

# Evidence of immune genes in the crinoïd: *Antedon bifida* evidence of *A. bifida* Igkappa gene and a FC receptor one

## Abstract

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

**Keywords:** invertebrates, echinodermata, crinoïds, igkappa gene, fc gene, *A. bifida*

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## 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 *Ophiocoma nigrum* (Ophiurids), possessed an immune system, able to mount cellular and humoral-specific responses. After stimulation with a foreign antigen: the horse-radish peroxidase (HRP).<sup>1,2</sup> Then, these echinodermata produced a primitive antibody, correlated to an Igkappa gene<sup>3-5</sup> to a Fab gene,<sup>6</sup> a Fc receptor gene.<sup>7</sup> 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 this crinoïd 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 crinoïd mRNA:** Digestive coeca were excised from the *A. bifida* body. *A. bifida* mRNA was obtained from RNeasy (Qiagen). 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 (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+ 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: The *Antedon bifida* IgK transcriptome sequence is the one:

>TRINITY\_DN9178\_c0\_g1\_i2 (Igk):

```
5'AGCGAATGAAAAAGAAGAACCGGCCAAA-
AAAAGTACTTCTACCAAAGAAGCGAATGAAA
AGAAGAACCGGCCAAAAAAGTACTTCTAC-
CAAAGAAGAACTGAAATAGAAGAAGTAAC
CGAAACAAGTATTTCTACAAAATCAGTTTC-
TGCCAGTGATATATTCCTTGGTACAACCTT
CACACTGGAGATGGGATTCTGCGTAGGACC-
TGAACACAAACCGTTTACAGGAGATTTTCA
CGGTGACGGTAATGAAGATCTTCTGTTTCA-
CAATTCAAGACAGGCTCGAAAAAGATATA
CTATGCAAGTTGTGACGGCTCTTTTAATGG-
TGATAGGTCTGTGGAGAAGAGAGATGAATTT
TTGCTACGTAAGTGGATATGATCTATACAT-
TGGTGAATTTCAACGGCGATGGTGCATCCGA
TATGCTGTGTCATCGTCTCTCAGTATGGTCA-
GATTTGGGTTGTGTTGGCGCAACCTGGGGG
TGATTTCACTGCTAACCCGTGGTCTGATAG-
TCCCAATTGGTGCAAGGCCACCACTGATAA
AGTATATATTGGAGACTTCAACGCAGACGG-
TCGGGATGATATTCTTTGCCACACACAAAG
TTCGGGTTACATTGCAATATATTATGCATTA-
TACACTGGTTATTTTCTACCTCTACAAC
ATATCGCTTTACACGAAGTATGAGTTGGTG-
CAGAGGTACATATCAAGAGTGTATACCTGG
AGATTTCAACGGAGACCGAAGGGTTGATA-
TGCTCTGCCACGACTACTCATCTGGCTACAT
ATATGTAGCAGTAGCCACAGCGACTGGTG-
GATTCACCTCTGCCACATGGAGCAGAAGTAT
GGGCTGGTGCAAGCATTTCGAACCTTAAGC-
TCAGCATTGGAGATTTCAATAAAGATAACCG
CGACGACATCATGTGCAGCGACACAAATG-
GTCCTTACTGGATAGCATTCTCTGTACAA
CGGTTTCGTTTTTCATCTAAAAGCTGGACCCG-
TAAACAAAACCTGGTGTACATCTGGCAATGA
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TGTGTTAGTTTCGGATGTGAATGGAGATGG-TGGGGATGATTTGATGTGCCATAATGAAGC CGACGGCATCAAGTACATATCGATCAACCA-TAAGGCCTAAAGCAAGTTCCTCTCAATATTACAGAAAACCTATTTCAACCACAAATGATT-CATTTTGTACTGAACCTCAATTCAAATTCAATTAAAATTTACATAAACGTTAACGGAAGGATACAAATCAACTAAAATAATGTTTCATTTCATTATTTTTCGTCGATAACCTAAACAAAAAATCAGATAAGAAATTATACAATAATATACTGTAAACGTATTATACAAAATAATTAATGTATATTAAGCTACTGTACTTGAAGATGTACTTTGTACGCTTATTAATATTAATAAGCCTAATGCCCGG-GTTGATAATAATAAAATACATTTTTTGCAGTTCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA-AAAAAAAAAAAAAAAAAAAAAAAAAACTCAAAA GTCCCAGGCCCCACCCCGACCTACTGAACCAGAAAG3'

The *Antedon bifida* Fc receptor (FCAR)transcriptome sequence is the one: >TRINITY\_DN13535\_c0\_g1\_i1 (FCAR)

5'ACTCTACGAACCAAATTTAAATATAACC-CGAGAATGTATGTACAACCGATCCAGTAAAAAT

Table 1 GenBank (Igk, FCAR, Fcer2a)

GGTAACATTCAAGACTACGATTATGTACCT-TGTTAAATTAAAAATAAAATAAAGTACCGGTAGATACACCATCATAAATATCAGCCTTTCA-TCAAGCAAAACAGTCAATTTGTTTACAGTTCTGTCTTGAGTAGATGTTCTCAGCAAATTTT-TCTAATATAACAATTATAAACTTCTTGTGAAGATGAAATTTATTGATTTAATTGGATGC-CAGTTAATTTTATTTTGAATTTATTTTAAATTTGATCTGAGAAACAGAATTAAGAAGCTGGA-AAAGAAATGAACAAAAGTTTCCATAAAACTATCGTTATTCAATTTAGTTTGTCTTCTATACA-ATGGCAAATTAACACTTTCAAGAGAGGTTGCATATTTTTTATTTTTTGGTCAACTATGCTTACAATAGGTAAAATAAAATATTAACATCCCCCTACCCTACTTACATCCCAACTTATCACG-TAATAAACCTTATTTCTCTGTCTGGGAAAATTTCAGATTTTGAGCAAGTATAATTTTATTTAT-TATTTTCAGAAATGTTCTCTATTTTAACTGGGTGCTTGATACAAATTAACATTGTAGAAGTT-TATTTGTTTATTTGTTTATTTGTTTGTGTTTGT-TGTTTGTGTTAGATGGAGTTTCTCTTGTGTCAGGCTG-GAGTGCAATGGCA3'

Query ID	Query Symbol	Species	Subject ID	Identity (%)	Length	Mis-match	Gapopen	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

## Discussion and conclusion

Fortunally, we find again in another Echinodermata, the IgKappa gene, the Fc receptor gene, we found in the Asterid: *Asterias Rubens* and in the Ophurid: *Ophiocomina nigra*. Fab gene was found also in *A.bifida*, but the e-value was not significant. A considerable role may be assigned to crinoid 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 peroxydase) 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!

## Acknowledgments

None.

## Conflicts of interest

The author declares there are no conflicts of interest.

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