

## The Problem of Sea Star Thrombocytes and Platelets in *Asterias Rubens* T.E.M and Genomic Observations

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### Abstract

Sea star Axial organ (A.O) cells were observed in TEM. The axial organ has been described by us as a primitive lymphoid organ in the years 1970. Sea star lymphocytes, platelets, have already been observed in previous works. They are smaller in diameter (4 to 5 $\mu$ ) than Vertebrate ones. It seems to us that Thrombocytes exist also in this Invertebrate (TEM observations): Genomics asserts this last data.

### Introduction

Observation of sea star *Asterias rubens* T and B lymphocytes have already been performed in TEM [1,2]: it was asserted by biochemistry and biophysical assays. Second sea star platelets [3] were observed. Genomics [3] assert these data.

In Vertebrates Hemostasis is a defence mechanism to prevent loss of blood in the event of an injury in an organism that has a vasculature [4]. In sea star (Upper Invertebrates) there is no blood « sensu stricto » but haemolymph (in the coelomic cavity). We try in the present work to analyse new images which seem correspond to Thrombocytes. and to aggregated platelets in transmission electron microscopy (TEM) at the level of the axial organ (AO).

## Materials and Methods

Sea star *Asterias rubens* were obtained from the Marine Institute of Arcachon (France)

Axial organs (A.O) were excised and:

- a) Either the whole cellular population was conserved and so observed in TEM
- b) or the whole A.O was separated into B and T cell subpopulations according the well-known method of Julius and al [5].

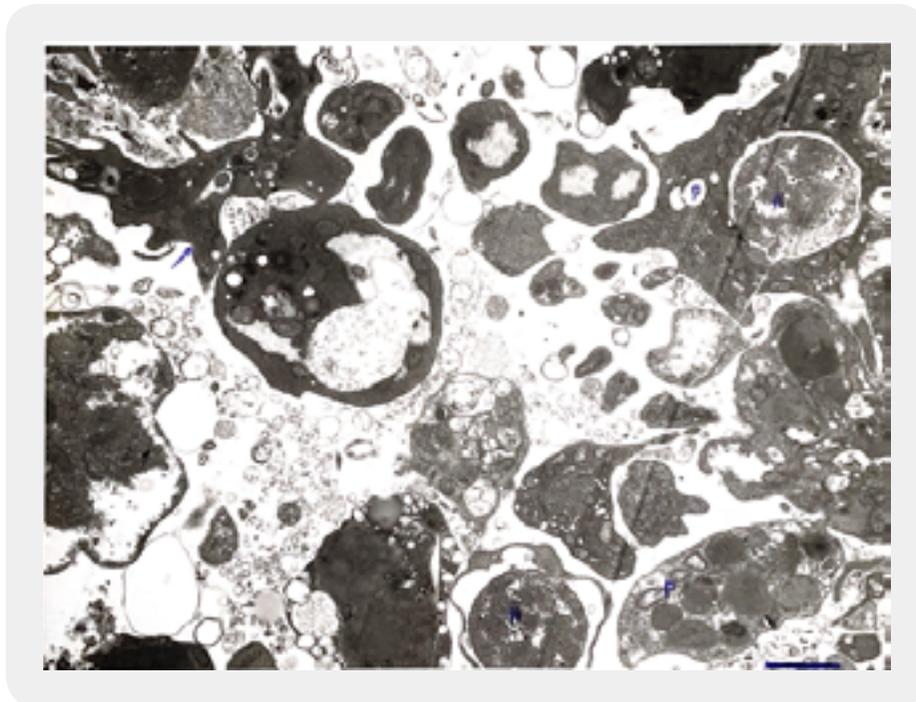
Cells were fixed with glutaraldehyde at 2%, in cacodylate buffer, as precedently described [1]

No post-coloration was operated.

Observations were done with a Hitachi Microscope.

## Results

We have a look on the Figure below: the scale (in the bottom, right side) represents 1 $\mu$ .



*Figure*

We observe always on this side what we described as a typical platelet (P) [3] without nucleus (N). Besides of it azurophiles particles smaller than  $0,2\mu$  are present.

These particles may correspond to lysosomes or to empty vesicles. Next this platelet we observe a nucleus (N) alone which is surrounded by a double membrane (nuclear membrane?): the nucleus is similar to the one which is shown on the top right side of the Figure. There, it is included in a platelet with digitations situated near another platelet: they seem aggregated.

We may envisage that the platelet with nucleus is an ancient thrombocyte which is « loosing » it. Note the large perinuclear space which is not due to a problem of fixation with glutaraldehyde but seems indicate this loosing.

Always in the top of the Figure, in the left side we observe another platelet (see arrow) with digitations. THERE IS NO NUCLEUS in this platelet.

Is it the definitive form of Platelet? In sea star system?

On a genomic point of view, it was demonstrated that thromboxane genes exist in this Invertebrate (Leclerc, 2019) [4].

## Conclusion

The sea star *Asterias rubens* presents T and B lymphocytes, Monocytes, Macrophages and Platelets, in T.E.M observations. The evolution of Thrombocytes in Platelets is envisaged from a point of view of morphogenesis in Invertebrates. Platelets are seen with various aspects either with nucleus or without one. Genomics confirms these data.

Nevertheless we have not yet observed classical Thrombocytes with nucleus showing a typical « indentation » as it is shown in human [4].

## Bibliography

1. Anteonis, A., *et al.* (1985). Immunocompetent cells in the starfish *Asterias rubens*. An ultrastructural study. *Cell. Biol. Int. Rep.*, 9(7), 663-670.
2. Leclerc, M. (2012). Humoral Immune Responses to Various Antigens in the Asterids: *A. gibbosa* and *A. rubens*. *Amer. J Immunol.*, 8(4), 196-199.
3. Leclerc, M. (2019). New Cytokine Genes in an Invertebrate: Thromboxane Ones in Echinodermata. Evidence of Platelets. *Archives of Immunology and Allergy*, 2(1), 40-41.
4. Jagadeeswaran, P., *et al.* (2005). Zebrafish: a genetic model for hemostasis and thrombosis. *Journal of Thrombosis and Haemostasis*, 3(1), 46-53.

5. Tokuda, Y., *et al.* (1999). Characterization of Distinct Subpopulations of Japanese Flounder Lymphocytes with Monoclonal Antibody against Serum Immunoglobulin. *Fisheries Science*, 65(3), 347-352.