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Complement System in Asterias Rubens Genome: Comparisons with Rainbow Trout Complement

Michel Leclerc*

*556 rue Isabelle Romée, 45640 Sandillon, France

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ABSTRACT

Seven complement components have been discovered in 2013 in Asterias rubens genome when compared to mouse one. Another component (C6) which is present in mouse was found: in sea star, when, also, compared to rainbow trout genome: “Oncorhynchus mykiss".

INTRODUCTION

We have recently described the “Sea star complement Evidence” [1]. We remarked that C6 and C7 components were missing in sea star transcriptome when compared to mouse one.

An extensive study allowed us to research these components in less evolved animals (phylogenetically speaking) than mouse. Genomic features of the rainbow trout: Oncorhynchus mykiss have helped us, in this study.
At this point, we were attempting to determine how many similar complement components might be present in Asterias rubens (Invertebrate) and in Oncorhynchus mykiss (Vertebrate).

MATERIALS & METHODS

Sea stars Asterias rubens were used.

Immunizations to HRP (Horse-radish Peroxydase) and genomic studies were already described [1]. RNA sea star was obtained by using Trizol (Invitrogene) then cDNA.
After ligation of adapters for Illumina's GSII sequencing system, the cDNA was sequenced on the Illumina GSII platform sequencing.

1.100 bp from one side of the approximately 200 bp fragments. Sequences were assembled using Velvet [2].

RESULTS

We recall that three complement components: C1r, C4, C1 inhibitor of the classical activation pathway have been fully sequenced in rainbow trout [3] and the well-known C6 was discovered in trout in 2006 [4].
Sea star C1q subunits A, B, C, were sequenced in A. rubens [1].

C2, C4B, and C3 which is central in mammals to both the classical and alternative pathways, C9, C5, C8 were also sequenced (1) in Asterias rubens.
As for C6, it was shown as following, when compared to Oncorhynchus mykiss genome:
One contig (Contig11285|m.9708) could be annotated via BLASTX to Oncorhynchus mykiss "Complement component C6" from the Trembl database, with an e-value of 3.75e-13. On an aligned region of 113 amino acids, 37 positive and 56 identical amino acids were found.

5'GACAAATTCGACACTTACAAAAAGCATCTCAAC
CCGAGTAGGAAGGAATCTCTTTTAGTT
GCAGTAAATTTTGAATTTGTATAATTCAGTATTTT
GTGCTCCCTTTGGTATCAGTTTAGA
TCCACACAACCTGTGAAAAACTTCAGTACTTACTA
GATTTCGCCAACGCAACGGTAAACG
AGTCATTTGATTTTGACCATCATCAACTGAAGCAA
CGCACGTAATACACACAACAAACGG
AACATTTTGTGTGTAGTTTCCAGCGATTCGAGAAG
CAAATCAAAGACAAGATGTCTTTAC
CCAGTGATGTTGAAACAGACTCCGTCATGGATAGT
CCAGCAGAGATTCATATGAACATGA
ATAAGCTACAATCTAAACTTCCCAGCGTTACTCAA
GACGAGAGATTTGACTCCGGAATTG
ACTCGTTACGTTCTGTTGATTCGGCGTACTGCTTG
AGCTTCGAAAGGGAATCGAGCCTGG

Corresponding author: Michel Leclerc, 556 rue Isabelle Romée, 45640 Sandillon, France, Tel: +92219926130; E-mail: mleclerc45@gmail.com

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CTTCGATAAATGAGAAGACGTCTCTCACATCACAC
CTGCAACAGCTCCATCTTTCACATG
AAACAAGAACAGAAACCGAGAAGACTGAAACGAC
AGTAGAAGACATCGATGAAGCTTATC
ATGATGAGTGTACTATGTCTGAAACACTCGACAATT
TGGAAGAAACTGCAAGAATTGTGG
AATATCCTGAACAAAGATGCACGGGACGTCTTACA
GATGATGCCTTCGACCAAGACCAAG
AGGGAGATACGCCCCTTCATCTTGCTATTATTCATA
AGGAAGTGGACTTCGCAGAAAAAT
TCATCATCTTTGTTGCAGATCCTGAGTTACTGAACA
TCAGCAATGATCTTATGCAGACTC
CTTTACACCTTAGCGTATTAACAAGGCAACAAGAT
ATCTGTCGTGTTCTCGTCTTGGGCA
ATGCCCAAATCGACTGCACCGACCGAAACGGCGAC
ACTCCTCTTCATATTGCATGCAGAC
TGAGAGATGAGGGCTGTATCAGAGCTCTGACTGAA
GGAATATCTCCACTCGAGCGTAAGA
GAGGGATGGTTCCACAGAATAGAGCAAGTGGGGTA
CAACAGCTTCCACAGAATCTTGAAC
TCAGAAACTTTGAAGGCTACACATGCATCCATATTG
CAGGATTCGCTTGTAGCGTCGATC
AGTTGGAGTACCTTGTGCAGCTAGGCGGCGACATA
AATGCCCCGGATGGAAAGAGCGGAA
GGACCATTCTCCACTACGCTGTAGAGGCGGGTGAC
TTTTCTCTTTGTCAGTACCTCATTG
CGAACTTGGGTGCCAATGTTAATGCGTTGACCTTTG
ACCAGTGCACACCC**3'**

C7 was not found in sea star genome.

DISCUSSION AND CONCLUSION

Asterias. rubens, although considered to be more primitive than lower vertebrates (as trout) seem to have evolved much more sophisticated immune innate defense mechanisms.

We find much more complement components in the sea star than in trout: 8 out of 9, when compared to mouse genome.

Phylogenetically (From a point of view...) the sea star could be situated in "an evolutive cul de sac"
It might evolve more quickly than rainbow trout, in term of innate immunity.

As for adaptative immunity, rainbow trout is more evolved [5] than Asterias rubens which presents an "invertebrate primitive antibody" in response to antigenic injury [6].

The main point to conclude is the following: the sea star Asterias rubens has evolved the ability to develop innate and adaptative immunity with its IPA (Invertebrate primitive antibody) in which Fab gene Fc receptor gene were found [7-10] like in two other Echinodermata [11,12].

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