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Authors: Nakajima, Masamichi, Shinohara, Eiji, and Fujio, Yoshihisa

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[SHORT COMMUNICATION]

Fluorescent Chromatophore Detected in the Guppy *Poecilia reticulata*

Masamichi Nakajima*, Eiji Shinohara and Yoshihisa Fujio

Laboratory of Applied Population Genetics, Graduate School of Agricultural Science, Tohoku University, Sendai 981-8555, Japan

ABSTRACT—Fluorescent chromatophores with bluish white fluorescence were detected in the guppy *Poecilia reticulata*. These chromatophores were observable only by means of a fluorescence microscope, and could not be observed by a standard transmission light microscope or incident light microscope. Resembling other common chromatophores, these fluorescent chromatophores were dendrictic cells and similar to other chromatophores in the size, about 50–100 μm.

Of the 17 strains examined, these fluorescent chromatophores were detected only in the R strain, and in all 12 R strain individuals examined, each presented fluorescent chromatophores.

These differences in the occurence of fluorescent chromatophores among strains suggest that the formation of these chromatophores is the result of genetic polymorphism.

INTRODUCTION

In mature males of the guppy *Poecilia reticulata*, aquarists have bred a variety of color types and patterns. The modes of inheritance of these body color types and color patterns have been examined (Winge and Ditlevsen, 1948; Ueshima *et al.*, 1998). The body colors of both females and males were determined mainly by the existence of several types of chromatophore, and the genetic polymorphisms of formation of these chromatophores have been described (Ueshima *et al.*, 1998).

Vertebral chromatophores are generally classified into five categories according to Fujii and Oshima (1986). These are the melanophore (black), erythrophore (red), xanthophore (yellow), leucophore (white), and iridophore (reflecting). Recently, the blue chromatophore (cyanophores) was also reported by Goda and Fujii (1995). No chromatophores which have fluorescence have been reported, however, several pigments which have fluorescence have been reported, such as pteridines.

We describe here our preliminary observations regarding fluorescent chromatophores made in the context of our study regarding the inheritance mode of chromatophores.

MATERIALS AND METHODS

Mature guppies *Poecilia reticulata* which were more than 60 days old were used as experimental fish. The individuals were collected from 17 strains which were maintained as closed colonies at a density of 300–500 individuals per 60 *l* aquaria in our laboratory. Each strain was selected by body color type or color pattern, and each trait was fixed in each strain. The examined number of individuals in each strain were more than 6 (3 females and 3 males), as shown in Table 1.

The chromatophores were observed in the scales sampled from specific parts of the body of the guppy (posterior part of head, dorsal fin base, lateral part of trunk and caudal peduncle). These scales were enclosed in the medaka linger solution (Iwamatsu, 1993) for observation. The chromatophore was observed by means of a standard transmission light microscope with differential–interference, and by means of fluorescence microscope (OLYMPUS BX-60). This system used the excitation filter, BP330-385, and the emission filter, BA420.

RESULTS AND DISCUSSION

Fluorescent chromatophores were detected in the scales sampled in one strain, the R strain, of 17 guppy strains (Table 1). By standard transmission light microscopy, it was not observed (Fig. 1A), however, these bluish white chromatophores were observable by means of fluorescence microscopy (Fig. 1B, 1C). These chromatophores were not visible when standard incidence light was used, however, some granulars were observed by standard transmission light microscopy (Fig. 1A). These chromatophores were composed of dendrictic cells and were simillar to other chromatophores in size about 50–100 μm. But they differed from previously reported chromatophores, such as melanophores, xanthophores, erythrophores, leucophores, iridophores, and cyanophores (Fujii, 1993; Goda and Fujii, 1995), because of

* Corresponding author: Tel. +81-22-717-8741;
FAX. +81-22-717-8743.

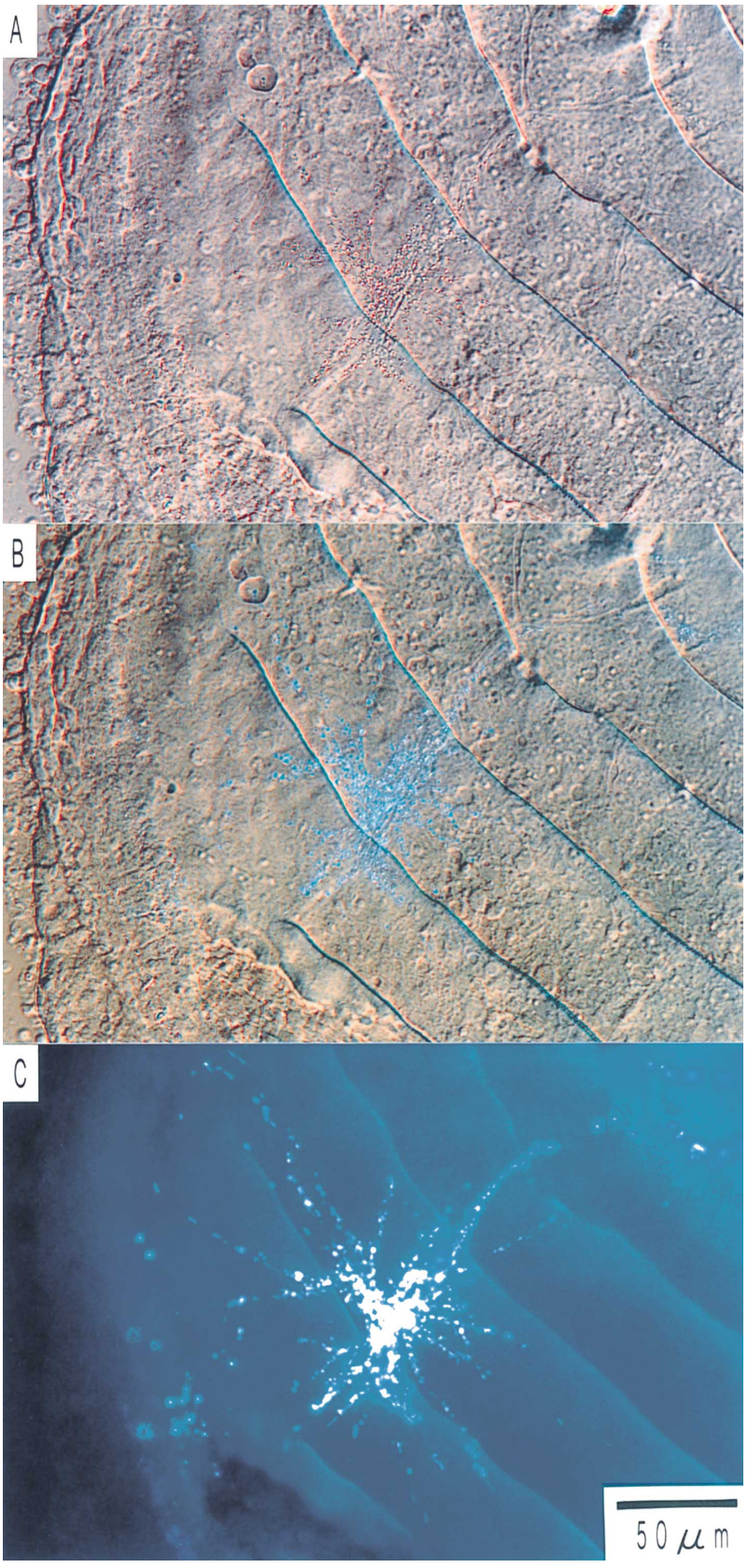

Fig. 1. Photomicroscographs showing the fluorescent chromatophore observed in the R strain of the guppy *Poecilia reticulata*. These three photomicroscographs were taken of the same area under differing optical conditions. **A**: Standard transmission optics with differential-interference microscopy. **B**: Standard transmission optics with differential-interference and fluorescence microscopy. **C**: Fluorescence microscopy.

Table 1. The existance of fluorescent chromatophores in each strain of the guppy *Poecilia reticulata*.

Strain	Female	Male
A	–* (n=5)	– (n=6)
B	– (n=3)	– (n=3)
C	– (n=3)	– (n=3)
D	– (n=3)	– (n=3)
D1	– (n=3)	– (n=2)
D2	– (n=3)	– (n=5)
F	– (n=3)	– (n=3)
G	– (n=3)	– (n=3)
G1	– (n=3)	– (n=3)
L	– (n=3)	– (n=3)
O	– (n=3)	– (n=3)
R	+ (n=5)	+ (n=7)
S	– (n=7)	– (n=6)
S3	– (n=3)	– (n=3)
S3HL	– (n=3)	– (n=3)
SC	– (n=3)	– (n=3)
T	– (n=4)	– (n=4)
Y	– (n=4)	– (n=4)

+: Presence –: Absence *: A few number of fluorescent chromatophores were observed only in the scales picked up from caudal peduncle in one female of the 6 individuals examined.

their fluorescence, the previously described chromatophores having no fluorescence. However, several fluorescent pigments have been reported. Some pteridines, such as biopterin, neopterin, and leucopterin, are known as fluorescent pigments (Matsumoto *et al*., 1971) and have blue or bluish white fluorescence. In fishe, biopterin has been isolated from goldfish (Hama *et al*., 1960), *Xiphophorus* fish (Kauffman, 1959) and medaka (Hama *et al*., 1965). However, the sort of pigments present in the chromatophores detected in this study was not yet identified.

Fluorescent chromatophores were observed only in the R strain of the 17 guppy strains examined (Table 1). The fluorescent chromatophores were not accompanied by chromatophores of other types, because the R strain is an albino strain which has no visible chromatophores. In the A strain, a few fluorescent chromatophores were observed only in scales sampled from the caudal peduncle of one female of the 6 individuals examined. On the other hand, these chromatophores were observed in all the scales of all the individuals examined in the R strain. The genetic control on formation of chromatophores, melanophore, xanthophore and erythrophore, has been observed in the guppy as a body color polymorphism (Ueshima *et al*., 1998). In regard to the fluorescent chromatophore, the differences of thier occurrence among strains suggest that the formation of florescent chromatophores in the result of genetic polymorphism.

A cross experiment will be needed for further examintaion of the genetic control of the fluorescent chromatophore.

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