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Revival of $^4$He based geochronometer

A wide variety of geochronological tools or methods are used to quantitatively and qualitatively estimate the dates of rocks and sediments, spanning ages from billions of years to recent historical records. U–Th–Pb, Rb–Sr, Sm–Nd, Lu–Hf, $^{40}$Ar/$^{39}$Ar, $^{206}$Pb/$^{207}$Pb, $^{14}$C, $^3$He/$^4$He, He/Ne and $^{10}$Be systems, tephrochronology, fission tracks and thermoluminescence are routinely used for geochronological dating. The abundances and isotopic compositions of the noble gases, helium, neon, argon, krypton and xenon from mantle-derived samples provide useful and unique information concerning the origin and evolution of the Earth including its differentiation into core, mantle, crust and atmosphere. (U–Th)/$^4$He Chronometry, dealing with the technique of dating minerals through the ingrowth of radiogenic $^4$He from U and Th decay has long been recognized, but it is said that ‘the technique has only rarely been successfully utilized’. Sudeshna Basu deals with ‘renewed interest in the U, Th–$^4$He dating systematics’ in an article (page 1515) that describes its use in dating apatite, zircon and titanite, cautioning on need to select suitable grains and applying proper He diffusion loss corrections.

Designer milk

With the advent of biotechnology, the potential to harvest a new generation of value-added products from milk and milk products is being realized. Attempts to alter the milk composition for specific health and/or processing opportunities by nutritional and genetic interventions are becoming successful. Generating a greater proportion of unsaturated fatty acids in milk fat, reducing lactose content in milk in order to cater to persons suffering from lactose intolerance and removal of β-lactoglobulin from milk are some challenges of ‘designing’ milk for human health benefits. Alteration of primary structure of casein to improve technological properties of milk, production of high protein milk, engineering milk meant for cheese manufacturing that leads to accelerated curd clotting time, increased yield and/or more protein recovery, milk containing nutraceuticals and replacement for infant formula are some of the processing advantages envisaged. Large-scale production of high value, low volume therapeutic proteins in the milk of domestic animals is another area of interest. The major advantage of transgenic technology is that proteins can be produced at a very low cost. ‘Humanizing’ bovine milk by incorporating several of the human milk molecules by transgenic means is a potential boon to the infant food industry. See page 1530.

Trace elements and viral infections

On page 1536, U. C. Chaturvedi et al. discuss the effects of trace elements on various viral infections. A number of trace elements are essential micronutrients and are required for various body functions. The deficiencies of trace elements and infectious diseases often coexist and exhibit complex interactions and thus influence the susceptibility to the course and the outcome of a variety of viral infections. Some trace elements inhibit virus replication in the host cells, thus showing antiviral activity. Many trace elements act as antioxidants or help such functions that not only regulate immune responses of the host, but also may alter the genome of the viruses. The grave consequences of this may be the emergence of new infections. The authors highlight the importance of trace element nutrition of host in not only optimizing immune response to infections, but also in preventing viral mutations which could increase viral pathogenicity.

Bacterial wilt of ginger

Bacterial wilt of ginger caused by a Gram-negative bacterium called Ralstonia solanacearum (formerly Pseudomonas solanacearum) is one of the serious diseases in ginger crop, particularly in small and marginal farm holding who depend on this crop for their livelihood. It is reported to cause wilting in more than 450 plants belonging to 50 families of plants. The disease spreads very quickly in the field if ignored and can cause total crop loss in a shorter time, which makes it one of the most dreaded diseases prevalent among ginger crops.

The pathogen causes wilting of plants by a very unique way of colonizing vascular elements where it multiplies and blocks water and nutrient transport to the above-ground parts of plants. The affected plants usually express water stress which manifest in the form of loss of turgidity, resulting in flaccidity of leaves and ultimate death of plants. Unlike general physiological wilt, bacterial wilt causes irreversible damage to the plants and they do not recover from wilting even in the presence of abundant water in the soil. The pathogen exhibits high diversity in terms of host range and other biochemical characters. Two varieties of pathogen exist in India namely Biovar 3 and Biovar 4, while the former is aggressive in many parts of the Indian subcontinent, the latter was reported to be the very rapid wilting pathogen prevalent in Queensland in the 1960s. The article by A. Kumar et al. (page 1555) is all about the diversity of R. solanacearum causing bacterial wilt of ginger analysed through certain molecular tools.