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Evidence of Immune Genes in the Crinoid: Antedon Bifida Evidence of A. Bifida Igkappa Gene, Fc Receptor Gene

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Abstract

Immuno-genomics studies realized in Echinodermata (Invertebrates) were surprising. 3 classes out of 5 Echinodermata presented an IGKappa gene and an Fc receptor gene. It was, first demonstrated, in Asterids and Ophuirids. It was, secondly clearly shown, in the ancestral Crinoïd: Antedon bifida.

Keywords: Invertebrates; Echinodermata; Crinoids; Igkappa Gene; Fc Gene; A. Bifida;

Introduction

The general idea that emerged from the experiments, made in our laboratory, was that Echinodermata, as exemplified, by sea star Asterias rubens (Asterids)and by Ophiocomina nigra (Ophuirids), possessed an immune system, able to mount cellular and humoral-specific responses,

After stimulation with a foreign antigen: the horse-radish peroxides (HRP) [1, 2]. Then, these echinodermata produced a primitive antibody, correlated to an Igkappa gene [3,4] to a Fab gene [5], an Fc receptor gene [6].But a question deserves to be put: did the ancestral Echinodermata, Antedon bifida, (Crinoïd) possess such genes? It is why, in a first time, we look for IgKappa gene, Fab gene, Fc receptor gene in these crinoids by the mean of genomic studies.

Materials and Methods

Animals

Antedon bifida was obtained at the station « Of Biologie Marine of Roscoff » France.

Obtention of crinoids mRNA

Digestive coeca were excised from the A. bifida body.

Bifida mRNA was obtained from Uptizol (Interchim). Quality control was 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 [7] 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+ [8] with parameter word size 7.

Results

The (Table 1) which is following summarizes the found Antedon bifida transcriptomes of Igkappa gene and Fc receptor gene of IgA (FCAR) of IgE (Fcer2a) we met in Homo sapiens and in Mus musculus:

Table 1: GenBank (IgK, FCAR, Fcer2a)

Query ID	Query Symbol	Species	Subject ID	Identity (%)	Length	Mis-match	Gap open	Query cover (%)	E-value
BC032451.1	Igk	Homo sapiens	TRINITY_DN9178_c0_g1_i2	89,74	78	7	1	8	4,00E-20
NM_133273.3	FCAR	Homo sapiens	TRINITY_DN13535_c0_g1_i1	79,31	87	13	5	4	5,00E-07
NM_001253737.1	Fcer2a	Mus musculus	TRINITY_DN20232_c5_g2_i1	84,31	51	7	1	2	8,00E-05

The Antedon bifida IgK transcriptome sequence is the one

>TRINITY_DN9178_c0_g1_i2(Igk)

5'AGCGAATGAAAAAGAAGAACCGGCCAAAAAAAGTACTTCTACCAAAGAAGCGAATGAAAAAGAAGAACCGGCCAAAAAAAGTACTTCTACCAAAGA
AGAAACTGAAATAGAAGAACTAACCGAAACAAGTATTTCTACAAAATCAGTTTCTGCCAGTGATATATTCCTTGGTACAACTTTCACACTGGAGATGGG
ATTCTGCGTAGGACCTGAACACAAACCGTTTACAGGAGATTTCGACGGTGACGGTAATGAAGATCTTCTGTTTCACAATTCAAAGACAGGCTCGAAAA
AGATATACTATGCAAGTTGTGACGGCTCTTTTAATGGTGATAGGTCGTGGAGAAGAGAGATGAATTTTTGCTACGTAAGTGGATATGATCTATACATTG
GTGATTTCAACGGCGATGGTCGATCCGATATGCTGTGTCATCGTCCTCAGTATGGTCAGATTTGGGTTGTGTTGGCGCAACCTGGGGGTGTATTCACTG
CTAACCCGTGGTCGTATAGTCCCAATTGGTGCAAGGCCACCACTGATAAAGTATATATTGGAGACTTCAACGCAGACGGTCGGGATGATATTCTTTGCCA
CACACAAAGTTCGGGTTACATTGCAATATATTATGCATTATACACTGGTTATTTTTCTACCTCTACAACATATCGCTTTACACGAAGTATGAGTTGGTGC
AGAGGTACATATCAAAGAGTGTATACTGGAGATTTCAACGGAGACCGAAGGGTTGATATGCTCTGCCACGACTACTCATCTGGCTACATATATGTAGCAG
TAGCCACAGCGACTGGTGGATTCACCTCTGCCACATGGAGCAGAAGTATGGGCTGGTGCAAGCATTCGAACTCTAAGCTCAGCATTGGAGATTTCAATA
AAGATAACCGCGACGACATCATGTGCAGCGACACAAATGGTCCTTACTGGATAGCATTCTCTCTGTACAACGGTTCGTTTTCATCTAAAAGCTGGACCC
GTAAACAAAACTGGTGTACATCTGGCAATGATGTGTTAGTTTCGGATGTGAATGGAGATGGTGGGGATGATTTGATGTGCCATAATGAAGCCGACGGCA
TCAAGTACATATCGATCAACCATAAGGCCTAAAGCAAGTTCCTCTCAATATTACAGAAAACTATTCACCACAAATGATTCATTTTGTACTGAACCTCAAT
TCAAATTCAATTAAAATTTACATAAACGTTAACGGAAGGATACAATCAACTAAAATAATGTTCATTCATTATTTTTCGTCGATAACCTAAACAAAAATC
AGATAAGAAATTATACAATAATATACTGTAAACGTATTATACAAAATAATTAAATGTATATTAAGCTACTGTACTTAGAAATGTACTTGTACGCTTATTAA
TATTAATAAGCCTAATGCCCGGGTTGATAATAATAAAATACATTTTTGCAAGTTCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAACTCAAAAGTCCCAGGCCCCACCCCGACCTACTGAACCAGAAAG3'

The Antedon bifida Fc receptor (FCAR) transcriptome sequence is the one:

>TRINITY_DN13535_c0_g1_i1(FCAR)

5'ACTCTACGAACCAAATTTAAATATAACCCGAGAATGTATGTACAACCGATCCAGTAAAATGGTAACATTCAAGACTACGATTATGTACCTTGTTAAATT
AAAATAAAATAAAGTACCGGTAGATACACCATCATAAATATCAGCCTTTCATCAAGCAAAACAGTCATTTGTTTACAGTTCTGTCTTGAGTAGATGTTC
TCAGCAAATTTTTCTAATATAACAATTATAAACTTCTTGTGAAGATGAAATTTATTGATTTAATTGGATGCCAGTTAATTTTATTTAGAATTATTTTTA
ATTTTGATCTGAGAAACAGAATTAAGAACTGGAAAAGAAATGAACAAAAGTTTCCATAAAACTATCGTTATTCAATTTAGTTTGTTTCTATACAATGG
CAAATTAACACTTTCAAGAGAGGTGCATATTTTTATTTTTGGTCAACTATGCTTACAATAGGTAAAATAAAATATTAACATCCCCCTACCCTACTTACAT
CCCAACTTATCACGTAATAAACCTTATTTCTCTGTCGGGAAAATTTCAGATTTGAGCAAGTATAATTTTATTTATTATTTCAGAATGTTCTCTATTTTAA
CTGGGTGCTTGATACAATTAACATTGTAGAAGTTTATTTGTTTATTTGTTTATTTGTTTGTTTGTTTGTTTAGATGGAGTTTCTCTCTTGTTGTC
CAGGCTGGAGTGCAATGGCA3'

Discussion and Conclusion

Fortunaly, we find again in another Echinodermata, the IgKappa gene, the Fc receptor gene, we found in the Asterid: Asterias Rubens and in the Ophuirid: Ophiocomina nigra. Fab gene was found also in A.bifida, but the e-value was not significant. A considerable role may be assigned to crinoids IgKappa gene and Fc receptor gene: it is the one of Antedon bifida primitive antibody, but further research is needed in order, to examine and characterize the "immunocytochemical aspects of immunizations" to HRP (Horse-radish peroxides) or other antigen in Antedon bifida.

Nevertheless, for the third time, we find an invertebrate primitive antibody in an Echinodermata: it's a great novelty!

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