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Short Communication

Nano Research - Is it Yet a Dream for Early Career Researchers in the Developing Nations?

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I N F O

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A B S T R A C T

Early career researchers (ECRs) lack a long track record of independent funding or publications, and they typically walk a delicate line between presenting novel, cutting-edge work and being too ambitious. Despite their strong passion and commitment, ECRs fail to personalise as independent researchers due to a variety of factors such as a lack of expertise as mentors at the host institute, a low probability of being trained in cutting-edge laboratories, hidden assessment measures used in awarding research grants, and insufficient or no funding aids from funding resources. Regardless of the enormous hurdles that ECRs encounter, outstanding research should be sustained until the work is acknowledged.

Keywords: ECR, Grants, Mentorship

Nanotechnology finds a multitude of applications in different domains of science and technology. For many early career researchers (ECR), the deployment of nanotechnology in developing a novel entity yet remains an unrealistic task as most of their research activities are conducted in basic laboratories that are deficient in high-end/ sophisticated instrumentation.[1] For any novice research pursuant, the preliminary task will be towards publishing his/ her research study in a reputed, peer-review journal and the success of such task relies not only on the research value ascertained but also on the deployment of sophisticated instrumentation, which yields an unambiguous outcome that is sensitive, reliable, and reproducible.

In the developing nations, many ECRs, despite their erudition in the domain of nanotechnology, were found to be unsuccessful in nano-research. Though ECRs are strongly passionate and committed, they fail to personalise as independent researchers due to numerous factors such as the non-availability of expertise as mentors at the host institute, poor probability rate of being trained in the state-of-the-art laboratories, concealed assessment measures adopted in awarding research grants, and an inadequate or no funding aids from the funding resources.[2]

In India, the research proposal of an ECR, submitted for research grants and/ or funds will be endorsed based on its compliance with the rules laid by the government of India. The probability of its success depends on the preferential sequence of the institutes; the foremost in the race are the IITs followed by the central and state government universities and the last, the reputed universities and institutes managed by private managements.[3]

The articulated research proposals of ECRs, in spite of their novelty and huge societal benefits, are declined, due to the assessed incompetency in skills and lack of sophisticated instrumentation in the research labs cited by them. The concealed assessment measures adopted in

awarding the research grants nullify any chances to modify, as he/ she is unaware of the reasons for the decline and they do re-submit the research proposal without any key modifications in the succeeding years. The repeated decline of such submissions develops a mirage in their minds that eludes them from such endeavours; instead, they should consider the feasible collaborations with state-of-the-art laboratories or seek an expert mentor, who aptly guides them to achieve the desired research target.

Figure 1 depicts the difference in the process outflow of research activity between the researchers from sophisticated laboratories and laboratories with basic facilities.

Researchers can overcome all these obstacles effectively through self-confidence, which drives them to utilise the existing facilities in the host institute. The flying of birds and airplanes appears alike in their principle of flying, but the airplanes are in-built with an advanced technology that makes them fly higher than the birds, thus the adoption of a highly modified and sophisticated version of basic tools will definitely yield a rapid and reliable output. ECRs should first verify the availability of necessary equipment, in case they are unavailable, possible alternate equipment befitting the intended research project must be chosen in the host institutes. The selection of possible alternate equipment (Table 1) narrows down the number of samples and confines to the processing of end-product alone, using the high-end/ sophisticated instrumentation, thereby minimising the time and cost factors involved. The data processed using high-end/ sophisticated instrumentation dictate the realisation of publishing the research outputs in any indexed journal, which consequently opens the gateway of research for a novice researcher.

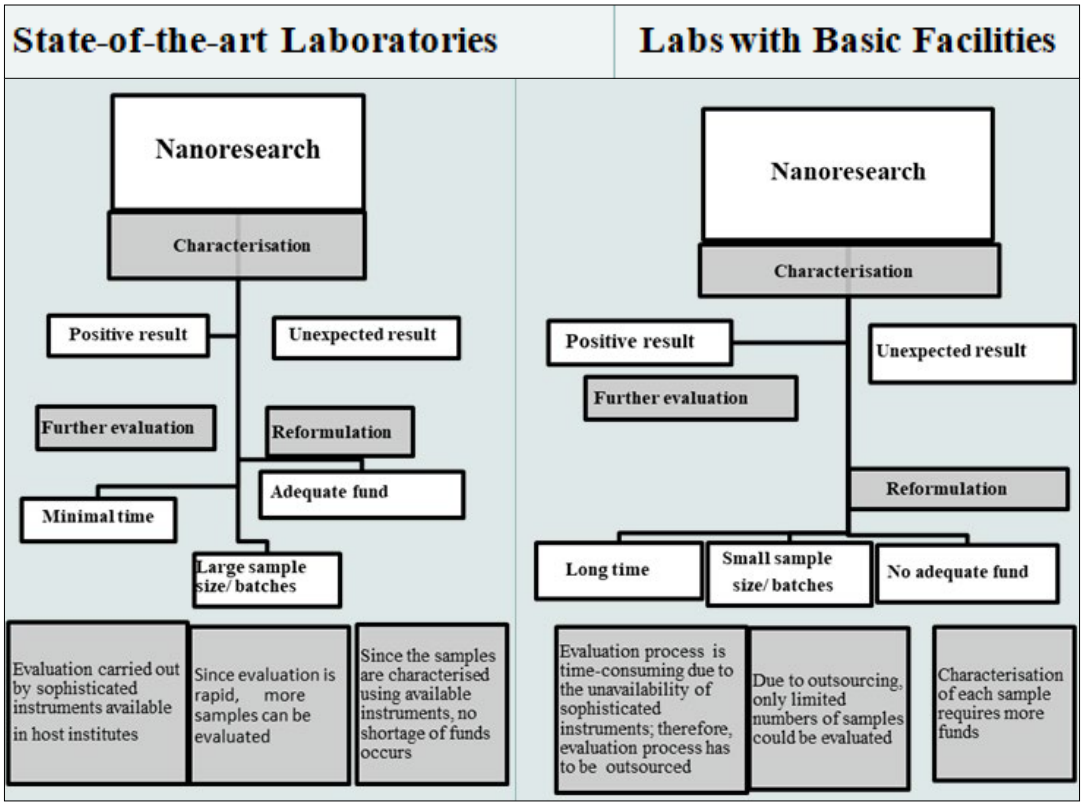

Figure 1.Schematic Representation comparing the Process Flow of Research Activity in both State-of-the-art Laboratories and Laboratories with Basic Facilities

Table 1.Very Few Alternative Methods for Sophisticated Instrument

Instruments/ Methods to Predict the Efficiency of Formulation Parameters	Alternative Basic Methods/ Instruments
FT-IR4	√
DSC5	Melting point apparatus
PXRD6	Density determination

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For formulation magnetic stirrer/ freeze dryer/ sonicator/ homogenizer/ centrifuge	√
UV-Vis spectrophotometer	√
DLS/ laser diffraction (size determination)7	UV-visible spectrophotometers, refractrometer
SEM/ TEM	Gel electrophoresis
Zetasizer	Gel electrophoresis, colloidal titration
In vitro release in simulated body fluids	√
Dissolution apparatus	
Partition coefficient Lipophilicity - shake flask method	√
LC-MS/ Gel permeation spectroscopy (molecular weight)8	Viscometer
Stability chamber	Force degradation study with hot air oven, UV chamber
HPLC	First confirm with UV-visible spectroscopy
In vitro study (cell lines): P-gp efflux	Everted sac technique
Plasma protein binding	In vitro dialysis bag method: BSA protein binding

√ - Will be available in a laboratory with a basic facility

Conflict of Interest: None

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