Research Article

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Morphology, Immunology of Antedon Bifida (Echinodermata)

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Abstract

Antedon bifida, belongs to the class of Crinoïds. It's an ancestral ECHINODERMATA. The body is a concave disc surrounded by ten pinnately divided arms, giving it a fem-like appearance. It possesses an axial organ similar to the sea star one : a primitive immune organ.
We discover in it :
1) An IGKAPPA Gene recalling the IPA (Invertebrate Primitive Antibody)
3) A Fc receptor gene witch matches with human Fc gene
4) At Last MHC genes.

Introduction

As shown in Figure 1, Antedon bifida is a strange animal, with a disc (the main body) which is surrounded by ten arms. We have performed genomic studies in 2018, concerning this ancestral Echinoderm, as following :

Materials and Methods

2)a Animals: Antedon bifida was obtained at the station « Of Biologie Marine of Roscoff » France.

2)b Obtention of crinoïd mRNA: Digestive coeca were excised from the A. bifida body.
A. bifida mRNA was obtained from Uptizol (Interchim). Quality control were operated.

2)c 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 [1]. 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+ with parameter word_size 7 [2].

Figure 1: Morphology of Antedon bifida.

Results

Various A.bifida transcriptomes are recalled [3,4]:

The Antedon bifida IgK transcriptome sequence is the following one:
>TRINITY_DN9178_c0_g1_i2 (Igk):
5'AGCGAATGAAAAAGAAGAACCGGCCAAAAAAA
AGTACTTCTACCAAAGAAGCGAATGAAAA

AGAAGAACCGGCCAAAAAAAAGTACTTCTACC
AAAGAAGAAACTGAAATAGAAGAACTAAC

CGAAACAAGTATTTCTACAAAATCAGTTT
CTGCCAGTGATATATTCCTTGGTACAACTTT
CACACTGGAGATGGGATTCTGCGTAGGA
CCTGAACACAAACCGTTTACAGGAGATTTCGA

CGGTGACGGTAATGAAGATCTTCTGTTT
CACAATTCAAAGACAGGCTCGAAAAAGATATA

CTATGCAAGTTGTGACGGCTCTTTTAATGGTGATA
GGTCGTGGAGAAGAGAGATGAATTT
TTGCTACGTAAGTGGATATGATCTATACATTGGTGATTT
CAACGGCGATGGTCGATCCGA
TATGCTGTGTCATCGTCCTCAGTATGGTCAGATTTGGG
TTGTGTTGGCGCAACCTGGGGG
TGTATTCACTGCTAACCCGTGGTCGTATAGTCCC
AATTGGTGCAAGGCCACCACTGATAA
AGTATATATTGGAGACTTCAACGCAGACGGTCGGG
ATGATATTCTTTGCCACACACAAAG
TTCGGGTTACATTGCAATATATTATGCATTATACACTG
GTTATTTTTCTACCTCTACAAC
ATATCGCTTTACACGAAGTATGAGTTGGTGCAGAGGTA
CATATCAAAGAGTGTATACTGG
AGATTTCAACGGAGACCGAAGGGTTGATATGCTCT
GCCACGACTACTCATCTGGCTACAT
ATATGTAGCAGTAGCCACAGCGACTGGTGGATT
CACCTCTGCCACATGGAGCAGAAGTAT

GGGCTGGTGCAAGCATTCGAACTCTAAGCTCAGCA
TTGGAGATTTCAATAAAGATAACCG

CGACGACATCATGTGCAGCGACACAAATGGTCCTTA
CTGGATAGCATTCTCTCTGTACAA

CGGTTCGTTTTCATCTAAAAGCTGGACCCGTAAACAAAA
CTGGTGTACATCTGGCAATGA

TGTGTTAGTTTCGGATGTGAATGGAGATGGTGGGG
ATGATTTGATGTGCCATAATGAAGC
CGACGGCATCAAGTACATATCGATCAACCATAAGGCC
TAAAGCAAGTTCCTCTCAATATT
ACAGAAAACTATTCACCACAAATGATTCATTTT
GTACTGAACCTCAATTCAAATTCAATT
AAAATTTACATAAACGTTAACGGAAGGATACAATCA
ACTAAAATAATGTTCATTCATTAT
TTTTCGTCGATAACCTAAACAAAAATCAGATAAGAAA
TTATACAATAATATACTGTAAAAC
GTATTATACAAAATAATTAAATGTATATTAAGCTACTGTA
CTTAGAAATGTACTTGTACG
CTTATTAATATTAATAAGCCTAATGCCCGGG
TTGATAATAATAAAATACATTTTTGCAAG
TTCAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAACTC AAAA

GTCCCAGGCCCCACCCCGACCTACTGAACCAGAAAG3'

The Antedon bifida Fc receptor(FCAR)transcriptome sequence is :
>TRINITY_DN13535_c0_g1_i1 (FCAR)

5'ACTCTACGAACCAAATTTAAATATAACCC
GAGAATGTATGTACAACCGATCCAGTAAAAT

GGTAACATTCAAGACTACGATTATGTACCTTGTTAAA
TTAAAATAAAATAAAGTACCGGT
AGATACACCATCATAAATATCAGCCTTTCATCAAGCAAAA
CAGTCATTTGTTACAGTTC
TGTCTTGAGTAGATGTTCTCAGCAAATTTTTCTAATATAA
CAATTATAAACTTCTTGTGA
AGATGAAATTTATTGATTTAATTGGATGCCAGTTAATTTT
ATTTAGAATTATTTTTAATT
TTGATCTGAGAAACAGAATTAAGAACTGGAAAA
GAAATGAACAAAAGTTTCCATAAAACT

ATCGTTATTCAATTTAGTTTGTTTCTATACAATGG
CAAATTAACACTTTCAAGAGAGGTG
CATATTTTTATTTTTGGTCAACTATGCTTACAA
TAGGTAAAAATAAAATATTAACATCCCC
CTACCCTACTTACATCCCAACTTATCACGTAA
TAAACCTTATTTCTCTGTCGGGAAAATT
TCAGATTTGAGCAAGTATAATTTTATTTATTATTT
CAGAATGTTCTCTATTTTAACTGGG
TGCTTGATACAATTAACATTGTAGAAGTTTATTT
GTTTATTTGTTTATTTGTTTTGTTTTGT
TTGTTTGTTTAGATGGAGTTTCTCTCTTGTTGTCC
AGGCTGGAGTGCAATGGCA3'

At last MHC transcriptomes class I (when compared to human HLA-E, HLA-B genes)are repertoried :

First HLA-E
>TRINITY_DN19334_c8_g2_i1 HLA-E

5'TGTAATCCCAGCACTTTGGGAGGCCGAGGCGGG
CGGATCACGAGGTCAGGAGATCGA GAC

CATCCTGGCTAACACAGTGAAACCCCGTCTCTACTAAAAA
TACAAAAAATTAGCCGGGCG

TGGTGGCGGGCGCCTGTAGTCCCAGCTACTCGGG
AGGCTGAGGCAGGAGAATGGCGTGAA

CCCGGGAGGCGGAGCTTGCAGTGAGCCGAGAT
CGCGCCACTGCACTCCAGCCTGGGCGAC

AGAGCGAGACTCTGTCTCAAAAAA
AAAAAAAAAAAAAAAAA3'

Secondly HLA-B
>TRINITY_DN15013_c0_g1_i1 HLA-B

5'GCCGAATATGATGCAGAGGTATCAGGGGGTGA
AGCATCTGGAGGTGAGGTATCGGCAGGA

GAGGCATCTGGGGGGAGAAGCTGAACAATC
TGACAATGAAAGCGATTAGATAACATTTTTT

TAATTCTAGTTGCAGCCTAAATATTTCGATATTACTTTTTTTT
ACTAGTTGAATGATTAA

CAAAAGAAAGCAACAACTGTGGTAATATTGCTAATT
A T G A A A T G A A A A A A T G T T T A A T G T G
GCCCTGACACTAAATTGTAAACTGTTTTTTAGTAATAA
G A A T T T C A A T A G C T T C T C T G A A
AGAAGATGTCTCTGAGAGAGTAATATTTGACAGGTT
C A G T G T A T T T A A A G A C T T A T A A T G
TAAAGCAGAGATGTAACTAGAGAAACCTAGATATT
GATGTCAACAAACTAAGGGTGCATG

GAAAATGTGAAAGACTTTAAGAGTGGGTGACCC
TGCCTACCAACACAATTCAATCCATGT

TTGAGGCTTTTTTTCATTAGCCTAATAGTGAAGTC
A G T G G C G T A A G G C C C C C T T G T T T A G
C A C T C C T A A G G G T C C C T A A T G A T G G A T A A T T G
T A T T G G G C T C T T C A T G C T C T G G G G C C C T
GGGTTTAGCTAGTGAGTGCTCATAGCAGTTGGC
TGGGCAAGGTTAGAAAGCAATGGTTCT

GTGCAGACATTTGCATTTAATTGACCAATATTTCAAA
T C G T G T G T T A C A C A G G A A T C A T A
ACCTAATCAGCAGTTGTTTTTAATAAACATTGCATCTT
G G T C G A C G T A A T A T T G T T A T G G
ACTGTCTGTGAAACCATGTGAATCTAAACTCTTAAAAA
T G C C T G C C T C T C C T G T C C T T G C
TAAATATAAATTTGTTTTCTCAATTAGGCG

G C C C T G A C A C T A A A T T G T A A A C T G T T T T T T
A G T A A T A A G A A T T T C A A T A G C T T C T C T G A A
A G A A G A T G T C T C T G A G A G A G T A A T A T T T
G A C A G G T T C A G T G T A T T T A A A G A C T T A T A A T G
T A A A G C A G A G A T G T A A C T A G A G A A A
CCTAGATATTGATGTCAACAAACTAAGGGTGCATG

GAAAATGTGAAAGACTTTAAGAGTGGGTGACCC
TGCCTACCAACACAATTCAATCCATGT

TTGAGGCTTTTTTTCATTAGCCTAATAGTGAAGTCA
G T G G C G T A A G G C C C C C T T G T T T A G
C A C T C C T A A G G G T C C C T A A T G A T G G A T A A T T G T A T T
G G G C T C T T C A T G C T C T G G G G C C C T
GGGTTTAGCTAGTGAGTGCTCATAGCAGTTGGCTGGG
CAAGGTTAGAAAGCAATGGTTCT

GTGCAGACATTTGCATTTAATTGACCAATATTT
C A A A T C G T G T G T T A C A C A G G A A T C A T A
ACCTAATCAGCAGTTGTTTTTAATAAACATTGCATCTT
G G T C G A C G T A A T A T T G T T A T G G
ACTGTCTGTGAAACCATGTGAATCTAAACTCTTAAAAA
T G C C T G C C T C T C C T G T C C T T G C
TAAATATAAATTTGTTTTCTCAATTAGGCG3'

Conclusion

From data to data it appears that Echinodermata ,especially Antedon bifida, possess a sophisticated immune system from a point of genomic point of view.Many human immune genes are shared with Echinodermata genes and in particular : Antedon bifida : It's of special interest in the domain of Comparative Immunology.

References

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