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Meteorite in Rajasthan

Paliwal *et al.* (**page 1071**) describe a new meteorite that fell on 6 June 2002 at village Bhawad in Rajasthan. The meteorite in Rajasthan is being compared with the five other meteorites that reportedly fell in Rajasthan over the past eleven years. Paliwal *et al.* describe experimental microscopic and Mössbauer study on the composition of the samples obtained from this Bhawad meteorite. The meteorite is unusual in lacking iron in the metallic phase and fractionation of alkali metals.

Totipotent plant cells: Somatic embryogenesis

Totipotent plant cells retain the ability to grow into a new adult plantlet without going through the normal cycle of sexual reproduction and zygotic development. The formation of 'zygotic embryos', the normal mode of reproduction in a plant, advances through a sequential and orderly progression of division of the fertilized zygote within the embryo-sac of the ovule. The embryo eventually differentiates and develops into a mature plantlet. Alternatively, a plant can be generated from a single or a group of adult somatic cells in a process called 'somatic embryogenesis' – the plantlets so derived become genetic clones. On the whole the somatic embryo development is analogous to its zygotic counterpart.

Somatic embryogenesis refers to the initiation of genetic clones of embryos *in vitro* from mature and differentiated somatic cells, bypassing normal cycles of sexual reproduction and genetic segregation. Originally discussed in cultures of carrot (*Daucus carota*), it is now known to be a general phenomenon in higher plants. During embryogenetic induction of cells, synthesis of new mRNA and protein results in reversal of biological information, a developmental reprogramming of somatic cells, leading to the restructuring of the tissue architecture and embryogenesis. In essence, somatic embryogenesis is a 'regression' of the 'time's arrow' of ontogenic development. This cellular totipotency in higher plants contrasts with the genetic programming in higher animals.

Because of the ease of propagation of genetic clones, genomic and plant biotechnology companies prefer multiplication of plants through somatic embryogenesis (for example see www.cirad.fr). Space biologists interested in studying effects of environmental stress, lower light and microgravity on embryogenesis utilized somatic embryogenesis during spaceflight (for example NASA experiments with orchard grass leaf).

Somatic embryogenesis can be induced directly without forming any callus, or it can be mediated through the intermediate stage of a callus maturing into an embryo. Several of the oil seeds can generate 'direct' somatic embryos, whereas the general model system for somatic embryogenesis, carrot, follows the latter mode of 'indirect' embryogenesis through a callus formation. In this issue of *Current Science*, Mandal and Dutta Gupta (**page 1138**) report the case of direct embryogenesis in safflower, and Sudhersan and AboEl-Nil (**page 1074**) report indirect somatic embryogenesis in Sturt's desert pea. The expression pattern of genes responsible for embryogenesis has been reviewed recently (*Curr. Sci.*, 2002, **83**, 715–730).

The induction of somatic embryogenesis from explants is carried out by variation of several hormones and other constituents in the growth media, the optimal composition of the culture medium being arrived at by empirical trial-and-error experiments. Usually plant growth regulators in a basal Murashige and Skoog's (MS) medium are determining factors for formation of somatic embryos. In some cases, growth regulators-free basal media have also been used.

In the prototype system, namely carrot plants, callus formation precedes embryoid formation, and the calli are cultured from young seedling cotyledons, the embryogenesis being triggered by removing the growth hormone 2,4-dichlorophenoxyacetic acid (2,4-D) from the medium. Maturation of the embryo involves passage through globular, oblong, heart and torpedo-shaped intermediate stages. 'Torpedo' embryos have the potential to regenerate into plants. In case of safflower, seeds are aseptically germinated on basal MS medium. Cotyledons are excised from 8–10 day-old seedlings and the whole cotyledon then is used as explant. Explants cultured on MS medium supplemented with NAA and BAP generate direct embryos. Somatic embryo (globular) can be seen developing directly on the cotyledonary surface without callus formation. SEM studies reveal normal development of somatic embryos via intermediate stages. In case of Sturt's desert pea, callus could be initiated from stem, petiole and leaflet explants cultured on MS medium supplemented with 2,4-D. Light greenish calli were transferred to growth regulator-free MS medium for embryogenesis. Greenish globular nodule-like structures were developed from the callus, after second sub-culture on the same MS basal medium. 2,4-D was required for initiation of callus from stem, petiole and leaflet explants. Callus transferred to regulator-free MS media can produce globular green nodule-like structure leading to embryogenic callus. In case of bamboo (*Curr. Sci.*, 2002, **83**, 885–889) only compact and nodular callus can generate somatic embryos. Compact callus can be

consistently obtained by the presence of 2,4-D, BA and NAA. MS medium supplemented with BA and 2,4-D was essential for culture establishment and callusing. Subsequent elimination of 2,4-D, and a corresponding increase in BA concentration, induced embryogenesis. The examples show that exact understanding of somatic embryogenesis and the roles of various chemicals required during initiation of embryogenesis still lack a comprehensive biochemical framework.

Hypogean loaches

In the age of genomics, one defines a genotype in terms of single nuclear polymorphism. Troglomorphisms in several fishes beg the question of understanding the gross phenotypic changes resulting out of simpler genotypic changes. At least 86 species of troglomorphic fishes belonging to 18 different families have been described. Study of these hypogean fishes also help us understand convergent evolution in animals.

Adaptation to the ecological niches in a cave requires several unique features accommodating the constraints posed by availability of light, temperature and oxygen. One interesting aspect of evolutionary biology has been to understand the mechanism of conversion, *vis-à-vis* reproductive isolation, of epigean form of a fish living in the flowing water stream and the hypogean form inhabiting hypoxic water pools and caves. Pati and Agarwal (**page 1112**) studied the behavioural ecology of hypogean loach in the Kotumsur caves, a large natural limestone cave on the bank of the river Kanger in Bastar. The loach found in the cave is named *Nemacheilus evezarsi* Day, though several other names have been used in the past. The hypogean form differs from the epigean form in several gross morphological features. The hypogean form has very reduced eyes, and lacks the pigmentation characteristic of the epigean form. The authors observed several behavioural peculiarities including burying behaviour, surfacing behaviour and the response to light, especially the biological rhythms. 'The hypogean individuals display convergent features shared by many hypogean fishes' but no firm conclusion could be reached regarding the evolution of one form from the other.

Biotite granites

Monazite sand and deposits containing thorium, predominantly found in the coastal plains of the southern part of India, contribute to the high level of background radiation present in India. Ramasamy *et al.* (**page 1124**) pursue the hypothesis that the weathering of the rocks in the Nilgiri and the Western Ghat region can release naturally-occurring radionucleotides present in the monazite deposits into the river Arjuna that runs through the hills in the Western Ghat region. Accordingly they assayed the level of radionucleotides in the sites, *in situ*, as well as in the powdered samples from various sites. It is found that ^{40}K is more abundant than the ^{238}U or ^{232}Th species, and the average value of the Th/U ratio is about 1.9. Higher abundance of uranium is found in sites at a higher level from the ground level (upper sites), at the top of the hills ^{235}U is 25 times higher than the world average value. This is likely to be related to upward mobilization during metamorphosis.

Pharmacokinetics of chloroquine

Chloroquine remains the drug of choice in cases of malaria despite reports of emergence of drug resistance. Indian expertise lack the knowledge and database in the pharmacokinetics of this useful drug in the indigenous Indian population. Work of Dua *et al.* (**page 1128**) fills the gap in understanding pharmacokinetics of chloroquine in Indian tribal and non-tribal populations. Diseased-infected subjects, from both tribal and non-tribal populations of either sex, were investigated against healthy control volunteers. Blood and urine samples from subjects were analysed to monitor chloroquine and its metabolite desethylchloroquine. Analysis of the experimental data revealed no significant differences in pharmacokinetics parameters of tribal and non-tribal subjects, however the time required to reach the maximum concentration in the plasma was higher in tribal than in non-tribal subjects.

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