

Evidence of MHC Class I and Class II Genes in Echinodermata

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ABSTRACT

It seems obvious to recall the found genomic results in *Ophiocomina nigra* and *Antedon bifida* (Echinodermata) from a point of view of genomic evolution: 2 MHC class I genes (HLA-E, HLA-B), 2 MHC class II genes (HLA-DRB1, HLA-DQB1) appear in them in the past, at the Cambrian period.

Keywords: HLA-E, HLA-B, HLA-DQB1, HLA-DRB1

INTRODUCTION

Recently, it was shown that, HLA-DRB1 gene existed in *Ophiocomina nigra* [1], so HLA-DQB1 gene [2]. In the same manner we demonstrated the existence of HLA-E, HLA-B genes in *Ophiocomina nigra* and *Antedon bifida* [2]. It was correlated to the presence of IPA (Invertebrate Primitive Antibody) in Echinodermata [3,4]. Genesis of these works were recalling in this paper.

MATERIALS AND METHODS

Animals

Ophiocomina nigra (Ophurid) and *Antedon bifida* (Crinoïd) were obtained at the station « Of Biologie Marine of Roscoff » France.

Obtention of ophurid and crinoïd mRNA

Digestive coeca were excised from their bodies and mRNA was obtained from Uptizol (Interchim) then quality controls were operated.

Sequencing

Sequencing was made on Illumina Next Seq 500 with paired-end: 2. 75 bp. Transcriptome was assembled from RNA-Seq fastq files using Trinity v2.1.1 with default parameters [5]. A BLAST database was created with the assembled transcripts using make blastdb 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+ with parameter word_size 7 [6].

RESULTS

MHC gene Class II appears in the genome of *Ophiocomina nigra* and *Antedon bifida* one, in a significant manner. The transcriptomes are given with their sequences. *Ophiocomina*

nigra results show the “HLA-DRB1” transcriptome which possesses a short sequence but a significative one:

>TRINITY_DN4807_c1_g1_i1

5'CATATAGTTTtaggggTTATAAAAAAATGACTCC
GGTACTGACATATTTGGGACCCCAA

CTGTCCAAAGAAAATTATAGCCCCTATAAATTATA
ATTTATTAATTTTTGTTTTCTCTTG

TATAGGGACCAGAGCCAATCCCACTGGAAGTTAGG
GCACGAGCAGTCAAAGACCAATTTT

AAATGTAAAAAAAAAAAAAAAAAAAAAAAAAATAAAAA
TTAAAAAAAAAAAAAAAAAAAAAAAAAATAAAA

AATTAATAAAAAAAAAAAAAAAAAAATAAAA3'

Secondly, a HLA-DQB1 class II gene was found in *O. nigra*: The sequence of the transcriptome follows

>TRINITY_DN20883_c0_g1_i1 HLA-DQB1

5'GTA AACAGCATTTCATCTGAAAAGAAATCAAT
GTCCAAAGTTCAAAACCTCTGTGAAG

ACTTGAATGCAAAAAGTACTCAAGTCCATCACATA
TTTGGCATTTTTtagatATGATCTTC

CAAAGATTTTAAAATAAAAACAAAAGAAAAACCAA
AAGAAGAAAAAATTTAACAAAAAAA

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TAAAGGGCCAAAAAAATTTTAAAAA
 CCCCATTTTTTTGGGTCTAAAAA

AAAAAAAAAAAAAAAAATCGC3'

MHC class I genes appear in the **Table 1** in *Antedon bifida*.

Table 1. MHC class I genes of *Antedon bifida*.

QueryID	Query Name	Subject ID	Identity (%)	Length	Mismatch	Gap open	Query cover (%)	E-value	Bitscore
NM_005 516.6	HLA-E	TRINITY_DN19 334_c8_g2_i1	88.15	287	28	4	11.00	2.00E-91	337.00
NM_005 514.8	HLA-B	TRINITY_DN15 013_c0_g1_i1	100.00	21	0	0	1.00	3.70E-02	39.90

Class I, HLA-E, HLA-B, Transcriptomes are given in 5'-3'

First HLA-E:

>TRINITY_DN19334_c8_g2_i1 HLA-E
 5'TGTAATCCCAGCACTTTGGGAGGCCGAGGCGGGC
 GGATCACGAGGTCAGGAGATCGAGAC
 CATCCTGGCTAACACAGTGAAACCCCGTCTCTACTA
 AAAATACAAAAAATTAGCCGGGCG
 TGGTGGCGGGCGCCTGTAGTCCCAGCTACTCGGGA
 GGCTGAGGCAGGAGAATGGCGTGAA
 CCCGGGAGGCGGAGCTTGCAGTGAGCCGAGATCGC
 GCCACTGCACTCCAGCCTGGGCGAC
 AGAGCGAGACTCTGTCTCAAAAAAAAAAAAAAAAAA
 AAAAAA3'

Secondly HLA-B:

>TRINITY_DN15013_c0_g1_i1 HLA-B
 5'GCCGAATATGATGCAGAGGTATCAGGGGGTGAAG
 CATCTGGAGGTGAGGTATCGGCAGGA
 GAGGCATCTGGGGGAGAAGCTGAACAATCTGACAA
 TGAAAGCGATTAGATAACATTTTTT
 TAATTCTAGTTGCAGCCTAAATATTTTCGATATTACT
 TTTTTTACTAGTTGAATGATTAA
 AAAAGAAAGCAACAAGTGTGGTAATATTGCTAATT
 ATGAAATGAAAAATGTTAATGTG
 GCCCTGACACTAAATTGTAACTGTTTTTTAGTAAT
 AAGAATTTCAATAGCTTCTCTGAA
 AGAAGATGTCTCTGAGAGAGTAATATTTGACAGGT
 TCAGTGTATTTAAAGACTTATAATG
 TAAAGCAGAGATGTAAGTAACTAGAGAAACCTAGATATT
 GATGTCAACAACTAAGGGTGCATG
 GAAAATGTGAAAGACTTTAAGAGTGGGTGACCCTG
 CCTACCAACACAATTCAATCCATGT

TTGAGGCTTTTTTTCATTAGCCTAATAGTGAAGTCA
 GTGGCGTAAGGCCCTTGTTTAG
 CACTCCTAAGGGTCCCTAATGATGGATAATTGTATT
 GGGCTCTTCATGCTCTGGGGCCCT
 GGGTTTAGCTAGTGAGTGCTCATAGCAGTTGGCTG
 GGCAAGGTTAGAAAGCAATGGTTCT
 GTGCAGACATTTGCATTTAATTGACCAATATTTCAA
 ATCGTGTGTTACACAGGAATCATA
 ACCTAATCAGCAGTTGTTTTTAATAAACATTGCATC
 TTGGTCGACGTAATATTGTTATGG
 ACTGTCTGTGAAACCATGTGAATCTAAACTCTTAAA
 AATGCCTGCCTCTCCTGTCTTGC
 TAAATATAAATTTGTTTTCTCAATTAGGCG
 GCCCTGACACTAAATTGTAACTGTTTTTTAGTAAT
 AAGAATTTCAATAGCTTCTCTGAA
 AGAAGATGTCTCTGAGAGAGTAATATTTGACAGGT
 TCAGTGTATTTAAAGACTTATAATG
 TAAAGCAGAGATGTAAGTAACTAGAGAAACCTAGATATT
 GATGTCAACAACTAAGGGTGCATG
 GAAAATGTGAAAGACTTTAAGAGTGGGTGACCCTG
 CCTACCAACACAATTCAATCCATGT
 TTGAGGCTTTTTTTCATTAGCCTAATAGTGAAGTCA
 GTGGCGTAAGGCCCTTGTTTAG
 CACTCCTAAGGGTCCCTAATGATGGATAATTGTATT
 GGGCTCTTCATGCTCTGGGGCCCT
 GGGTTTAGCTAGTGAGTGCTCATAGCAGTTGGCTG
 GGCAAGGTTAGAAAGCAATGGTTCT
 GTGCAGACATTTGCATTTAATTGACCAATATTTCAA
 ATCGTGTGTTACACAGGAATCATA
 ACCTAATCAGCAGTTGTTTTTAATAAACATTGCATC
 TTGGTCGACGTAATATTGTTATGG
 ACTGTCTGTGAAACCATGTGAATCTAAACTCTTAAA
 AATGCCTGCCTCTCCTGTCTTGC

TAAATATAAATTTGTTTTCTCAATTAGGCG3'

CONCLUSION

From data to data it appears that Echinodermata possesses a sophisticated immune system. We recall the existence of B lymphocytes, T lymphocytes with the sea star as model of study, the IPA (Invertebrate Primitive Antibody) we meet in Asterids, Ophiurids, Crinoïds, the Igkappa genes, in these last ones such as Fag gene, Fc receptor gene, Cr gene, at last MHC class I, class II genes, all that is disturbing for classic scientifics, in 2019.

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