

New Cytokine Genes in an Invertebrate: Thromboxane Ones in Echinodermata. Evidence of Platelets

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Abstract

Two main points assert the existence of « platelets » in Echinodermata (Invertebrates) :

a) the evidence of thromboxane genes in an ophiurid, *Ophiocomina nigra*

b) the appearance of T.E.M platelets, in the asterid, *Asterias rubens*.

Ophiurids and asterids (Echinodermata) possess each an IGGKAPPA gene.

INTRODUCTION

The appearance of platelets, in *Asterias rubens* was just described (Ref.1 Fig 1): They resemble blood platelets of vertebrates.

The aim of this work is to look for genes implicated in the initiation and synthesis of thromboxane

which plays a rôle in platelet biochemistry (in vertebrates).

Thromboxane A synthetase gene, Thromboxane A2 receptor gene are the main genes which represent thromboxane activity in vertebrates. Thromboxane is also a cytokine, regulated by immune system and immune genes we research in the *Ophiocomina nigra* genome.

MATERIALS AND METHODS

1) *Ophiocomina nigra* was purchased by the Laboratory of Roscoff (France). Digestive coeca were excised. RNA was extracted.

2a) *Ophiocomina nigra* and its preparation to obtain mRNA have already been described (Ref.2). Further more quality controls were made.

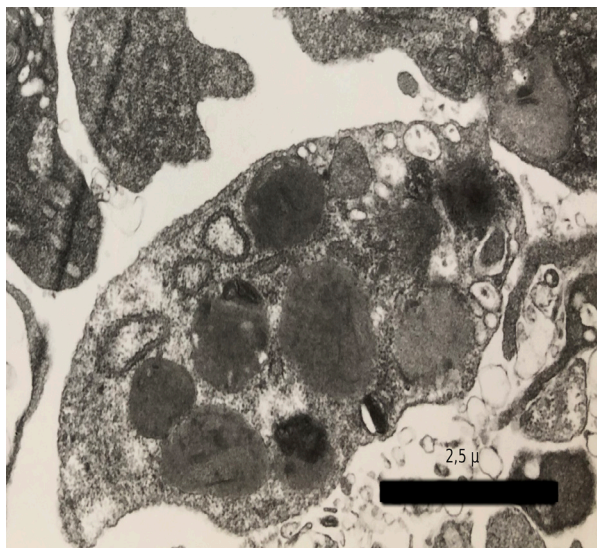
2b) sequencing :

Transcriptome was assembled from RNA-Seq fastq files using Trinity v2.1.1 (Ref.3) with default parameters. A BLAST database was created with the assembled transcripts using make blast db application from

ncbi-blast+ (v2.2.31+). The sequences of transcripts of interest were then blasted against this database using blastn application from ncbi-blast+ (Ref.4) with parameter word_size 7.

RESULTS

we observe a sea star *Asterias rubens* platelet in T.E.M (Ref.1, Fig.1)



Evidence of Platelets in Echinodermata

On the other hand, a table summarizes the genomic results. TBXA2R represents the human thromboxane A2 receptor gene, TBXAS1 the human synthetase one

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Query ID	Query Name	Subject ID	Identity (%)	Length	Mismatch	Gapopen	Query cover	E-value	Bitscore
NM_001060.5	TBXA2R	TRINITY_DN38594_c0_g1_i1	77,93	222,00	34,00	9,00	13,00	2,00E-27	124,00
NM_001061.5	TBXAS1	TRINITY_DN22549_c0_g1_i1	84,21	38,00	6,00	0,00	2,00	1,60E-01	38,10

The sequences of the transcriptomes are following :
first TBXA2R one

>TRINITY_DN38594_c0_g1_i1

5'ATATATCATATATGATATAGTACCTTTGTTATATATCA-TAATACATATAAATGTGTATTA

TGTTATCTATAATTATATAATTTTCATATATAAGATGTA-TAATATGTATCATATATTATAT

ATGTTATGTAATATATATAGTATATATAAGATGACACAG-GATAAATATTATATACTATGA

CATATAAAATATATGAGGTTATATGTTACATATAAGGCA-TAGCACATAACATGTAATATA

TATCATATATAATTTTTTTTTTAGACAGAATCTTGTCCT-GTTGCACAGGGTGGGGTACAAT

GGCGCCATCTTTGCTCACTGCAACTTCTGCCT-CACGGGTCCAAGCGATTGCTCCTCCTCA

GCCTCCCAGGTAGCTGGGACTACACCACACTGGGACTA-CACCAGCTGCCACCATGCCTAG

CTAATTTTTGTATTTTTGGTAGAGACAGGGTTTTGTC-CGTGTTGCCAGGCTGGTAGATCG3'

Second TBXAS1 transcriptome :

>TRINITY_DN22549_c0_g1_i1

5'AAATAAGCATACGCATGGAAGAATCACTCAGATTTT-TATGTTAAATAGGAGGAACCTAGA

AAACACCAAGTGTGGATTTGGAGAATTTGTAAAAC-TAACCAAAGACAATGCCTAATCA

CATTGAGGGCAACATAAGTGGCACTATGTGTGTCATCG-GCTCAACAGTTCATTCATCATC

ATCGGGATCTAACAAAATGACACATTGTAGGCATAAT-CATAACAGGACTCGGCGTAGGTT

ATCAGCAACAGCTATGATTGGAGTACTCGGAGGA3'

DISCUSSION AND CONCLUSION

Thromboxane A2 gene, we found in ophiurids (Echinodermata) induces a cytokine in human (Ref 5). Thromboxane A2 produced by activated platelets, has prothrombotic properties. It stimulates activation of new platelets as well as increases platelet aggregation (Ref.5)

Genomic results assert the evidence of a new cytokine in invertebrate : the thromboxane. Furthermore TEM results (Ref.1 Fig.1) show structures which resemble blood platelets. In conclusion, it was clearly shown that platelets and thromboxane cytokine exist in Echinodermata : It's a great novelty in invertebrates !

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