

DNA repair in sea star *asterias rubens*: genomic aspects

Michel Leclerc*

556 rue Isabelle Romée , Sandillon 45640, France

Both genetic and biochemical approaches have been used, to study the molecular mechanisms, by which damaged DNA is repaired, in a number of species. The fundamental DNA repair pathways have been functionally conserved for the most part among, prokaryotes, lower eukaryotes and higher eukaryotes. The proteins and protein families, involved, in these repair processes, show high degrees of amino-acid sequence conservation. However, there are also a number of cases in which lack of conservation of particular polypeptides may reveal interesting species specific differences in how certain repair functions are performed.

1. DNA methylation: In mammals, DNA methylation is associated with the regulation of gene expression and the maintenance of the differential state in cell lineages [1]. It is also present in other phylogenetic groups such as some invertebrates: sponges, some insects, sea urchins.

2. DNA repair in Invertebrates: The recent completion of the *Drosophila* genome sequence show the existence of the

Rad 51 Family DNA repair

(Rad 51 named for *Saccharomyces cerevisiae*: the first member discovered). Two *Drosophila* Rad 51 have been described [2]: there are important in both recombinational DNA repair and meiotic recombination.

3. DNA repair in sea star *Asterias rubens*: Sea star *Asterias rubens* genome has recently been studied [3] in immunized and non-immunized sea stars to HRP (Horse-radish peroxidase)

We find Rad 51 Family DNA repair and also what is original and not yet described ,genes which are found in vertebrates exclusively:

a) in non-immunized sea star genome ("control")

Control: TR38504|c0_g1_i1 sp|Q64267|XPA_MOUSE DNA repair protein complementing XP-A cells homolog OS=Mus musculus GN=Xpa PE=1 SV=2 Control: Contig11913 sp|P23475|XRCC6_MOUSE X-ray repair cross-complementing protein 6 OS=Mus musculus GN=Xrcc6 PE=1 SV=5

Control:Contig7953 sp|P27641|XRCC5_MOUSE X-ray repair cross-complementing protein 5 OS=Mus musculus GN=Xrcc5 PE=2 SV=4

b) We find similar results in immunized sea star genome.

c) Interpretation -Discussion:

These genes are mainly used in cellular response to X-Ray, to gamma radiation, in Vertebrates.It is surprising to find them in an ancestral invertebrate: the sea star *Asterias rubens*: The enigmatic sea star!

Another explication can be done. These genes named : Xrcc6 and Xrcc5 play a role in the immune process in which immune receptor V,D and J,orV and J gene segments, depending on the specific receptor are recombined within a single locus utilizing the conserved heptamer and nonamer recombination signal sequence (RSS) regional genes (V,D,J) used to generate Ig molecules.

This last aspect of sea star genomic studies corroborates the existence of the sea star primitive antibody.

References

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2. McKee BD (1996) *Chromosoma* 104: 479-488.
3. Leclerc M (2011) *Immunol Lett* 138: 197-198.

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Correspondence to: Michel Leclerc, 556 rue Isabelle Romée , Sandillon 45640, France, Email: mleclerc45@gmail.com

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