Initiating a green research laboratory culture in life sciences

Research in the life sciences in India is growing day by day, with increasing number of private and public sector institutions. Even though the quality of output from these institutions is questionable, the quantum of their infrastructure facilities is rising. Most of their scientists are interested in harnessing the latest instruments using the money obtained from various funding agencies. Usually they buy instruments just for the sake of buying and not based on need. Except in the case of private organizations, especially industries, the funding agencies are not interested in the output. The government has earmarked a specific amount for science and technology to be used in a particular financial year. So scientists write project proposals and receive the required money. Public funding agencies never ask scientists to reimburse the funds if their work is not satisfactory. The result is that scientists keep amassing consumables and equipment in their laboratories.

There are two categories of scientists in India. One group does not like students using the chemicals and instruments that have been obtained using public money. They wish to see these always in unused form and become angry if they find students trying new experiments. The second category uses materials and equipment unscrupulously. This is more evident in molecular biology laboratories, wherein nowadays people prefer disposable consumables. See the quantity of micropipette tips, eppendorf tubes and petri dishes that our research scholars dump in the waste bin! They feel that wastage is not a problem as these items were bought with government money. The latter category is more dangerous to the Indian scientific community.

Today, most research work is done through instruments. Starting from the isolation of proteins from a sample to their characterization, everything is automated. The role of a human being is just to supply the raw materials and provide the required specifications like pH and temperature. The sad part is that most of our research scholars, who later become scientists, do not know the elementary techniques such as buffer preparation or setting up the required pH. This is worse in molecular biology laboratories in which experiments are done with kits supplied by companies. Most new-generation instruments create dependency on the manufacturer for consumables and chemicals. Once a new model is launched, the old one becomes outdated and will be dumped as it cannot be repaired or the repairing cost will be almost the same as that of the new brand. So, scientists prefer the new models. When dumping expensive sophisticated instruments, one has to keep in mind that ours is a country where people still find it difficult to get their daily meals.

In most laboratories, there are no stringent regulations regarding the handling and disposal of chemicals and consumables. We still rely on the protocols formulated by Western scientists in our research in the life sciences, which is unfortunately necessary for publishing in high impact factor journals. On many occasions and in most laboratories, our scholars handle toxic chemicals without safety precautions. Even in some nationally acclaimed laboratories that have provision for segregation, consumables are dumped together in most cases.

We have to develop a 'green research laboratory' culture in the life sciences that incorporates proper segregation and disposal. The chemicals used for reactions should be green, as opposed to the numerous highly toxic ones used in molecular biology laboratories. By utilizing concepts from green chemistry, one would be able to find alternatives. There is no need to use disposable petri plates or centrifuge tubes when the same results can be obtained from their glass counterparts. Micropipette tips should be reused as far as possible. Unused instruments like PCR machines, pH meters, centrifuges and deep freezers can be distributed free to small research laboratories in our colleges so that at least some students can benefit. The government should initiate a green laboratory culture in our research institutions so that our researchers will develop social responsibility.

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Insects in the Ajanta caves

I would like to provide a clarification to an otherwise excellent article on 'Microclimatic condition in relation to conservation of cave no. 2 murals of Ajanta'[1]. I noticed that a small mistake has made its way through a statement on p. 93, perhaps because it was not seen by an entomologist. The sentence states: 'The insects identified at the Ajanta caves are mainly *Thysanura lepismantidae* and *Coleoptera ptinidae*, which attack mortars, plasters and paint layers, including vegetable material present in mud plaster as they feed on cellulose.' This statement implies that *T. lepismantidae* and *C. ptinidae* are two different insects, because they were mentioned with their scientific names (binominal nomenclature). But, they refer to two distinct insect orders and families. The statement should have been written as: 'The insects identified at the Ajanta caves are mainly silverfish (Thysanura: Lepismatidae) and spider beetles (Coleoptera: Ptinidae), which attack mortars, plasters and paint layers, including vegetable material present in mud plaster as they feed on cellulose'. Thysanura and Coleoptera are two different insect orders that contain Lepismatidae (not Lepismantidae as mentioned in the article) and Ptinidae families respectively.

1. Singh, M., *Curr. Sci.*, 2011, **101**, 89–94.

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