tially affecting cytotoxicity. A generation of IL-2 from PBM cells could conceivably take place and could play a role in mediating the response of NK activity to IFN-γ and cortisol. It is known that glucocorticoids are able to suppress IL-2 production and via this effect to interfere profoundly with T-lymphocyte proliferation in rodents and man[17]. Most recently, the potent synthetic glucocorticoid dexamethasone was demonstrated to strongly inhibit synthesis of TCGF mRNA in human normal PBM cells stimulated in culture with phytohemoagglutinin, and concomitantly to inhibit the accumulation of IFN-γ mRNA in these cells[18]. We are not aware of data on glucocorticoid effects on IL-2 receptor interaction, which is thought to represent a crucial event which mediates IL-2 promoted cell-cycle progression. Glucocorticoids, on the other hand, have been shown to reduce dramatically the activity of plasminogen activator, a serine proteinase produced by NK cells and postulated to play an important role in the cytolytic process[19]. In human fibroblasts, inhibition by glucocorticoids of plasminogen activator has been shown to be due to induction of a cellular inhibition[20].

However, regardless of what mechanisms are involved, data obtained with the present study coupled with previous observations lead us to suggest that endogenous cortisol participates in the control of human NK cell activity and is capable under stressful conditions of intruding into the complex interplay between IFN, IL-2 or other soluble factors which enhance NK activity when an IFN-inducing stimulus exists within a tissue (e.g., virus infection or neoplastic cells).

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Immigration of lymphoid precursor cells into the thymic rudiment in *Xenopus*[1]

K. Kurihara and S. Kato

Department of Anatomy, Medical College of Oita, Oita 879-56 (Japan), 7 February 1985

Summary. The origin of thymic lymphocytes was investigated, using a new reliable method to mark cells in *Xenopus*. It was easily observed that extraneous cells immigrated into the thymic rudiment 4 days after fertilization and differentiated into a cell population identified as thymic lymphocytes in a fully developed thymus. Clearly, lymphoid precursor cells are of extrinsic origin.
Key words. Xenopus thymus; thymic rudiment; lymphoid precursor cell; cell immigration.

Two theories as to the origin of thymic lymphocytes have been offered: the transformation and the immigration theories. The former is supported by Turpen et al.'s[2] experiments. Using diploid-triploid chimera embryos of *Rana pipiens* produced by orthotopic transplantation of the gill arch region, they observed that thymic lymphocytes arose from the elements in the primary rudiment of the thymus. On the other hand, Le Douarin and Jotereau[3] proposed a contrary view that thymic lymphocytes originate from circulating embryonic stem cells from heteroplastic transplantation of chick and quail thymic rudiments. Further, in *Xenopus laevis*, Tochinai[4] grafted diploid thymic rudiments of larvae into triploid tadpoles and emphasized that thymic lymphocytes are of extrinsic origin.

Recently, in *Xenopus* species, an excellent new genetic cell marker was found[5]. The purpose of this study is to re-examine the origin of thymic lymphocytes with the use of this cell marker.

Materials and methods. Fertilized eggs of *Xenopus laevis* and *Xenopus borealis*[6] were obtained by injecting a gonadotrophic hormone into their dorsal lymph sac. The eggs were dejellied with 2.5% sodium thioglycollate, sterilized by placing them in Steinberg's solution containing 0.05% Chloramin-T (Wako Pure Chemical Ind., Osaka) for 1 min, and then cultivated at 23 °C for 22 h. For chimerae preparation, 22-h-old embryos (neural tube stage; st. 21 by Nieuwkoop and Faber[7], 1975) of *X. laevis* and *X. borealis* were used. Approximately in the middle of its anteroposterior length each embryo was cut manually into two parts. Then chimera embryos were produced by joining the anterior half of an embryo of *X. laevis* and the posterior half of an embryo of *X. borealis*, and were then cultivated in Steinberg's solution for 3, 4 and 35 days. The operation was performed on a clean bench.

The investigation was carried out using paraffin and epon-embedding. Chimera larvae cultivated for 3 and 4 days were fixed in Carnoy's solution for 30 min and serial sections 4 μm in thickness made using the ordinary paraffin method. After removing the paraffin, the sections were stained in a 0.5% solution of quinacrine dihydrochloride (Wako Pure Chemical Ind., Osaka) in McIlvain's buffer (pH 7.0) according to Thiébaud[5], and

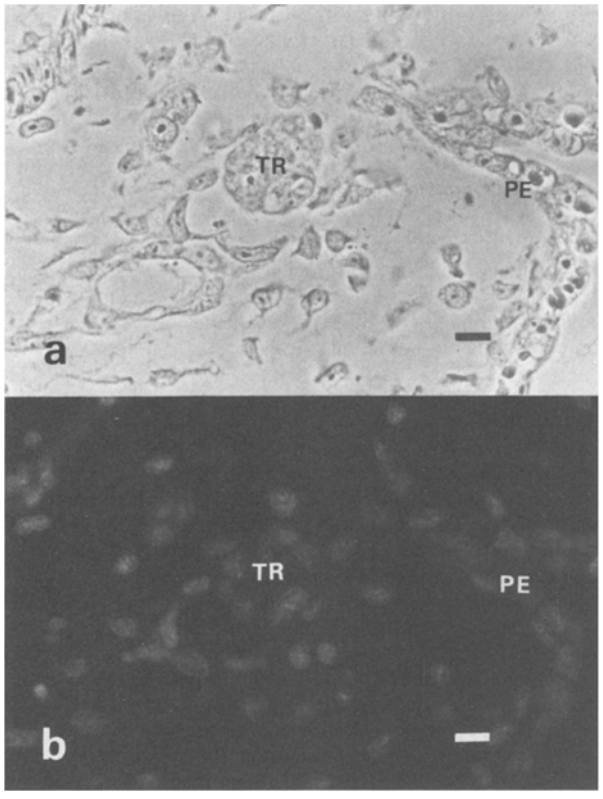

Figure 1. Thymic rudiment of a chimera larva cultivated for 3 days after preparation: *a* A phase-contrast and *b* a fluorescence micrograph of the same transverse plane, prepared with the paraffin-quinacrine method. The thymic rudiment is of *X. laevis* origin. TR, thymic rudiment; PE, pharyngeal epithelium. Scale = 10 μm.

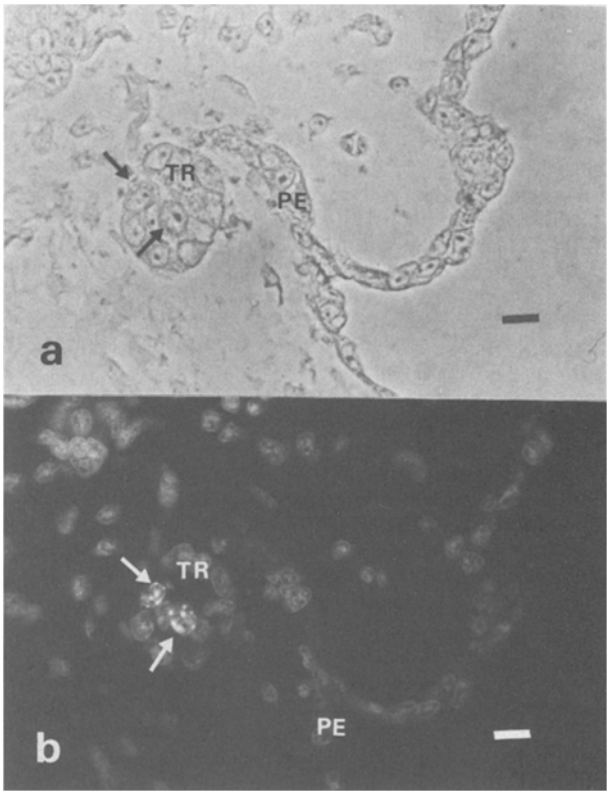

Figure 2. Thymic rudiment of a chimera larva cultivated for 4 days after preparation: *a* A phase-contrast and *b* a fluorescence micrograph of the same transverse plane, prepared with the paraffin-quinacrine method. Arrows indicate nuclei which originated from *X. borealis*. TR, thymic rudiment; PE, pharyngeal epithelium. Scale = 10 μm.

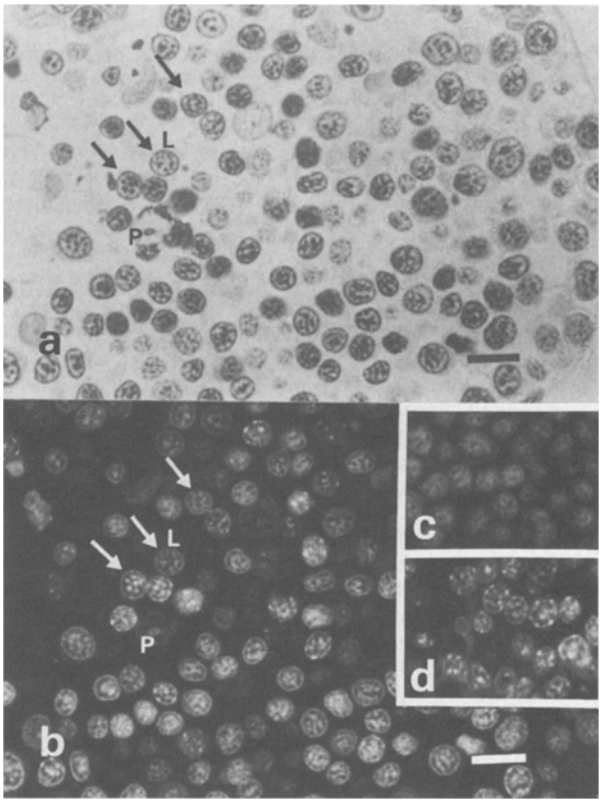

Figure 3. Thymic rudiment of a chimera tadpole cultivated for 35 days after preparation: *a* A light micrograph and *b* a fluorescence micrograph of the same transverse plane, prepared with the epon-toluidine blue and quinacrine methods, respectively. Arrows indicate nuclei which originated from *X. borealis*. c and d; fluorescence micrographs of 35-days-old thymic rudiments from *Xenopus laevis* and *Xenopus borealis* respectively prepared with the epon-quinacrine method. L, lymphocyte; P, pigment cell. Scale = 10 μm.

mounted in a saturated solution of sucrose in distilled water for phase and fluorescence microscopy.

For the chimera tadpoles cultivated for 35 days, the mature thymuses were carefully removed and fixed in Carnoy's solution for 30 min. The tissue blocks were dehydrated through absolute ethanol and embedded in Epon 812 resin. 1-μm plastic sections were cut on a Porter Blum MT-1 Ultramicrotome and stained with the fluorescence dye quinacrine as stated above. For localization purpose the sections were stained with 1% toluidine blue after fluorescence examination. A Nikon FL Fluorescence Microscope was used to examine the sections.

Results and discussion. On the basis of the staining characteristics of cell nuclei with the fluorescence dye quinacrine, each nucleus of *X. borealis* in *X. laevis- X. borealis* chimerae could be clearly identified. As described by Thiébaud[5], the nuclei of *X. borealis* exhibited a number of bright fluorescent spots against a homogeneous background, while the stained nuclei of *X. laevis* fluoresced only homogeneously (figs. 1b, 2b and 3b). Thus, this method was effective for marking migrating cells in chimera larvae. In 20 chimera larvae cultivated for 3 days after the preparation, immigration of cells of *X. borealis*-origin into the thymic rudiment was observed in 6 cases (30%), while in the remaining 14 cases immigration did not occur. Figure 1b indicated that the primary rudiment of the thymus was composed of cells of *X. laevis*-origin only, i.e. from the anterior part of chimera embryos. This agreed with the conception that the thymus arises as a pair of dorsal buddings of the epithelium from the second visceral pouches. As shown in figure 2, in all chimerae (13 cases) cultivated for 4 days after the preparation, the cells possessing bright spots, which arose from the posterior part of chimera embryos, were observed in the primary thymic rudiment. Because chimera larvae were produced from 22-h-old embryos of two *Xenopus* species, thereafter cultivated for 3 and 4 days, these corresponded to 4- and 5-day-old larvae which had developed normally. Thus it was concluded that extraneous cells immigrated into the thymic rudiment 4 days after fertilization. Except for the thymic rudiment, largest number of the cells derived from *X. borealis* were present in the vascular system.

To investigate further the differentiation course of immigrating cells, mature thymuses of chimera tadpoles cultivated for 35 days after preparation were embedded in epon resin, and compared using both quinacrine fluorescence and toluidine blue observations in the same section. According to Rimmer et al.[8], at 30 days of age larval thymus displays a clearly defined corticmedullary differentiation with an abundance of small lymphocytes. Figure 3 showed that the majority of thymic lymphocytes were progeny of the cells which had immigrated into the thymic rudiment in the early embryonic stage (4 days after fertilization). Hence, it might be expected that lymphoid precursor cells of blood island-origin enter the thymic rudiment during the early development stage.

There is still a serious discrepancy between different authors on this subject. In line with the experiments by Le Douarin and Jotereau[3] and by Tochinai[4], our data supported the immigration of lymphocyte precursor cells into the thymic rudiment. Turpen et al.[2] have, however, advocated the intrinsic origin of thymic lymphocytes, in *Rana pipiens*. If thymic lymphocytes arise in situ from the thymic rudiment itself in *Xenopus* as in *Rana pipiens*, the lymphocytes of chimera embryos in this experiments should be from the *X. laevis* side. On the contrary, the cells possessing bright spots from the *X. borealis* side were actually observed in the thymic rudiment, as shown in figure 2b. Further, figure 3 proposes that the immigrating cells differentiated into thymic lymphocytes during subsequent thymus development. The apparent discrepancy may be the result of a species difference. In the present study, the procedures using epon-embedding materials for localization provided a new possibility for electron microscopic studies of migrating cells.

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Carbon tetrachloride modulates the rat hepatic microsomal UDP-glucuronyl transferase activity and membrane fluidity[1]

G. Deliconstantinos, M. Mykoniatis and D. Papadimitriou

Department of Experimental Physiology, and Department of Experimental Pharmacology, University of Athens, Medical School, GR-115 27 Athens (Greece), 14 February 1985

Summary. Modulations in rat hepatic microsomal UDP-glucuronyl transferase activity have been observed during carbon tetrachloride (CCl_4) poisoning, with a large decrease in the enzyme cooperativity and increase in the membrane fluidity, occurring 30 min after administration. The results strengthen the possibility that an increase in microsomal membrane fluidity may be an early key event in liver injury induced by CCl_4.

Key words. UDP-glucuronyl transferase; carbon tetrachloride; membrane fluidity; rat hepatic microsomal membrane.

UDP-glucuronyl transferase (EC 2.4.1.17) is an integral enzyme, or group of related enzymes, of the endoplasmic reticulum membrane of liver cells catalyzing the reversible transfer of the glucuronate grouping from UDP-glucuronate to a wide variety of poorly water soluble, nucleophilic acceptors[2,3]. There is considerable evidence that the phospholipids of the microsomal membranes are important for efficient function of UDP-glucuronyl transferase[4]. Because phospholipids, depending on their composition, have variable effects on the activity of UDP-glucuronyl transferase, it is indicated that lipid-protein interactions could modulate the substrate binding and catalytic properties of the enzyme[5]. The initial events of liver injury induced by CCl_4 are thought to stem directly from carbon-halogen bond cleavage by the cytochrome P-450 mixed function oxidase system in the liver smooth endoplasmic reticulum. The free radical product of the interaction leads to the initiation of peroxidation of adjacent membrane lipids[6]. Various pathological phenomena, including disruption of the endoplasmic reticulum, loss of associated en-