ADITUM

Journal of Clinical Case Reports and Clinical Study

Open Access

Research Article

Language of Scientific Communications: A Case Study

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Article Info

Received: April 03, 2021
Accepted: May 10, 2021
Published: May 14, 2021

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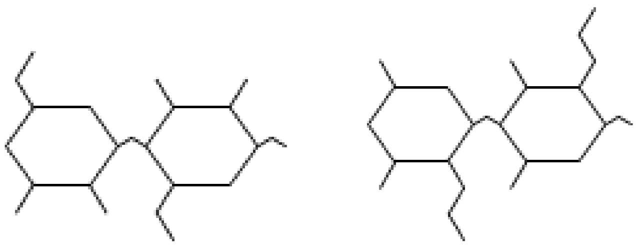
Citation: Feranchuk S "Language of Scientific Communications: A Case Study". Clinical Case Reports and Clinical Study, 3(5); DOI: 10.61148/2766-8614/JCCRCS/058

Abstract Introduction

There is no need to prove that the science had transformed in the past decades. New and young peoples, a terribly big flow of information, overall changes in a society did contribute to this. A reality anyway provide alarming and unexpected challenges. The need for improved surfaces in medicinal equipment is a part of urgent "response" to that challenges.

A chemical modifications of chitosan are discussed among most promising approaches to flexibly respond to vulnerabilities from micro-species [1]. Chitosan is quit similar to chitin, and the challenges in [1] are similar by an intention to the story in [2] which bind modifications of chitin and wide-ranged evolution of species.

Chitosan ***chitin***



Lessons from that story, if any, could direct and improve the "game" around chitosan modifications. If only some piece of understanding would be between these different subjects of science. So the case of chitin and chitosan is a suitable object to investigate what are issues "towards" and "reverse" in a language of scientific communications.

Methods

The key terms "chitin" and "chitosan" are met several times in abstracts of both articles. "Traditional" approach to rules of sentence assembly can easily point to combinations of mutually paired words. In the considered case, these word pairs were selected by authors to specify meaning in which they present their findings around chitin and chitosan. They can point out how a piece of knowledge grow up in each case and what is common between it. Plain search in NCBI "pubmed" provide following counts for the selected word pairs, of 2-nd and 3-rd level of subordination, in thousands:

chitosan	*2-nd single*		*2-nd paired*
^	polysaccharide 46.8		1.7
^	derivative 129.8		1.0
modify	^ 100.1		0.3
^	backbone 48.1		0.3
	3-rd single 3-rd paired		
polysaccharide	received	524	1.3
derivative	biomaterials	28.0	0.2
strategy	modify	555	3.4
introduce	backbone	99.1	0.5
chitin		*2-nd single*	*2-nd paired*
^	synthesis	814	1.4
^	degradation	321	1.0
^	rich	251	0.5
gut	^	103	0.9
	3-rd single 3-rd paired		
regulation	synthesis	880	66.8
regulation	degradation	880	32.9
rich	structures	649	15.5
split	gut	65.3	0.13

The texts of abstracts itself are provided in the appendix.

Results

The narrative and subject of the first study is fairly original, although the matters around chitosan are widely discussed. Some of the threads in the narrative are anyway anchored in common terms of biochemistry, like it is shown below; the originality is anyway looks to be preserved. The threads from the term "chitin" are anchored in the systems biology and usage of some common phrases is visible.

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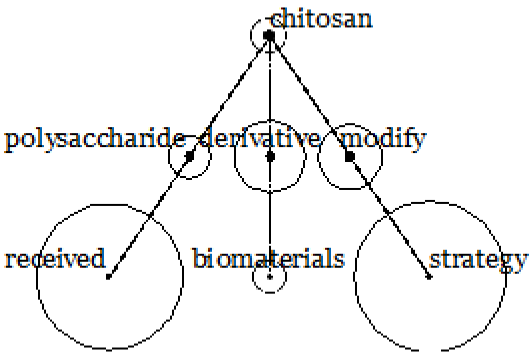
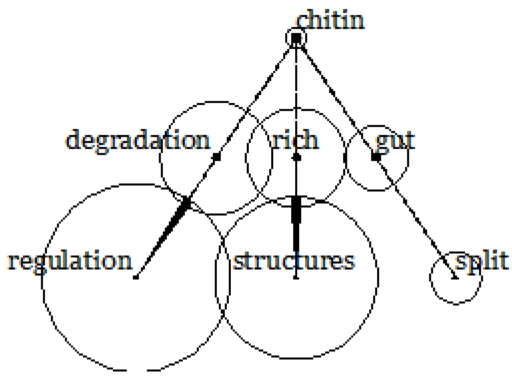
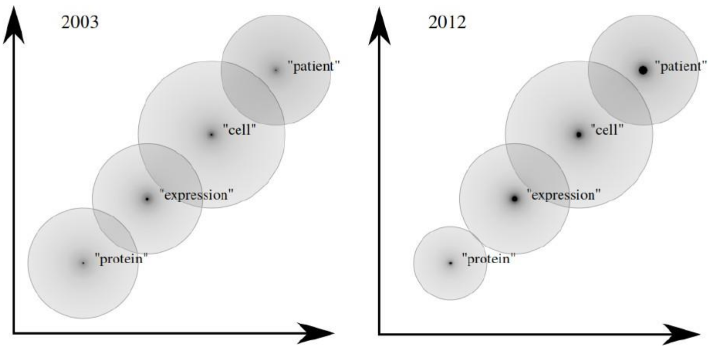




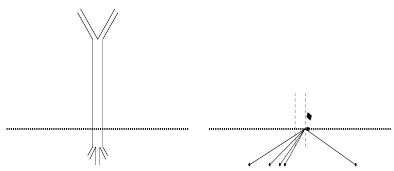
The language of the two text anyway intersects in some wide and more narrow terms of molecular biology, at a level of proteins and regulation of metabolites. The declared findings of the authors are not centered in these subjects. But anyway this level of knowledge looks like an only direction were some co-operation can be established.

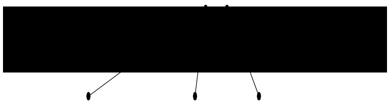
Discussion

The changes in science are expressed in what is shown below: a "boldness" of scientific subjects become not as "flat" as before. In a terms of socio-economy, the Gini inequality in the topmost subjects becomes higher. The same happened for the topmost brand names of scientific groups and for the fame of the most famous researchers.



The scientific search which binds together these separate topmost directions is anyway continue to develop, in the remaining area of "not-so-popular" studies. The science in a straight and conventional meaning is a highly organized entity of co- operating investigators. In the same way cells are arranged in a tree, as it is schematically drawn below. In a mushroom the over-weight in complexity is higher in a fruiting body and in endings below the ground (rhizomorphs). Citing [3], "*By comparing these functionally different structures* (fruiting body and rhizomorps), *we can get to the basics of how complex multicellularity emerges — one of the major questions in evolution*".





What is already known is that chitin and structures from chitin contribute a lot to emergence of this multicellularity in fungi. Chitin structures is an obvious object for attacks and ability to modify chitin is a matter of survival for this multicelluar entity.
In an asco-mycota fungi, like common yeast or candida species, multicellularity in some way supported in a formless entities like a human body or even in contamination of medicinal equipmement. The loop is this way closed - efforts to improve medicinal surfaces by chitosane is in co- or contra- interference with activity of many specific enzymes in common dirt.
The rules of the game in modern science anyway influence choice [2] of subjects for research. And in the case example considered above, chitin and chitosan appeared in titles as a subject of research not by chance.

The plants and fungi are in some way opposed in wild. The fungi are "predators" and "strong players" comparing to any of the trees. But if to look on a stability of species, plants appear to be winners in this opposition. Citing [4], *"land plants exhibit an alternation of generations, with complex multicellular bodies developing in both the haploid and diploid stages of their life cycle"*. Continuing to cite [4], *"One thing that is clear is that the choice of possibilities for plant researchers is large and open—and that any information obtained about any plant model will be applicable to studies of other plants, improving our understanding of the evolution, diversification, and fundamental properties of plants."*
The multi-cellularity of plants is different from that of fungi, the tree grow up and the micellium is distributed in deep. The course of any evolution can have two directions, towards a slow decay or towards a sudden break. The same is about the development of any knowledge - the two directions are met in the same scene. The "optimism" of the review [4] is a part of truth, an opposite trend towards increase of misunderstanding is observed with an increasing rate.

In both cases, the matter is not about a course and a direction. The science in a "best" meaning is a constructive cooperation, and a trend toward inequality and competition observed here is obviously destructive. In the examples above, the neutral approach to studies of both surface materials and adaptation of enzymes is expected to put more attention to the complex and less competitive investigations of molecular interactions.
The plants are adopted to co-exist with parasitic and predator species. The rules of a game are in a side of a fungi and any tree can survive only "by chance" in this game. In the same way, the travel "in deep" to a complex and risky scientific area can be in vain. And can be not in vain. Otherwise...

Appendix

[1] *Sulfonated and sulfated chitosan derivatives for biomedical applications: A review*

From 20th century, chitosan, a natural polysaccharide, has received much attention for use in biomedical applications thanks to its remarkable properties, such as biodegradability, biocompatibility, hemostasis and antibacterial activity. Over the last decades, many researchers have attempted to generate new chitosan derivatives-based biomaterials though chemical modifications, especially through sulfonation or sulfation reactions in order to tailor the physicochemical and biochemical properties. Due to the presence of residual amino groups, the generated polyampholytic derivatives are characterized by convenient biological properties, such as antioxidation, antiviral activity, anticoagulation and bone regeneration, expanding their application scope. This paper provides an overview of the strategies used to chemically modify chitosan by introduction of sulfonate groups on chitosan backbone, focusing on various sulfonating or sulfating agents used and substitution regioselectivity, and highlights their applications in biomedical field.

A shared mechanism of defense against predators and parasites: chitin regulation and its implications for life-history theory

Defenses against predators and parasites offer excellent illustrations of adaptive phenotypic plasticity. Despite vast knowledge about such induced defenses, they have been studied largely in isolation, which is surprising, given that predation and parasitism are ubiquitous and act simultaneously in the wild. This raises the possibility that victims must trade-off responses to predation versus parasitism. Here, we propose that arthropod responses to predators and parasites will commonly be based on the endocrine regulation of *chitin* synthesis and degradation. The proposal is compelling because many inducible defenses are centered on temporal or spatial modifications of *chitin*-rich structures. Moreover, we show how the *chitin* synthesis pathway ends in a split to carapace or gut *chitin*, and how this form of molecular regulation can be incorporated into theory on life-history trade- offs, specifically the Y-model. Our hypothesis thus spans several biological scales to address advice from Stearns that "Endocrine mechanisms may prove to be only the tip of an iceberg of physiological mechanisms that modulate the expression of genetic covariance".

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