メバルのテトラゾリゴーム・オキシターゼにおける遺伝的多型

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Short Paper

Genetic Polymorphism of Tetrazolium Oxidase in Black Rockfish*

BREWER[1] first demonstrated the enzyme catalyzing the transfer of electrons from reduced tetrazolium to oxygen in human tissues, and identified the enzyme as indophenol oxidase. The genetic variants of this enzyme sometimes called tetrazolium oxidase (TO) have been found in rainbow trout and chinook salmon[2] as well as in human[1] and dog.[3] JOHNSON *et al.*[4] reported the occurrence of interspecific variations of TO in fifteen species of *Sebastodes*. This paper describes four different patterns of this enzyme found during the survey of variants of various dehydrogenases in black rockfish, *Sebastes inermis*.

Two groups of black rockfish from Kanagawa Prefecture, 63 specimens captured at Hashirimizu in Mar. 1969 and 9 specimens captured at Aburatsubo in Aug. 1969 were analyzed. The fresh tissue or frozen tissue kept at −20°C was homogeneized with distilled water (1 : 1) and centrifuged. The supernatant obtained was subjected to starch gel electrophoresis using a Tris-borate-EDTA buffer, pH 8.7. The current of 0.1 mA/cm^2 was applied for 15 hr. After the run the gels were sliced and immersed in the reaction mixtures for visualization of various dehydrogenases such as lactate dehydrogenase and malate dehydrogenase. After 2 to 3 hr-incubation, broad white zones appeared against the non-specific bluish background of reduced tetrazolium (Fig. 1). The patterns were also detectable with a reagent containing 5 mg of phenazine methosulfate and 10 mg nitro blue tetrazolium per 50 ml of 0.1 M Tris-HCl, pH 8.7. The positive staining with 10^{-3} M α-naphthol and 10^{-3} M N, N-dimethyl-phenylenediamine gave faint bands at the identical positions to the above achromatic bands on the gels, as already described by BREWER. The tissues examined were liver, testis, ovary, blood, heart muscle, pigmental layer of eye, pyloric caeca, intestine, stomach, kidney, brain, gill, retina, white muscle, and skin, and all of these tissues exhibited a qualitatively identical pattern, the intensities of stain decreasing in the above order.

The livers from 63 specimens of Hashirimizu revealed three types of TO designated F, F–N and N (Fig. 1) in the ratio 2: 10: 51. Of the 9 specimens of Aburatsubo, 7 were of type N, but 2 showed a variant pattern designated N–S. These results suggest that the variation of TO in black rockfish is controlled by three codominant alleles; the homozygote for TO^F allele produces one kind of dimer, FF, migrating faster than the dimeric isozyme of N subunit in the case of homozygote for TO^N allele, and each of the heterozygotes (TO^F/TO^N and TO^N/TO^S) produces two homodimers and one heterodimer. In the above assumption of the genetic control of TO, the numbers of specimens exhibiting F, F–N and N types in the Hashirimizu population are expected to be 0.8, 12.4 and 49.8 respectively, which are in good agreement with the observed numbers ($\chi^2 = 2.29$). The gene frequencies of TO^F and TO^N in this population were 0.111 and 0.889 respectively, while the Aburatsubo population was supposed to have the genetic composition in which all the TO^F alleles in the Hashirimizu population were replaced by the TO^S alleles. The types of TO were independent of the genotypes of catalase as well as the five isozyme systems of lactate dehydrogenase (unpublished data).

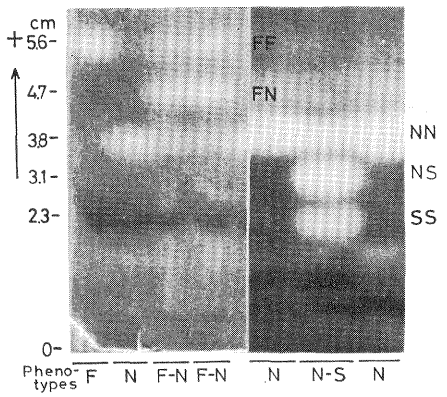

Fig. 1. Four electrophoretic patterns of tetrazolium oxidase in black rockfish, *Sebastes inermis*. Postulated subunit compositions of respective isozymes are shown on their right side.

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