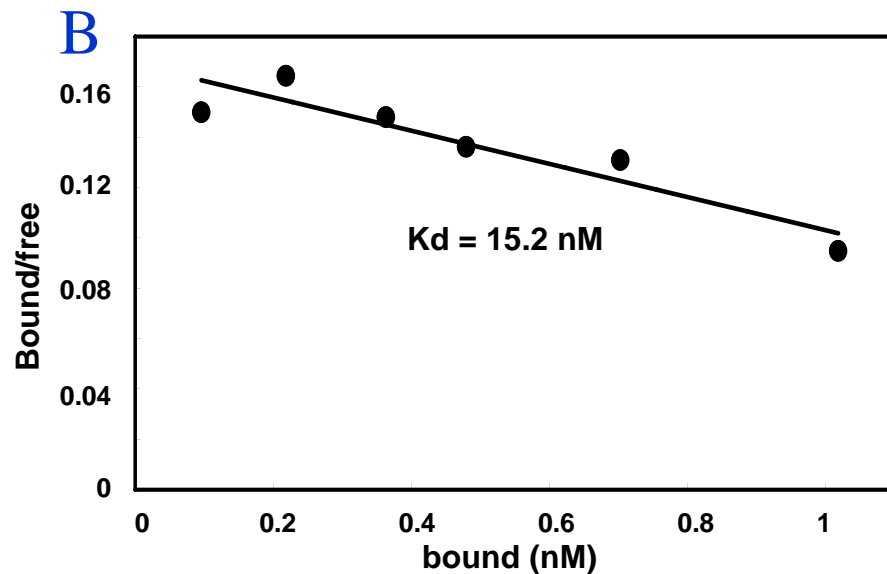
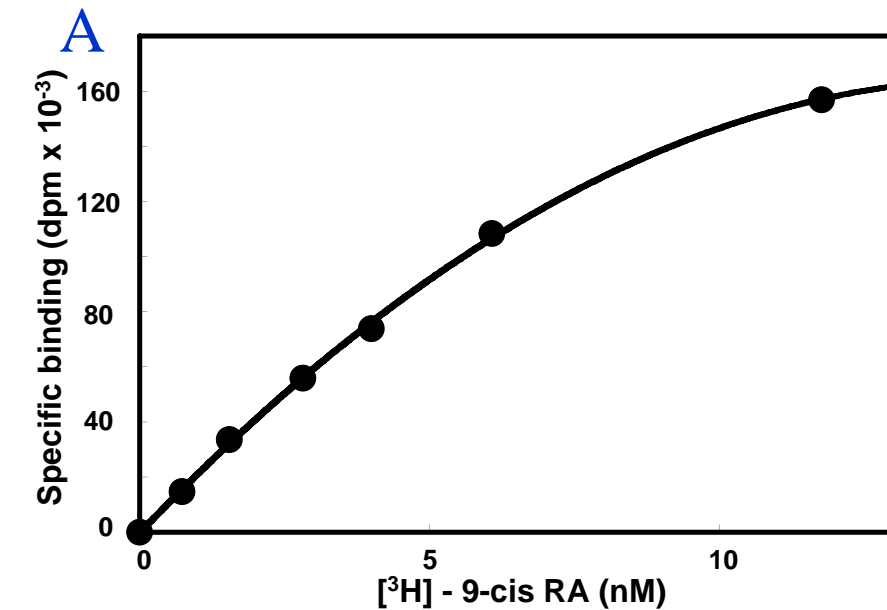


In Vitro Assays with Rock Shell RXR

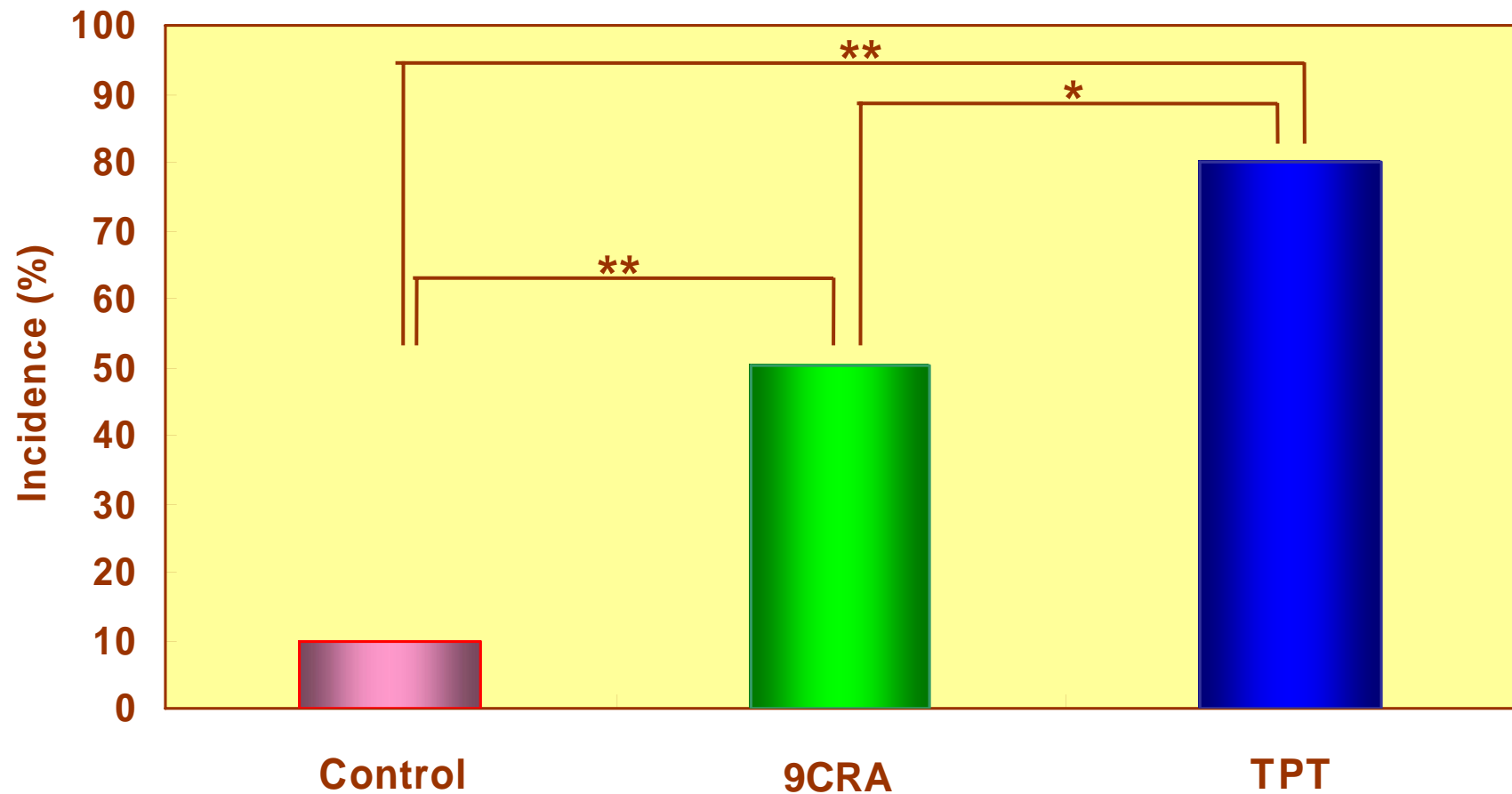


A: Binding assay
B: Scatchard analysis
C: Competition assay

Nishikawa, J., Mamiya, S., Kanayama, T.,
Nishikawa, T., Shiraishi, F., Horiguchi, T.:
Environ. Sci & Technol. **38**: 6271-6276,
2004.

Effects of 9CRA to the Development of Imposex in *Thais clavigera* (1)

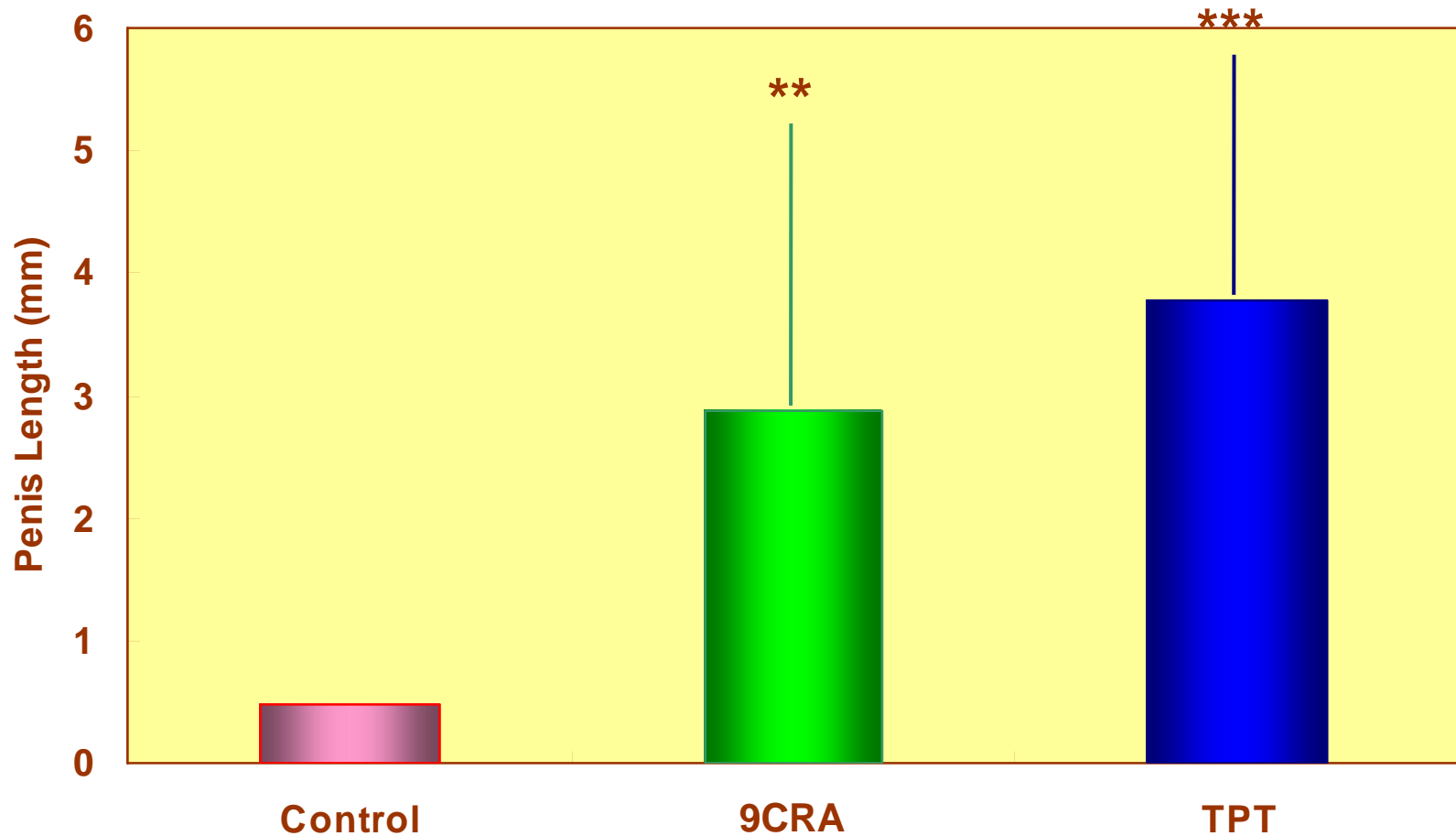
Incidence of Imposex



Nishikawa, J., Mamiya, S., Kanayama, T., Nishikawa, T., Shiraishi, F., Horiguchi, T.:
Environ. Sci & Technol. **38**: 6271-6276, 2004.

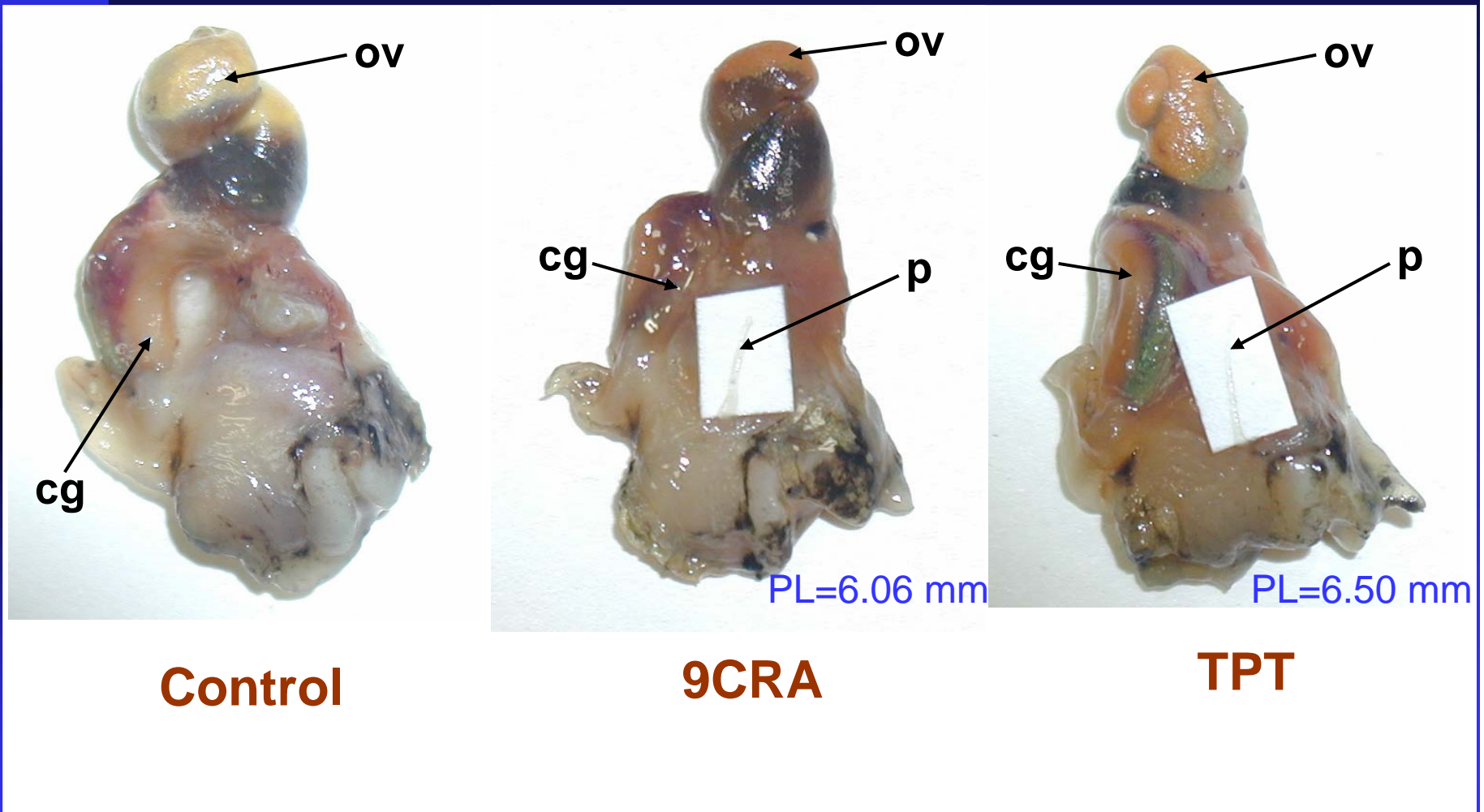
Effects of 9CRA to the Development of Imposex in *Thais clavigera* (2)

Female Penis Length



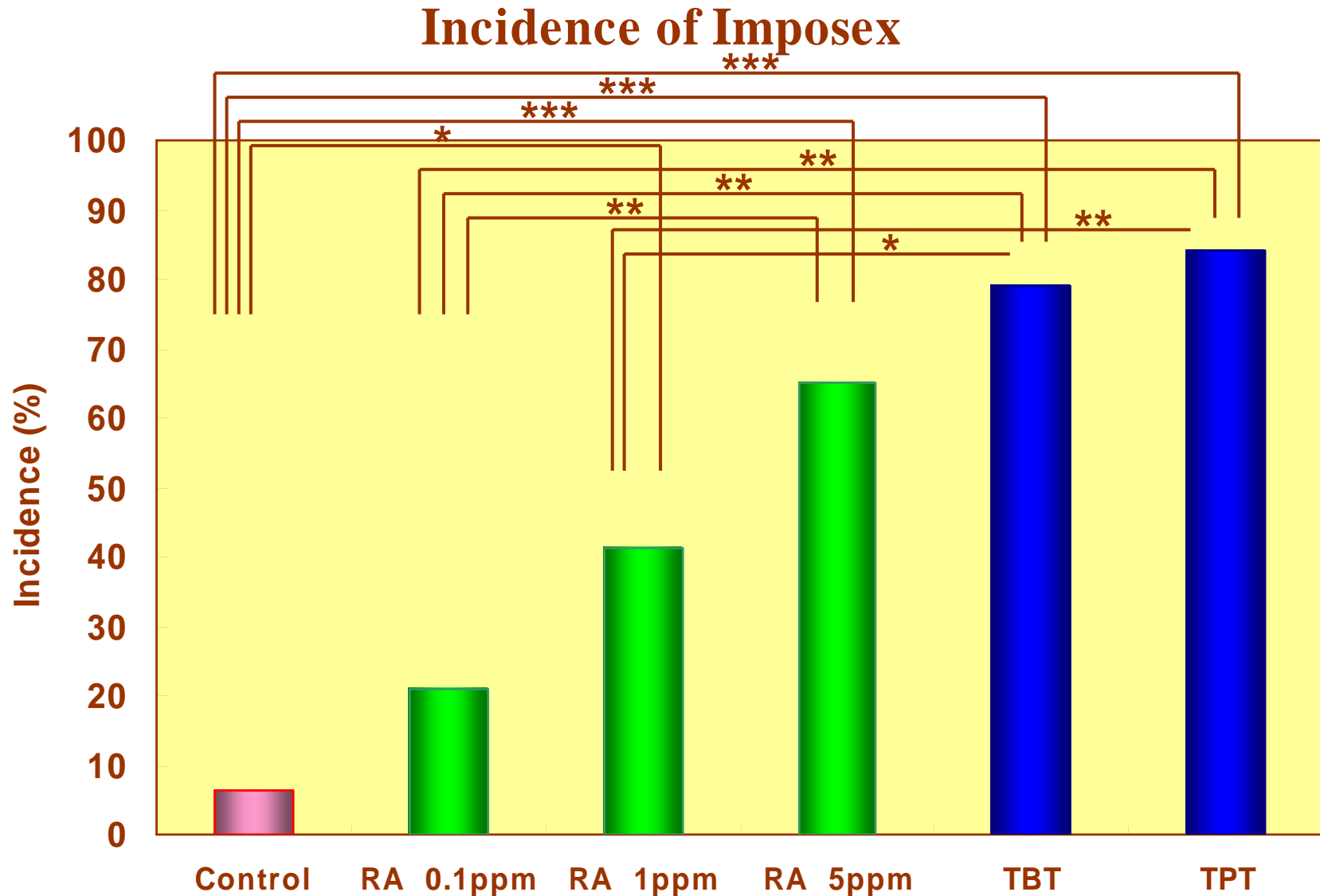
Nishikawa, J., Mamiya, S., Kanayama, T., Nishikawa, T., Shiraishi, F., Horiguchi, T.:
Environ. Sci & Technol. **38**: 6271-6276, 2004.

Effects of 9CRA to the Development of Imposex in *Thais clavigera* (3)



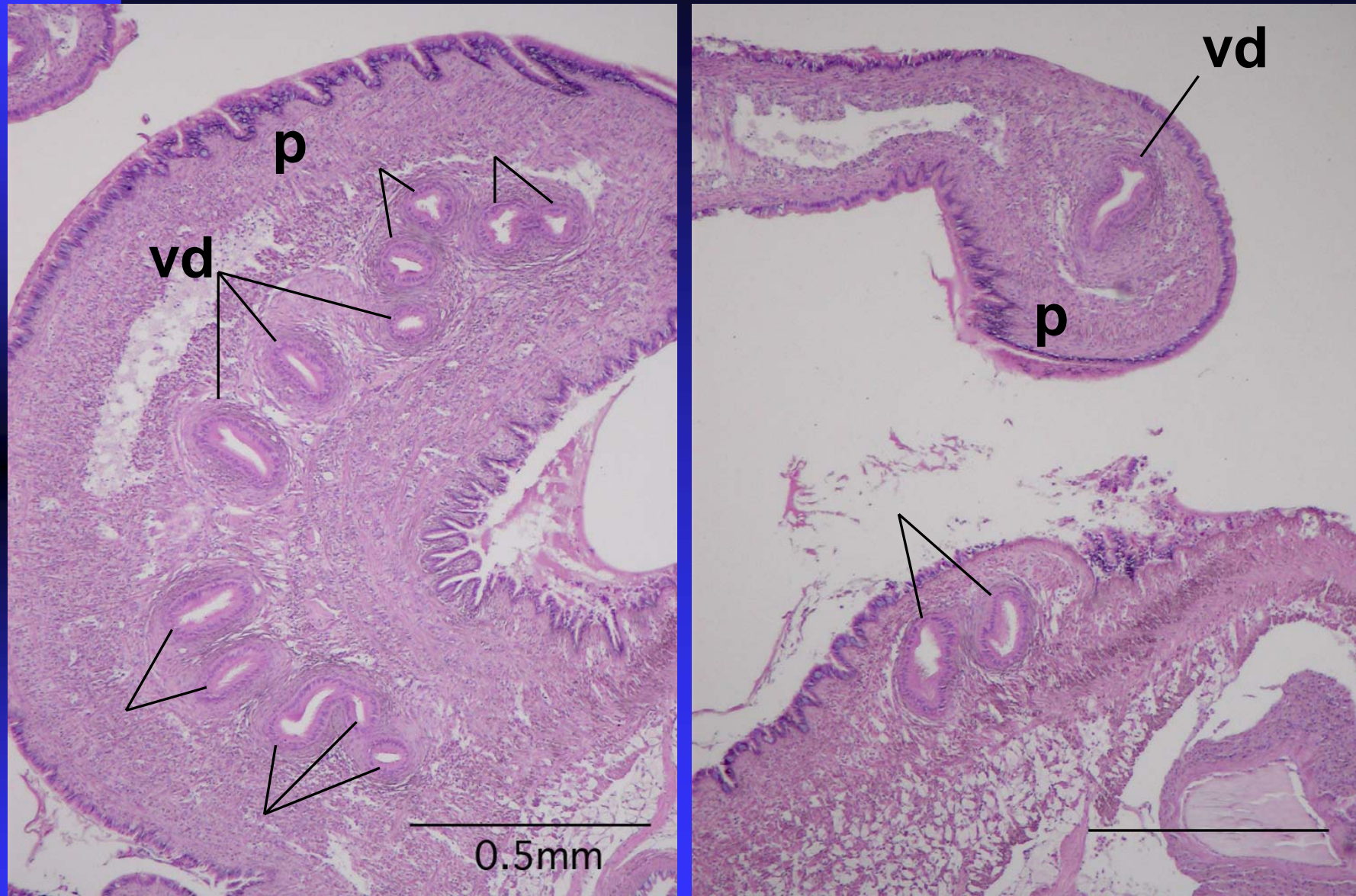
Nishikawa, J., Mamiya, S., Kanayama, T., Nishikawa, T., Shiraishi, F., Horiguchi, T.:
Environ. Sci & Technol. **38**: 6271-6276, 2004.

Effects of 9CRA to the Development of Imposex in *Thais clavigera* (4)



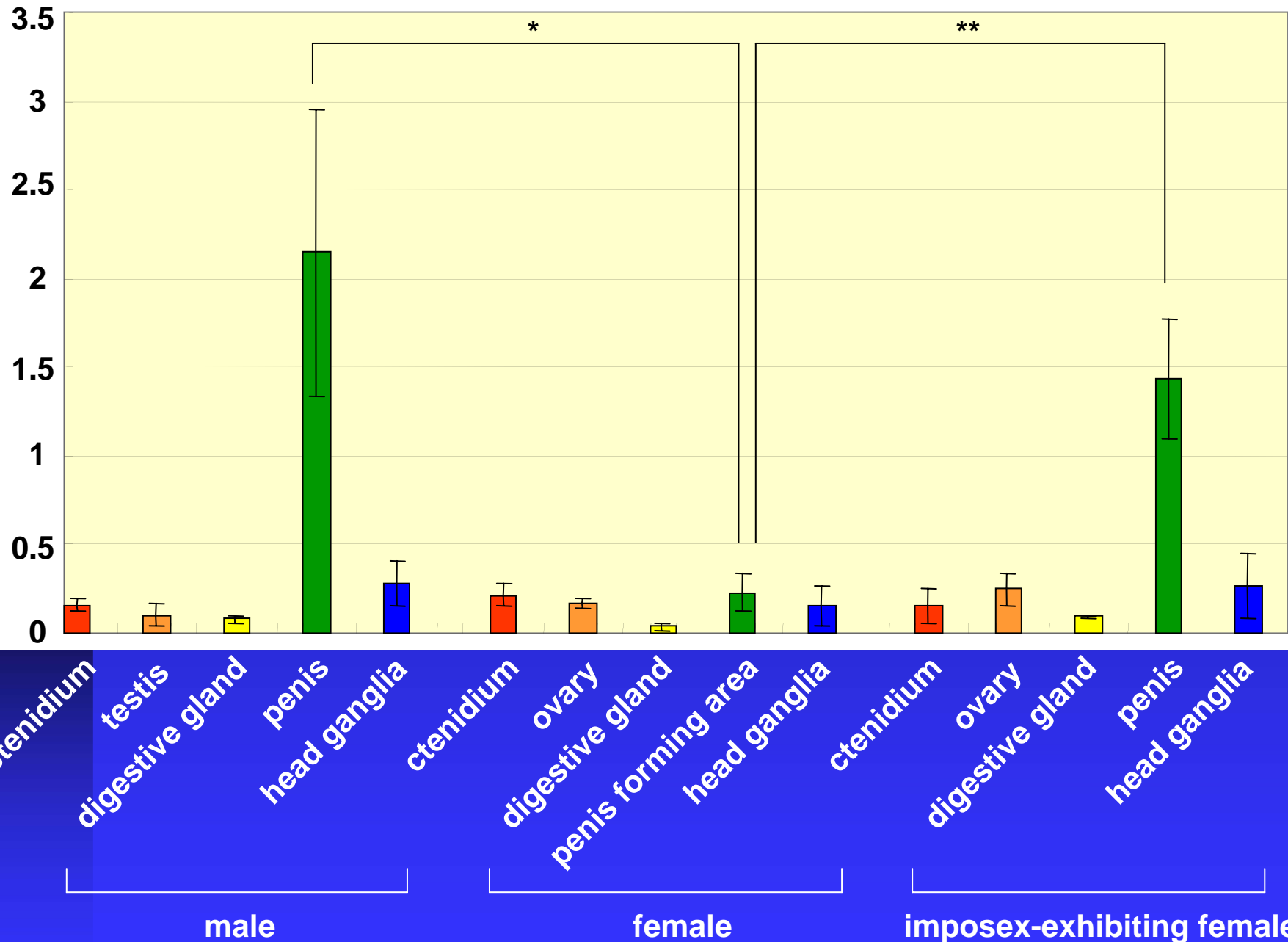
Horiguchi, T., Ohta, Y., Nishikawa, T., Shiraishi, F., Shiraishi, H., Morita, M.: In press *Cell Biol. Toxicol.*

Histology of Penis Developed in Female *T. clavigera*



Penis and vas deferens developed in female *T. clavigera* which received 9CRA injection (PL: 7.00 mm) Horiguchi, T., Ohta, Y., Nishikawa, T., Shiraishi, F., Shiraishi, H., Morita, M., In press *CBTO*.

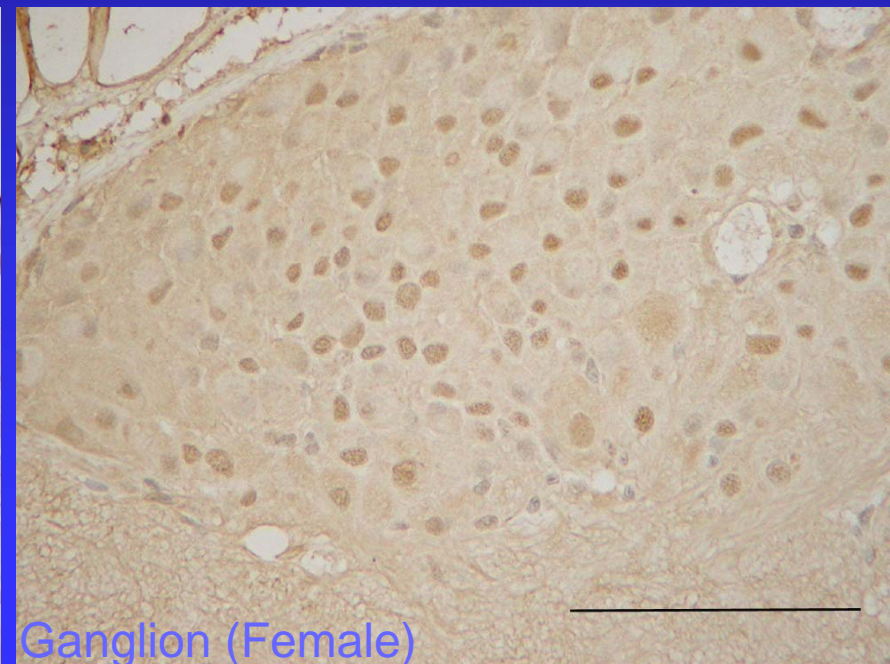
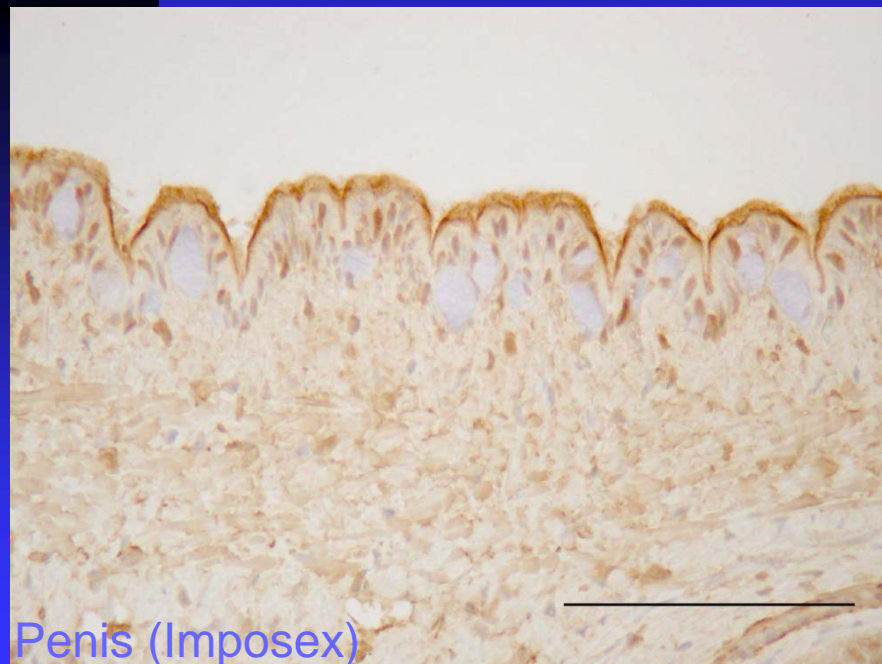
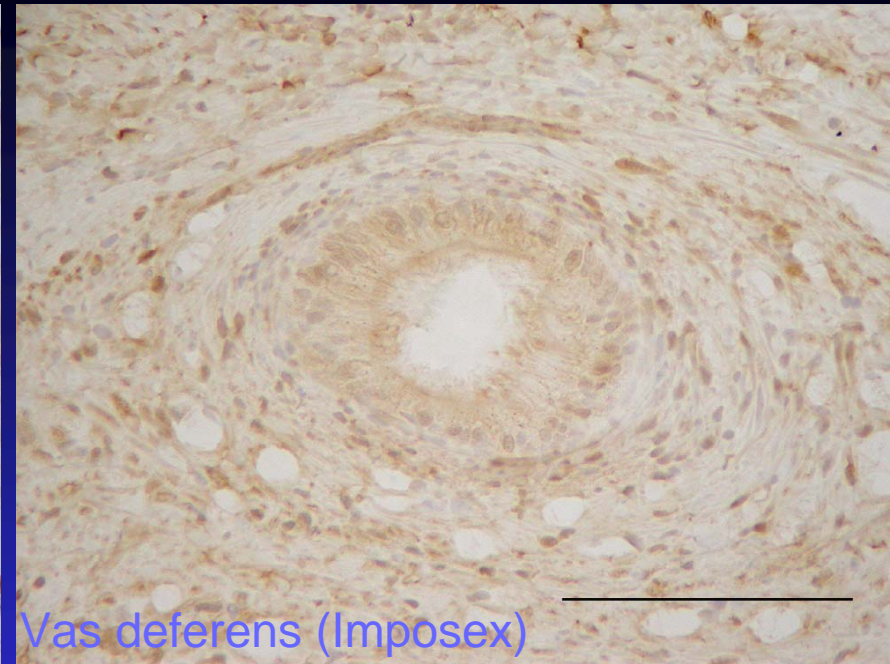
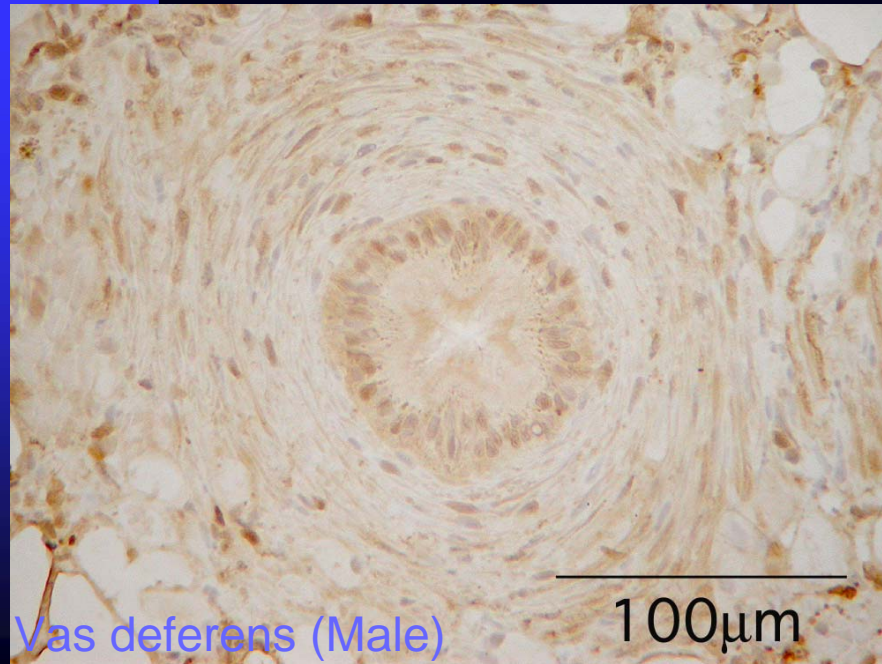
RXR / 16S rRNA



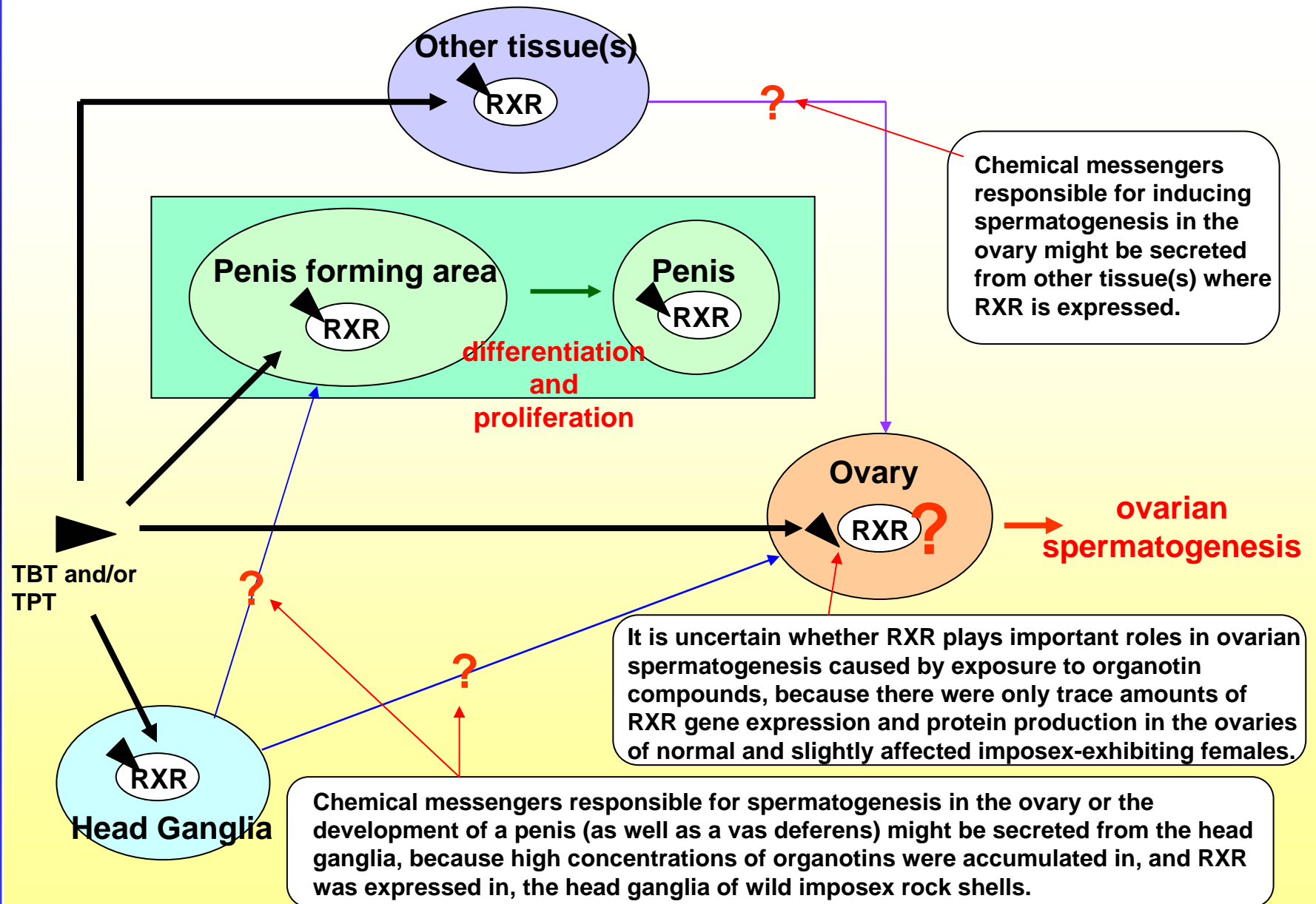
RXR gene expression in various tissues of *T. clavigera*

Horiguchi et al., *Aquat. Toxicol.* **84**: 379-388, 2007.

($n=3$, *; $p<0.05$, **; $p<0.01$)



Speculative mechanism of induction of imposex in gastropods



Conclusions

Physiological regulatory system of reproduction may be different in gastropods, compared to that of vertebrates.

Retinoid X receptor (RXR) has an important role in the development of imposex caused by TBT and/or TPT in gastropods.

Future Studies

Natural ligand for RXR in *Thais clavigera*

Heterodimer, homodimer or homotetramer?

Target gene(s) of RXR in *T. clavigera*

Genes and their functions in *T. clavigera*

Acknowledgement

Collaboration: Prof. Emer. M. Shimizu, Prof. Emer. S. Yamazaki, Prof. H.S. Cho, Prof. A. Okubo, Prof. E. Yoshimura, Prof. O. Matsushima, Prof. F. Morishita, Prof. T. Nagao, Prof. T. Iguchi, Prof. J. Nishikawa, Dr. Y. Katsu, Dr. T. Imai, Mr. N. Takiguchi, Mr. M. Terui, Mr. A. Kajikawa, Mr. F. Hamada, Dr. H. Shiraishi, Dr. F. Shiraishi, Dr. M. Morita, Dr. T. Nishikawa, Dr. M. Lu, Dr. A. Treuner, Ms. A. Sugimoto, Ms. M. Shibuya, Mr. T. Sakuma, Mr. S.W. Seol & Mr. J.H. Lee

Assistance: Mr. M. Kojima, Ms. M. Kaya, Ms. M. Higashiyama, Ms. Y. Tezuka, Ms. K. Miyoshi, Ms. N. Hamada, Ms. A. Nabata, Ms. T. Kinoshita, Ms. A. Honda, Ms. K. Stockwell, Ms. S. Nagumo, Ms. Y. Kinumi, Mr. T. Matsuo, Mr. S. Ochiai, Mr. M. Ooyama, Mr. S. Hamada & Mr. A. Tokugawa

Pictures of several shells were cited from 'Gakken Illustrated Nature Encyclopedia THE MOLLUSKS OF JAPAN (SNAILS)' (Habe, T. & Okutani, T. eds.), Gakken, Tokyo, Japan, 294p. (1983)

Funding

- Ministry of the Environment, Japan
- Ministry of Education, Culture, Sports, Science and Technology, Japan
- Nihonseimei-Zaidan Foundation, Japan
- National Institute for Environmental Studies, Japan