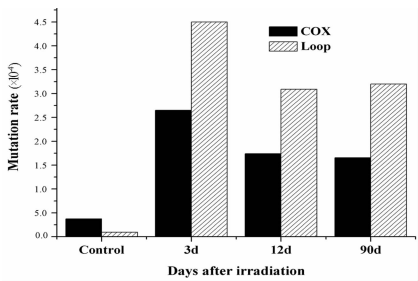


### 3 - 97    Effect of Carbon-ion Radiation on Transgeneration Mitochondrial DNA Mutation of Zebrafish

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Radiation exposure to reproductive female, especially to their ovaries may cause mitochondrial DNA mutations in oocytes, which may be transmitted to offspring dut to the exclusively maternal inheritance of mtDNA. We hypothesized that females who were exposed to carbon-ion radiation may cause increased mtDNA mutation in their offspring. Seven healthy female zebrafish were selected as mother, a total of 277 offspring were sequenced in Loop and COX region. Mother zebrafish were irradiated with an non-lethal dose of 1 Gy carbon-ion radiation. The first generation which was produced 3 d after carbon-ion irradiation showed the highest mtDNA mutation rate than the latter two generations produced 12 and 90 d after.



The mutation rate was  $3.75 \times 10^{-5}$  in COX and  $9.5 \times 10^{-6}$  in Loop of the offspring produced by female zebrafish prior to radiation eposure. Mutation rate increased to  $2.65 \times 10^{-4}$  in COX and  $4.50 \times 10^{-4}$  in loop in the irradiated female zebrafish's offspring 3 d after. Mutation rate decreased in 12 and 90 d offspring but still exhibited increased mutation level versus control (Fig. 1).

Analysis of base substitution based on the counting of more than 277 samples showed that offspring from irradiated mothers harbored significantly more mutations than offspring from mothers produced prior to irradiation. In detail, the first generation after radiation exposure showed the highest base substitutions score than the second and third generation. There was clear dominance of guanine deletions than other types of mutations. The analysis of possible consequences of mutations for the protein structure has been done for COX loci (Table 1).

Table 1    Type of mutation

Location of mutation	Nuclotide substitution	Possible effect on protein
6597	T/C	V/A
6600	C/G	T/S
6673	G/A	Silent
6694	C/G	P/R
6821	G/A	A/T
6904	A/T	Silent
6916	T/C	Silent
6944	C/G	P/A
6996	C/A	T-L
7018	T/C	Silent
7033	T/A	Silent
7172	G/C	G/R
7410	G/A	G/Q
7480	G/A	Silent
7651	A/T	W/C
7896	A/C	N/T

Our results indicated that single carbon-ion exposure could increase the risk of transgeneration mtDNA mutation in zebrafish.

#### References

[1] A. Grosovsky, H. Bethel, K. Parks, et al. , Phys. Med. , 17 Suppl. , 1(2001)238.  
[2] J. Dziegielewski, W. Goetz, J.E. Baulch, Radiation and Environmental Biophysics, 49(2010)303.