Guidelines for Good Basic Research

Faculty Presenter
Mark Duncan, MD, Visiting Professor of Medicine, University of Colorado, Denver, CO, USA

Scholars' Summaries

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Dr. Mark Duncan spoke about a topic which is universally recognized yet appears to vary in application: guidelines for good scientific practice. His talk stemmed from the distinction among good science, pseudoscience, and poor science. Science can be defined, among many other ways, as an endeavor to observe, explore, and explain aspects of our known world through a rigorous and replicative process (i.e. a scientific method).

"Good" science is the exploration of a good idea using a novel approach and collecting accurate data to make sound conclusions. The hypothesis is logical and based on facts/known data, not the opinion of investigators or other "thought leaders." The quality of the analyses is maintained through the fair representation of data as well as acknowledgement of unknown/unidentified /unclear/ambiguous elements. Key data are replicated and sufficient details provided for others to replicate. Bias across all stages of investigation is minimized to the best of one's ability. And finally, all appropriate references – supportive and contrary – are provided.

Pseudoscience uses legitimate scientific principles, methods, and language to investigate and prop up false scientific claims and ideas. Pseudoscience can deceivingly appear as good science using sound scientific technique; the flaw lies in the inherent nature of the scientific question (if one exists at all), which must be carefully scrutinized before conferring merit.

"Poor" science begins with a hypothesis that has an emotional appeal, appears exceptionally novel, or suggests a special significance but lacks a sound scientific basis. It often builds on one's own pet theories and hence leads to the collection of poor data. It carries features similar to pseudoscience, is indifferent to contrary facts, provides sparse citations, and is marred by sloppy research practices.

Ultimately, Dr. Duncan emphasized that science is a collaborative undertaking. A significant amount of trust is conferred and shared among investigators. Each investigator is at the mercy of his/her co-investigators' research practices, ethics, and perspectives. The principles of good scientific practice are key to building and maintaining a reliable, honest, and collaborative research career.

Authored by **Takayuki Takahama, MD, Ph.D.,** Kindai University Hospital, Osaka, Japan

Dr. Duncan discussed how science observes and shares results in order to encourage other people's hypothesis tests. Good science is logical and not opinionated, and must be based on facts and data. It is necessary to accurately express the quality of data. For example, restrictions are clearly identified and discussed. All relevant references should be cited. Good science contrasts with "pseudo science" including poor science, a fake method, including only data that supports the hypothesis, and invalid data is incorporated into the process. As a scientist, we need to recognize opinions based on the data that we and others can reproduce, publish and review.