ASCIDIAN NEWS*

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Well, here we are still in this pandemic! I asked how you all are and again received many responses. A number are included in the next two sections. Nearly everyone still expresses confidence at having met the challenges and a great feeling of accomplishment even though tired of the whole thing; congratulations to you all! There are **117** new publications since December! Thanks to so many for the contributions and for letting me know how important AN continues to be. Please keep in touch and continue to send me contributions for the next issue. Keep safe, keep working, and good luck to everyone.

***Ascidian News is not part of the scientific literature and should not be cited as such.**

NEWS AND VIEWS

1. From **Hiroki Nishida** (hnishida@bio.sci.osaka-u.ac.jp) :
In Japan, we are very slow to be vaccinated, but the labs are ordinarily opened and we can continue working. Number of patients are gradually increasing though and we are waiting for vaccines. I have to stay in my home and the lab.

Postponement of 11th ITM (International Tunicate Meeting)

This is an announcement about 11th ITM that had been planned to be held in July 2021 in Kobe, Japan. It is postponed by a year because of the global spread of COVID-19. We had an 11th ITM board meeting, and came to the conclusion that we had to reschedule it for July 2022 at the same venue (Konan University, Kobe, Japan) and similar dates (July 11 to 16).

We needed to decide at this difficult time, and the decision had to be done based on the current situation of the pandemic in Japan and other countries. As you know, COVID-19 cases are still high in many countries including Japan. Although vaccinations have recently started, it will take some months before enough people are vaccinated and we see the effects. Therefore, we had no choice but to cancel on-site meeting this year. Movement across countries is still restricted in Japan as well as in many countries. We had to choose one of the two possibilities, on-line or postpone. We discussed about the possibility of on-line meeting. However, the major problem is time difference between countries which is a big hurdle for this kind of international meetings, which people attend from the whole globe. One can upload the presentation files for on demand viewing, but guess how the meeting will be. Not a few members of our tunicate community would like to visit Japan and meet face to face as it is a small community. Taking these into consideration, we decided to reschedule the 11th ITM to 2022, then we will have much more chance to hold it on-site. The 2022 meeting will definitely be held. If COVID-19 issue does not allow us to have on site meeting in 2022, we will try it in on-line manner in 2022.

We feel so sorry to inform you of this disappointing news. It was a hard decision to make, and we appreciate your kind understanding. We are looking forward to seeing you all in 2022 and learning exciting findings from your research.
Také Kusakabe, Takahito Nishikata, Yasunori Sasakura, Hiroki Nishida

2. From **Euichi Hirose** (euichi@sci.u-ryukyu.ac.jp): I'm still fine, although the activity on research and education is restricted. Now we can have open class when the number of students are small (less than half of the room capacity).

3. From **Susanna Lopez-Legentil** (lopezlegentils@uncw.edu) : Here at Univ. of N. Carolina Wilmington things are improving, although there are still quite a few people who do not want the vaccine. A priori UNCW is planning on going back to mostly face to face instruction in the Fall but they have given faculty the option to offer hybrid courses too if that worked better. Summer courses are still on-line. Besides that, not much more to report here, a slow year for research since most of our time has been dedicated to transition our lectures to on-line formats!

4. From **Javier Atalah (**Javier.Atalah@cawthron.org.nz) who sent a new publication: greetings from New Zealand, where we are very fortunate to be covid free for now!

5. Thanks to **Jovairia Loan** (JLoan@lacsd.org) who submitted the following two internet links and wrote: When a tunicate meets a pandemic; advancing medical technology one marine invert at a time.
a) New treatment for covid-19 using drug from an *Aplidium* species.
International team of scientists identifies new treatment for COVID-19 that appears to be far more effective than drugs in use now. Mark Johnson, Milwaukee Journal Sentinel, Jan. 25, 2021.
https://www.jsonline.com/story/news/2021/01/25/international-team-finds-new-more-effective-drug-treat-covid-19/6673529002/

b) Plitidepsin has potent preclinical efficacy against SARS-CoV-2 by targeting the host protein eEF1A. White et al. Science 26 Feb 2021: Vol. 371, Issue 6532, pp. 926-931 DOI: 10.1126/science.abf4058
Abstract: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) viral proteins interact with the eukaryotic translation machinery, and inhibitors of translation have potent antiviral effects. We found that the drug plitidepsin (aplidin), which has limited clinical approval, possesses antiviral activity (90% inhibitory concentration = 0.88 nM) that is more potent than remdesivir against SARS-CoV-2 in vitro by a factor of 27.5, with limited toxicity in cell culture. Through the use of a drug-resistant mutant, we show that the antiviral activity of plitidepsin against SARS-CoV-2 is mediated through inhibition of the known target eEF1A (eukaryotic translation elongation factor 1A). We demonstrate the in vivo efficacy of plitidepsin treatment in two mouse models of SARS-CoV-2 infection with a reduction of viral replication in the lungs by two orders of magnitude using prophylactic treatment. Our results indicate that plitidepsin is a promising therapeutic candidate for COVID-19.

6. From **Anabela Taverna** (anabelataverna@gmail.com) : The SARS COVID-19 Pandemic situation is still affecting our activities. The situation in Argentina is not easy as it is not in all of South America. We are going through the second wave of COVID, hoping that vaccination will bring some relief. The Universidad Nacional de Córdoba and Institute have allowed the resumption of some experimental activities and laboratory tasks under specific protocols and limiting the number of people working simultaneously. In this way, happily we are getting back to work, step by step, slowly but surely. We continue working, giving classes and taking courses remotely.
Despite the pandemic situation, some members of the group have managed to travel. Postdoctoral

fellow Paola Reyna is in Spain, while Gastón Alurralde moved to Stockholm to start a new postdoc position.

7. From **Lucia Manni** (lucia.manni@bio.unipd.it) : As members of Local Committee, Lucia Manni and Paolo Sordino inform that the 8th Meeting of the European Society for Evolutionary Developmental Biology (https://www.evodevo2020.eu/) will take place from the 26th to the 29th of October 2021 at the Stazione Marittima Congress Centre in Naples, Italy (due to the pandemic, please, stay tuned on date confirmation). The meeting includes the symposium The Evo-Devo of Tunicates, therefore we invite you to register and send your abstract for talk selection and/or poster presentation. It will be a great opportunity to gather our community after a long period of isolation. We hope to meet you in Naples! Registration will open soon!

8. From Noa Shenkar (noa.shenkar@gmail.com) : I love reading Ascidian News and getting all the updates from our lovely community. Here is my team update, I [will summarize] that we have had a very tough time, missiles fell in the university and it is very difficult to return to "normal" scientific routine. Hoping for better time.

Tal Gordon's publication [see New Publications] about the extreme regeneration ability of *Polycarpa mytiligera* gathered much attention in the media, including in a podcast about Jewish Kabbalah (!) which discussed a philosophical question: if an organism continues to regenerate and replace all of its organs is it still the original individual it was? it is probably the first time they mention ascidians in this context.

And in the media

The Scientist: https://www.the-scientist.com/news-opinion/when-severed-this-solitary-tunicate-regrows-as-three-new-animals-68764

The Jerusalem Post https://www.jpost.com/israel-news/species-of-animal-able-to-regenerate-organs-fully-following-diss

[and in many other media outlets]

WORK IN PROGRESS

1. From **Karen Sanamyan** (karen@sanamyan.com):

Dear friends and colleagues, at the end of 2020 we published a very beautiful book entitled "Flora and Fauna of Matua Island (middle Kuril Islands, Russia): the field guide". It was published in two thick volumes (400+496 pages) containing descriptions and photos of about 400 species of marine and terrestrial animals, plants and fungi (and several taxa in anemones, octocorals and nudibranches are described as sp.nov and gen.nov.) [Ascidians on pp. 277-315 of volume 1, searchable on pp. 140-159.] Many thanks for those of you who helped us a lot with the identification of some groups of marine invertebrates for this book (Roger Clark, Masaatsu Tanaka, Lucilia Souza Miranda, Catherine McFadden). The book is in Russian but you really do not need to read the text to enjoy all these beautiful photos and species!

And the best news - these two volumes (both pdf and paper versions) are distributed free of charge! Sanamyan, K. E. and Sanamyan, N. P. (editors) 2020. Flora and Fauna of Matua Island (middle Kuril Islands): the field guide. Volume 1. Sea; Volume 2, Earth. You can download pdf versions of both volumes from our website here: http://sanamyan.com/matua/eng.php

2. From **Anne and Wilfried Bay-Nouailhat** (mer.littoral@gmail.com) http://www.mer-littoral.org/

Despite the covid, we had the chance to participate throughout the month of October, in the MNHN mission La Planète revisitée in southern Corsica, to make an inventory of the underwater fauna and in our particular case, Ascidians. We now have a lot of identification work to do (over 700 samples).

MEETINGS ABSTRACTS

1. 93rd Natl. Congress of the Italian Soc. Of Experimental Biology. Palermo, Italy, 22-25 April 2021.

Effects of iron on the transcription of stress-related genes in the solitary ascidian *Ciona robusta*. Loriano Ballarin, Laura Drago, Gianfranco Santovito, Univ. of Padova Dept. of Biology, Padova, Italy.

Heavy metal pollution of aquatic environments is an increasingly widespread problem affecting the survival of living organisms. Due to its frequent presence and impact on marine ecosystems, iron has recently attracted the interest of researchers involved in ecotoxicological studies. Despite its being an essential metal required for various catalytic functions of living cells, iron excess leads to the generation of free radical species through the Fenton/Haber–Weiss reaction, resulting in oxidative stress (Vajayavel *et al.*, 2012). In this study we aim to investigate the sub-lethal effects of iron chloride (10 μM), in *Ciona robusta*, an invertebrate chordate from the Lagoon of Venice, during 5 days of exposure. We measured the transcription of a series of oxidative genes for anti-stress proteins, such as superoxide dismutase (SOD), glutathione peroxidase-7 (GPX7), peroxiredoxin-6 (PRDX6), glutathione synthase (GS) and metallothioneins (MT), the role of which in ascidians detoxification was previously demonstrated in our laboratory (Ferro *et al.*, 2018). We also considered two important protein components of stress granules (SGs), TIA-1 related nucleolysin (TIAR) and tristetraprolin (TTP), which are cytoplasmic foci operating in anti-stress protein mRNA preservation (Drago *et al.*, 2021).

The obtained results show a modulation of expression of stress-related genes and the activation of stress granules in response to iron-stress. This highlights the importance of SGs as new biomarkers of heavy metal pollution.

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THESIS ABSTRACTS

Tal Gordon (tgordon611@gmail.com). Ph.D. thesis, Tel Aviv University, Tel Aviv, Israel. Advisor Dr. Noa Shenkar.

Regeneration is a fascinating and a complex biological process that enables the replacement of lost or damaged body structures in a precise and controlled manner. Model animals have been long used to study complex biological processes in a simple and an accessible system. By utilizing a wide array of model systems, a significant progress has been made in the identification and characterization of a regeneration tool-kit. These mechanistic insights revealed that evolutionarily conserved pathways, such as Wnt, Notch, and BMP, are involved in regeneration regulation.

Invertebrates are excellent models for regenerative systems, as they are able to regenerate most, if not all, body systems. The ascidians (phylum Chordata, class Ascidiacea) are marine invertebrates that represent the closest living relatives of the vertebrates, and thus constitute an informative model for studying the evolution of regeneration in this phylum. While ascidian regeneration had been extensively studied over the last decade, most studies have focused on colonial species, since they present vigorous regeneration abilities as part of their asexual reproduction process. Solitary ascidians, on the other hand, have been known to have limited regeneration abilities.

The current study examines the cellular and molecular processes underling the solitary

ascidian *Polycarpa mytiligera* unique regenerative abilities and investigates its potential to become a new model system for regenerative and evolutionary studies.

In chapter 1, I describe *P. mytiligera*'s recruitment patterns, reproduction and development process using field observations and controlled laboratory experiments. Culturing and maintaining a research organism are crucial steps in determining the feasibility of new model systems and were therefore one of the goals of my research work. I was able to demonstrate the significant effect that water temperature and daylight length had on *P. mytiligera* spawning and reproduction success, data that were then used to develop a culture protocol in both open and closed water systems. Furthermore, induced spawning experiments led to successful spawning events outside of this species' natural reproduction period. These results offer the opportunity to perform controlled experiments using individual animals at any stage of their life cycle and facilitate the development of genetic and molecular tools. In addition, the ability to induce spawning at any given time throughout the year, in facilities with no direct access to the sea, is of great advantage for a new model system.

In chapter 2, I describe the different experimental approaches I adopted to gain an insight on the mechanistic cellular events involved in *P. mytiligera* regeneration processes. By using amputation and histological tools, I observed that *P. mytiligera*'s is able to regenerate major body systems, including the heart and neural complex. Furthermore, dissection of a single individual to several separate fragments along two body axes resulted in the complete regeneration of all fragments into independent, functional individuals. Cell proliferation assay revealed accumulation of dividing cells at the regenerating area, indicating the involvement of local cells and the formation of a blastema, similar to other regenerative animals, such as salamanders and zebrafish. The ability of a solitary ascidian to regenerate all body structures and tissue types is unique, as such robust abilities were so far only observed among colonial species. Phylogenetic analysis revealed in fact a close affinity of *P. mytiligera* to colonial species and further established this species as a valuable model for evolution and development studies.

Finally, in chapter 3, I describe the molecular signature of the central nervous system (CNS) regeneration. *De novo* transcriptome assembly of *P. mytiligera* tissue undergoing regeneration was analyzed using differential gene expression and gene ontology analysis. Results show the upregulation of evolutionary conserved wound healing and regeneration pathways such as Wnt and Notch. Early stages of regeneration showed expression of genes involved in injury response and proliferation, while later stages were characterized by genes associated with differentiation and synaptogenesis. Furthermore, the upregulation of stem cell markers as *Sox2* and *Hes1* supports the possibility of stem cells mediated regeneration in this species.

The current study presents the solitary ascidian *P. mytiligera* as a new model system for regeneration studies. It uncovered the unique regenerative capacity of this species and allowed for a deeper mechanistic insight into the cellular and molecular events underling this process. Gene expression analysis revealed upregulation of genes with conserved roles in stem cell generation, proliferation, differentiation and patterning of tissues, suggesting an essential part in *P. mytiligera* regeneration process. The presented culture protocols and transcriptomic database will facilitate future studies on this new and fascinating system.

I have started a postdoc position at Tel Aviv University in Dr. Omri Wurtzel's lab (stem cells and regeneration lab) where I'm continuing studying *Polycarpa's* regeneration from a genetic point of view.

NEW PUBLICATIONS

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