The Acquisition of Mathematical Language in Biomedical Articles

Da Yong Lu[1]*, Ting Ren Lu[1], Yi Lu[2], Hong-Ying Wu[1] and Nagendra Sastry Yarla[3]

[1]School of Life Sciences, Shanghai University, Shanghai, PR China

[2]Shanghai Ocean University, Shanghai, PR China

[3]Divisions of Biochemistry and Chemistry, School of Medicine, City University of New York, New York, USA

*Corresponding author: Da-Yong Lu, School of Life Sciences, Shanghai University, Shanghai, China, Tel: +86-021-66135182; E-mail: ludayong@shu.edu.cn

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Abstract

Mathematical equations are a universal language suitable for all areas of scientific disciplines. Yet, currently, only limited biomedical scientists like to use mathematical equations to introduce new ideas in their articles. To change this situation, a great deal of effort must be made in the biomedical field. This article tries to urge more biomedical scientists to do that by providing new ideologies and initiatives.

Keywords: Systems biology; Biomedical science; Mathematics; Central dogma; Mathematical equation; Disease treatment

Introduction

Despite great popularity of statistical analysis, only a limited number of biomedical articles contain new mathematical equations for data abstraction and idea introduction. However, the importance of scientific researchers is to find out new "central dogma" for many traditional biomedical fields and disciplines. Without the bond of mathematical equations, people in other fields of biomedical areas find it difficult to comprehend the essence and biomedical discoveries of the article in an immediate way. Since mathematical equations are a kind of universal language suitable for all scientific disciplines, this article tries to persuade more biomedical scientists to start doing so by offering some new existent examples and insights into this topic.

Recommendation

In order to clarify our argument, following avenues might be something usefulness for mathematical promotions in the field of biomedical science:

- Strengthen mathematical aptitude of biomedical scientists through participation in in-depth mathematical courses and conferences.
- Think of biological problems deeply and comprehensively in terms of mathematics, especially for the establishments of 'central dogma' of biological systems and pathways.
- Make friends with mathematical or physics-major students or scholars as cooperative efforts might be helpful.

Discussion

At present, mathematical equations are divided into various levels and professional stages:

- Basic level- provide with simple mathematical equations that can be known by scientists of all disciplines [1-5];
- Common mathematical methodology- these can be understood by general mathematical or physics-major students [6-9];
- Professional level- commonly used, invented and discussed by mathematical and physics scholars and scientists [10,11].

Generally speaking, articles of high quality do not essentially require mathematical methodological complexity because the mathematical equations of basic level can be understood by anyone with high education. In the past, master scientists, Einstein once remarked that for mathematical equations, the simplest is the best and perfect one (similar in meaning, but not the original remark); Like Einstein's famous equation in general relativity $E=mC^2$.

Due to this reason, we argue herein that the mathematical equations can only speed up biomedical discovery and knowledge translation in the clinic no matter what types and levels of mathematical equations are used.

We do not believe that mathematical equations in biomedical articles/books are superficial and not useful, for its utility depends on the originality of mathematical equations. Sometimes, it has even a sort of magical influence, as

illustrated by the wide-spread presence of $E=mC^2$, which forms the basis modern physics, astrophysics and applications in global positioning systems [12].

Situation Explanation and Paradigm Establishments

During the big momentum shift towards mathematical use in biomedical research, Harvard medical college started building a division of systems biology [13]. By noticing this future trend, we tried to do something useful for mathematical promotion in science during my career as a mathematician. Since mathematical methodology is the universal language for all scientific disciplines, we should not lose the opportunity to improve biomedical research by incorporation of mathematical equations.

Of course, we don't support over-use of this route. Any over-use of this route may lead to contradiction and unexpected confusion, and finally waste of money and human resources. Regularly checks or review (every 5 to 10 years) from fund distributions and regulatory committees is quite necessary to ensure proper use of mathematical equations in biomedical science.

Conclusion

The expansion of mathematical methodologies in biomedical science is an important future trend that should be encouraged. Mathematical methodologies in biomedical articles may increase the influence and quality of content in the articles. They can enhance the originality of future articles, though at the moment it is not practical to incorporate additional formal statistical analysis to the great number of already existing articles and books. Our intuition and experience tells us this is a promising route.

However, we do not encourage all authors to write mathematical equations of highly levels, because general audiences are only familiar with basic mathematical equations. Mathematical equations are great technical tools that can be very useful for biomedical scientists to rethink of their findings and discoveries in terms of mathematics, and enhance the impact of their scientific biomedical discoveries.

Final Remarks

Finally, we encourage more biomedical scientists to introduce mathematical equations in their articles. They can get used to mathematical equations step-by-step using the methods suggested under Recommendations section above. To start doing so, biomedical scientists can reach out to mathematical collaborations to apply and understand the core of new biomedical discoveries through equations and share the results in international articles and books.

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