In this issue

Life in extreme environments

Ever since the evolution of early plants about 100 million years ago (during Cretaceous), angiosperms have been invading all the habitats of the planet. They are found almost everywhere including in the Arctic, plains, deserts, swamps, freshwater rapids, salt marshes. However, not all these places can be considered habitable. Many of the environs (such as hot springs, salt marshes and deserts) constitute conditions that at best can only stifle life. But even under these conditions, plants seem to have done extremely well in evolving features of infinite complexity to adopt to the rigors of the environment, making their stay a comfortable one.

Each of the adaptations to the extremes of the environment is a story in a scientific precision and is best exemplified by plants growing in the arid deserts. For example, on a warm summer day, it is estimated that a date palm loses nearly 4000 l of water, a ragweed about 8 l and the common cactus just a couple of spoons of water. Yet all the three systems share the same basic mechanism of uptake of water. The saguaro, one of the remarkable cacti of the Sonoran desert, is believed to store about a ton of water in its stem. A single rye plant, in an attempt to locate water, puts out roots where total length in four months equals the distance between Bangalore and Madras (a promise for cellular phone facility?).

Plants growing in water (e.g. deep-water rice) are known to employ an ingenious technique for transporting oxygen from their leaves to their roots. Many species of plants nonchalantly take to salt-rich diet and thrive exceedingly well in brackish waters and salt marshes. They have elaborate machanisms to 'excrete' the excess salt through their foliage and also compartmentalize salts in their cell vacuole. Plants growing in acid soils readily extrude out calcium salts as a mechanism to neutralize the pH. The list of such adaptations seems to be unending as newer research comes to light. Indeed many of the adversities in the habitat of plants have provided a fair share of excitement to scientists to unravel the underlying mechanisms contributing to the adaptations.

In their article on **page 306**, Mohan Ram and Gupta provide a fascinating account of the natural history of plant life under extreme environment and provoke frequently the necessity to understand the mechanisms contributing to their adaptations.

R. Uma Shaanker

Thyroid hormones

Thyroid hormones and their actions have commanded a separate identity in endocrine literàture particularly from a comparative endocrinology perspective. Along with glucocorticoides and pituitary prolactin they are considered 'permissive hormones'. A molecular correlate of 'permissiveness' has eluded researchers in this area. A uniform biochemical correlate applicable to all phylogenic groups has not been established yet.

In the case of warm-blooded animals capable of maintaining constant internal body temperature against external temperature variations (of course within a range and for a certain period of time), regulation of basal metabolic rate (as measured by tissue respiration) by thyroid hormones has been an accepted paradigm for thyroid hormone action. Their calorigenic action is well established. However, such an 'action paradigm' for thyroid hormones in the case of poikilotherms has been difficult to establish. Further, the diverse nature of their effects even within mammals has also created confusion in literature in early periods of endocrinology with regard to their classification into groups labelled as metabolic hormones and developmental hormones. They do bring about predominantly metabolic effects in mammals but their cognate receptors have been localized in nuclei of target tissue cells. This is similar to those of steroid hormones which are clearly classified as developmental hormones. Fittingly, thyroid hormones do have a role in brain development and severe thyroid deficiency leading to growth retardation is an established fact. Further, thyroid hormone T_4 has been long back established as capable of accelerating amphibian metamorphosis.

Notwithstanding all this, whether in poikilotherms, thyroid hormones have positive metabolic effects, whether they have only non-metabolic effects (e.g. growth and development) or whether other hormones can substitute for them is not clearly investigated and understood. Couple of years back Samir Bhattacharya and his group had elegantly demonstrated the unambiguous role of thyroid hormones in fish reproduction. Now Gupta and Mahanta (**page 326**) have shown that testosterone can function like the thyroid hormone T_4. They are demonstrating positive *in vitro* and *in vivo* effects of the androgen on peripheral tissue respiration.

The judicious use of antihormones (goitrogens and cyproterone acetate) in establishing the role of thyroid and gonadal hormones in calorigenic action *per se* in poikilotherms as well as in demonstrating the ability of thyroid hormone to potentiate the non-shivering calorigenic effect of catecholamines is noteworthy. In these animals, exogenously administered T_4 and T_4 have produced equivocal results in other workers' laboratories.

Hibernation among all phylogenic groups is associated with low metabolic rate. In hibernating mammals, thyroid tends to be inactive during winter months. On the other hand, thyroid exhibits moderate activity in winter months in poikilotherms. Gupta and Mahanta also demonstrate the differential sensitivity of hibernating and non-hibernating frogs to thyroid hormones and the ability of gonadal androgen to substitute for thyroid hormone in both types of poikilotherms.

K. Muralidhar