Majority of TcR β^+ T-lymphocytes located in thymus and midgut of the bony fish, *Dicentrarchus labrax* (L.)

Nicla Romano · Francesca Rossi · Luigi Abelli ·
Elisabetta Caccia · Rita Piergentili · Lucia Mastrolia ·
Elisa Randelli · Francesco Buonocore

Received: 21 December 2006 / Accepted: 23 April 2007
© Springer-Verlag 2007

Abstract Real-time polymerase chain reaction (PCR) and in situ hybridization analyses were performed to investigate the occurrence and distribution of T-lymphocytes expressing TcR β in intestine and lymphoid tissues of the bony fish, *Dicentrarchus labrax* (sea bass). Immunohistochemistry with the monoclonal antibody DLT15 (pan-T-cell marker) was carried out to compare the cytology, distribution and number of T-cells and TcR β^+ cells in the various sampled lymphoid organs. The highest TcR β expression was revealed by real-time PCR in the thymus, with high levels also being found in the gut. In the thymus, DLT15 $^+$ and TcR β^+ cell populations were concentrated in the cortex and TcR β^+ cells were notably reactive at the cortical-medullary border, suggesting a specialized role of this region in thymocyte selection. The density of DLT15 $^+$ T-cells increased from the anterior to posterior intestine, whereas TcR β^+ lymphocytes were more numerous in the middle intestine compared with other segments. The existence, in fish thymus, of a medulla and a cortex comparable with those of mammals is revealed by this study. The concentration of

TcR β^+ cells in the sea bass midgut also strongly suggests a special role of this intestinal segment in antigen-specific cellular immunity. The large population of TcR β^- /DLT15 $^+$ T-cells in the posterior gut can probably be ascribed to the TcR $\gamma\delta$ phenotype fraction.

Keywords T-cells · TcR β · Thymus · Intestine · Sea bass · *Dicentrarchus labrax* (Teleostei)

Introduction

The general organization of the fish immune system involves specialized lymphoid organs, such as the thymus, the head and trunk kidney (having a similar role to the bone marrow in mammals), the spleen and the mucosa-associated lymphoid tissues (Romano et al. 1997a, b, 1999a). In order to explore the evolution of vertebrate immunology, numerous studies have recently focused on obtaining markers for immunocytes, such as surface/cellular molecular probes. Among available markers, monoclonal antibodies (mAbs), which recognize antigenic determinants expressed by T-cells (DLT15) and Ig-bearing cells (DLIg3), have been produced in the European sea bass (*Dicentrarchus labrax*; Scapigliati et al. 1999) and have allowed some lymphocyte populations to be identified and characterized during ontogeny and in adulthood (Romano et al. 1997a; Abelli et al. 1996, 1997; Picchietti et al. 1997). Recently, the T-cell receptor β -chain (TcR β) of the sea bass has been characterized (Scapigliati et al. 2000) and cells expressing TcR β have been described in allogenic grafts (Romano et al. 2005). The latter work has confirmed, as in other vertebrates, the recruitment of antigen-dependent T-cells in the rejected tissue and has also suggested the involvement of further TcR $\alpha\beta$ -negative T-cell populations.

N. Romano · F. Rossi · E. Caccia · R. Piergentili · L. Mastrolia ·
E. Randelli · F. Buonocore
Department of Environmental Sciences,
Tuscia University,
Viterbo, Italy

L. Abelli
Department of Biology and Evolution, Section of Comparative
Anatomy, University of Ferrara,
Ferrara, Italy

N. Romano (✉)
Dipartimento di Scienze Ambientali,
Blocco D, Università della Tuscia,
Largo dell'università,
01100 Viterbo, Italy
e-mail: nromano@unitus.it