

MHC, Class I, Class II Genes in Invertebrates

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Abstract

It seemed interesting to summarize the found 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) appeared in them at the Cambrian period.

INTRODUCTION

Recently, it was shown that, HLA-DRB1 gene existed in *Ophiocomina nigra* (Ref.1), so HLA-DQB1 gene (Ref.2). In the same manner we demonstrated the existence of HLA-E, HLA-B genes

in *Ophiocomina nigra* and *Antedon bifida* (Ref.2). It was correlated to the presence of IPA (Invertebrate Primitive Antibody) in Echinodermata.(Ref .3, 4). Genesis of these works were recalling in this paper.

MATERIALS AND METHODS

Animals

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

Obtention of Ophiurid and Crinoïd MRNA

Digestive coeca were excised from their bodies and mRNA were 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 (Ref.5) with default parameters. A BLAST database was created with the assembled transcripts using makeblastdb 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.6) with parameter word_size 7.

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'CATATAGTTTAGGGGGTTATAAAAAAATG
ACTCCGGTTACTGACATATTTGGGACCCCAA
CTGTCCAAAGAAAATTATAGCCCCTATAAAT-
TATAATTTATTAATTTTTGTTTTCTCTTG
TATAGGGACCAGAGCCAATCCCCTGGAAGT-
TAGGGCAGCAGCAGTCAAAGACCAATTTT
AAATGTAATAAAAAAAAAAAAAAAAAAATAA-
TAAAAAATAAATAAATAAATAAATAAATAA
AATTAATAAAAAAAAAAAAAAAAAATAA3'
```

SECONDLY, A HLA-DQB1 CLASS II GENE WAS FOUND IN O.NIGRA:THE SEQUENCE OF THE TRANSCRIPTOME FOLLOWS

```
>TRINITY_DN20883_c0_g1_i1HLA-DQB1
5'GTAAAACAGCATTTCATCTGAAAAGAAAT
TCAATGTCCAAAGTTCAAAAACCTCTGTGAAG
ACTTGAATGCAAAAAGTACTCAAGTCCAT-
CACATATTTGGCATTTTTAGATATGATCTTC
CAAAGATTTTAAATAAAACAAAAGAAAAAC-
CAAAAGAAGAAAAAATTTAACAAAAAAA
TAAAGGGCCAAAAAATTTTAAAAAAAAAAAAAC-
CCCCATTTTTTTTGGGTCATAAAAAA
AAAAAAAAAAAAAAAAATCGC3'
```

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Table. MHC Class I genes appear in the following table in *Antedon bifida*

QueryID	Query Name	SubjectID	Identity (%)	Length	Mismatch	Gapopen	Query cover (%)	E-value	Bitscore
NM_005516.6	HLA-E	TRINITY_DN19334_c8_g2_i1	88,15	287	28	4	11,00	2,00E-91	337,00
NM_005514.8	HLA-B	TRINITY_DN15013_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_i1HLA-E
5'TGTAATCCCAGCACTTTGGGAGGCCGAGG
CGGGCGGATCACGAGGTCAGGAGATCGAGAC
CATCCTGGCTAACACAGTGAAACCCCGTCTC-
TACTAAAAATACAAAAAATTAGCCGGGCG
TGGTGGCGGGCGCCTGTAGTCCCAGCTACTCG-
GGAGGCTGAGGCAGGAGAATGGCGTGAA
CCCGGGAGGCGGAGCTTGCAGTGAGCCGA-
GATCGCGCCACTGCACTCCAGCCTGGGCGAC
AGAGCGAGACTCTGTCTCAAAAAAAAAAAAA
AAAAAAAAA3'
```

Secondly HLA-B

```
>TRINITY_DN15013_c0_g1_i1HLA-B
5'GCCGAATATGATGCAGAGGTATCAGGGGT
GAAGCATCTGGAGGTGAGGTATCGGCAGGA
GAGGCATCTGGGGGAGAAGCTGAACAATCT-
GACAATGAAAGCGATTAGATAACATTTTTT
TAATTCTAGTTGCAGCCTAAATATTTTCGAT-
ATTACTTTTTTTTACTAGTTGAATGATTAA
CAAAAGAAAGCAACAACCTGTGGTAATATT-
GCTAATTATGAAATGAAAAATGTTTAATGTG
GCCCTGACACTAAATTGTAAACTGTTTTTT-
TAGTAATAAGAATTTCAATAGCTTCTCTGAA
AGAAGATGTCTCTGAGAGAGTAATATTT-
GACAGGTTTCAGTGTATTTAAAGACTTATAATG
TAAAGCAGAGATGTAACCTAGAGAAACCTA-
GATATTGATGTCAACAAACTAAGGGTGCATG
GAAAATGTGAAAGACTTTAAGAGTGGGT-
GACCCTGCCTACCAACACAATTCAATCCATGT
TTGAGGCTTTTTTTTCATTAGCCTAATAGT-
GAAGTCAGTGGCGTAAGGCCCCCTTGTTTAG
CACTCCTAAGGGTCCCTAATGATGGATAAT-
TGTATTGGGCTCTTCATGCTCTGGGGCCCT
GGGTTTAGCTAGTGAGTGCTCATAGCAGTT-
GGCTGGGCAAGGTTAGAAAGCAATGGTTCT
```

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GTGCAGACATTTGCATTTAATTGACCAAT-
ATTTCAAATCGTGTGTTACACAGGAATCATA
ACCTAATCAGCAGTTGTTTTTAATAAACAT-
TGCATCTTGGTCGACGTAATATTGTTATGG
ACTGTCTGTGAAACCATGTGAATCTAAACTCT-
TAAAAATGCCTGCCTCTCCTGTCTTGC
TAAATATAAATTTGTTTTCTCAATTAGGCG
```

```
GCCCTGACACTAAATTGTAAACTGTTTTTT-
TAGTAATAAGAATTTCAATAGCTTCTCTGAA
AGAAGATGTCTCTGAGAGAGTAATATTT-
GACAGGTTTCAGTGTATTTAAAGACTTATAATG
TAAAGCAGAGATGTAACCTAGAGAAACCTA-
GATATTGATGTCAACAAACTAAGGGTGCATG
GAAAATGTGAAAGACTTTAAGAGTGGGT-
GACCCTGCCTACCAACACAATTCAATCCATGT
TTGAGGCTTTTTTTTCATTAGCCTAATAGT-
GAAGTCAGTGGCGTAAGGCCCCCTTGTTTAG
CACTCCTAAGGGTCCCTAATGATGGATAAT-
TGTATTGGGCTCTTCATGCTCTGGGGCCCT
GGGTTTAGCTAGTGAGTGCTCATAGCAGTT-
GGCTGGGCAAGGTTAGAAAGCAATGGTTCT
GTGCAGACATTTGCATTTAATTGACCAAT-
ATTTCAAATCGTGTGTTACACAGGAATCATA
ACCTAATCAGCAGTTGTTTTTAATAAACAT-
TGCATCTTGGTCGACGTAATATTGTTATGG
ACTGTCTGTGAAACCATGTGAATCTAAACTCT-
TAAAAATGCCTGCCTCTCCTGTCTTGC
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, Ophurids, Crinoids, the Iggkappa genes, in these last ones such as Fag gene, Fc receptor gene, Cr gene, at last **MHC class I, class II genes.**

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