

Departamentul de Chimie Anorganică, Organică, Biochimie și Cataliză



Provocări și soluții în pregătirea cercetătorilor în domeniul STEM la Universitatea Cambridge

STUDENȚI: George Costache
Nicoleta Sandu
Andrei-Gabriel Grecu

COORDRONATORI: Mihaela Matache
Marius L. Matache

Global Programme Timeline

| Design | Collect | Analyse | Present | Conference | Continuous Support |
|--------------------|---------------------------------|---------------------|---------------------|-------------------------|--------------------|
| Week 1 | Week 2-4 | Week 4-6 | Week 6-8 | Finale | |
| Introductory talks | Critical thinking | Analyze the results | Make a presentation | | |
| Research proposal | Professional Skills | | | | |
| | Run the experiment successfully | | | | |
| | | Write a report | | Outstanding application | |
| | | | | Support workshops | |

- Universitatea Cambridge
- 10 săptămâni
- întâlniri online
- online **training**
– prezentări, leadership –
- experimente on-site
- teme
- networking
- dezvoltare personală

Structure of the programme

| Monday | Monday | Thursday | Saturday night |
|----------------|--------------------|------------------|----------------|
| Research skill | Professional skill | Feedback session | Submit work |

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- ✓ Networking and building connection

- Subiectul cercetării și diseminarea rezultatelor -

Monitoring the Influence of Different Interferents on Glucose Readings of Commercial Glucometers

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INTRODUCTION

Glucometers are devices used to measure blood glucose concentration and are especially useful to diabetic patients that have to closely monitor their glucose levels. As a result of the fact that worldwide the number of people with diabetes (2021 – 573 million adults between the ages of 20-79), it is very important that we have glucometers which analyse the given sample and offers accurate and precise data every time it is being used.

In this context, we proposed to conduct an experiment in which we test three glucometers (G₁, G₂ and G₃) that are most common in Romania. We aimed to test the linearity and if the following three substances (mannose, oxalic acid and ascorbic acid) can interfere with the readings.

EXPERIMENTAL METHOD

made measurement for three glucometers • G₁ and G₂ can read
 • G₃ error

G₁ successfully displayed glucose concentration values for blood self-tests

G₂ does not work on simple aqueous glucose solutions
 Buffer - Patent for control glucose solution
 2.777 g Na₂HPO₄ · 2H₂O
 0.7352 g NaH₂PO₄ · 2H₂O
 3 g polyethylene glycol (PEG)
 distilled water to fixed volume
 azorubine dye (E122) + sodium benzoate
 1 L graduated flask

Figure 2. The working principle of the glucometer

Figure 3. Glucometer 1 response for glucose solutions in water

| Device | Average Displayed Glucose Concentration (mg/dL) | | | Mean Deviation from Theoretical Value (%) | | |
|----------------|---|--------|--------|---|--------|--------|
| | Hypo | Normal | Hyper | Hypo | Normal | Hyper |
| G ₁ | 82.44 | 162 | 302.32 | 14.49 | 42 | 150.22 |
| G ₂ | 82.44 | 82.8 | 127.07 | 2.44 | -17.8 | -72.89 |
| G ₃ | 84.47 | 183.42 | 306.83 | 34.47 | 83.42 | 106.83 |

Figure 4. Glucometer 1 response for glucose solutions in buffer solutions and with red dye

INTERFERENTS

made measurement for three interferents with the three glucometers

Legend: • Glucometer 1 • Glucometer 2 • Glucometer 3 • Theoretical Value (open weighing)

Figure 6. Oxalic acid: interfere with glucose for all three glucometers

Figure 7. Ascorbic acid: potentially interfering substances with glucose

Figure 8. Mannose: potentially interfering substances with glucose

CONCLUSIONS

- Developed a testing protocol for some of the most common glucometers in Romania
- Glucometers tested have a deviation from the real concentration of glucose but they give a linear response
- Glucometers are not affected by ascorbic acid and mannose, but are affected by oxalic acid

ACKNOWLEDGMENTS

We are grateful to ReachSci, the NGO InformAR Association and project PN-III-P2-2.1-PED-2021-2529, contract 609/PED for funding this work.

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- [2] WOI1995021928A1 - Liquid glucose control solution and process of making the same (1995).
- [3] <https://www.reachsci.com/vector-art/7795166-glucometer-vector-illustration>.

PERSPECTIVES

- Studies conducted on human blood plasma
- Publishing the results obtain in this programme

Monitoring the Influence of Different Interfering

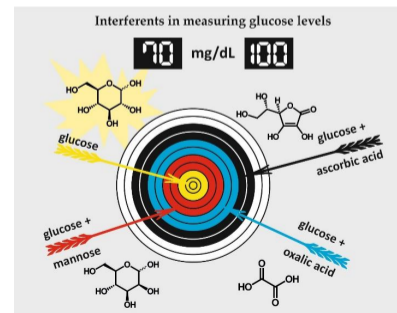
Substances on Glucose Readings of Commercial Glucometers

Andrei-Gabriel Grecu¹, George Costache¹, Nicoleta Sandu¹, Marius L. Matache², Mihaela Matache^{1,*}

HIGHLIGHTS

- Linearity and interference tests were conducted on three commercial glucometers
- Ascorbic acid was confirmed to interfere with the readings of all three devices tested
- Oxalic acid and mannose were signaled as potentially interfering substances

GRAPHICAL ABSTRACT



o Conferință

- Conferința -

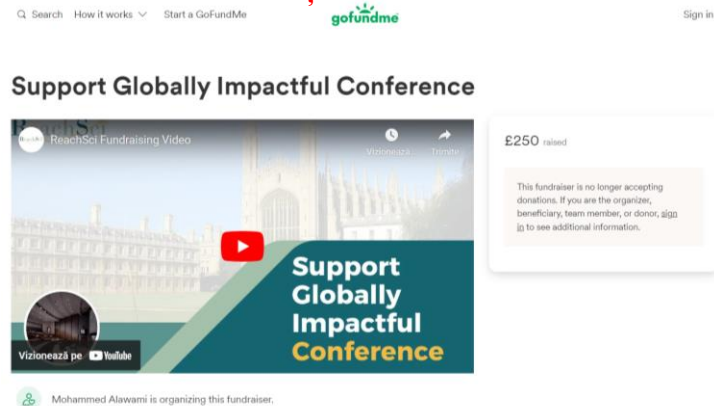
concurs

- finanțarea cazării – video creativ -



Conference
– online and on-site –

o campanie strângere fonduri pentru
finațarea cazării



Prima zi

– networking și turul Cambridge –



A doua zi

– Provocări în STEM –



A treia zi

– Proiect de cercetare –



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Provocările în
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Provocările în
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Romania

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! discriminarea de gen



Irac

! timp limitat
! număr mic de centre de cercetare
! dezinteres – institute de cercetare



Nigeria

! lipsa suportului internațional
! resurse



Tunisia

! inovație



Mexic

! lipsa competiției și a eficacității



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! poziția geografică

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STEM – slab promovat

sistem divizat

STEM – nu sunt cel mai profitabile domenii

sponsorizare insuficientă pentru infrastructură

CONSECINȚE



UNDER DEVELOPMENT

https://ec.europa.eu/research-and-innovation/sites/default/files/rio/report/PS-F-RO-Final-Report_03.06.2022.pdf



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Challenges in STEM Research in Romania

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INTRODUCTION

The Romanian research and development system contains universities national institutes subordinated to the Ministry of Research, Innovation and Digitalisation as well as research institutes of the Romanian Academy. Romania has historically faced many challenges in research, mainly due to low financing and an increased rate of brain drain. For example, Romania's recorded Research and Development (R&D) expenditure as % of GDP for the year 2022 was under 0.5% [1]. Currently, measures are being put in place to increase this value. [2]

This study aims to describe how researchers and university professors perceive the most relevant barriers for conducting research in their field of research, in particular chemistry and chemistry-related fields.

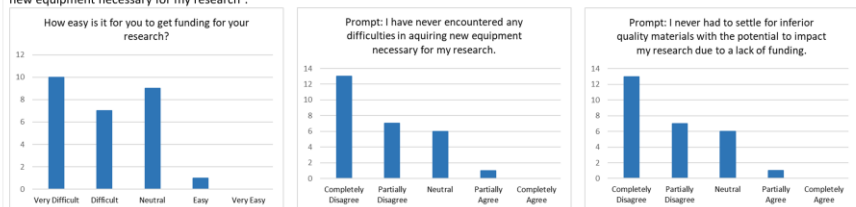
DATA COLLECTION

Participants were asked to fill out an online form consisting of 10 questions regarding research in Romania, covering issues such as funding, publication difficulty, infrastructure accessibility, ease of collaboration and presence of discrimination.

All answers were anonymously collected. Participants were asked to choose if they are currently working as researchers or as university professors that conduct research. There were 28 participants in total, 18 of them (64%) researchers and 10 (36%) university professors.

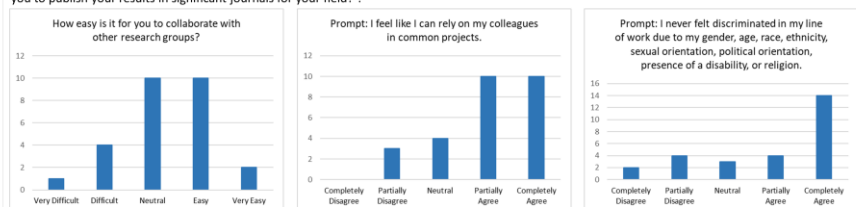
RESULTS AND DISCUSSION

All of the questions regarding funding had overwhelmingly negative responses – 48% and 26% of participants choosing “completely disagree” and “partially disagree” respectively for a total of 74% of participants answering negatively to the prompt “I have never encountered any difficulties in acquiring new equipment necessary for my research”.



Figures 1, 2, 3. Questions regarding funding

Questions regarding ease of collaboration, level of trust and presence of discrimination were predominantly positive. The majority of participants claimed they have never experienced any sort of discrimination, with 52% and 15% of participants selecting “completely agree” and “partially agree” respectively for a total of 67% answering positively to the prompt “I have never felt discriminated in my line of work due to [...]”. Questions regarding ease of publication and quality of selected journals were mostly neutral, with almost 60% of participants answering “neutral” to the question “How easy is it for you to publish your results in significant journals for your field?”.



Figures 4, 5, 6. Questions regarding ease of collaboration, trust and presence of discrimination

CONCLUSIONS AND PERSPECTIVES

In conclusion, this study reinforced some previous concerns and trends regarding funding in Romania; confirming the lack of funding as one of the highest priority issues for research in Romania.

While the accessibility of publication can be improved, collaboration between research groups and the general level of trust do not seem to constitute barriers in research at the moment. Discrimination was not recorded as an issue encountered in Romanian research. Efforts to bridge the gaps are currently underway, and the future of Romanian research appears promising.

REFERENCES

- [1] The World Bank, Research and development expenditure (% of GDP) – Romania, <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=RO>
- [2] research.gov.ro

ACKNOWLEDGEMENTS

We are grateful to ReachSci, the NGO InformArt Association and project PN-III-P2-2.1-PED-2021-2529, contract 609/PED for funding this work.

Challenges In Romanian Chemical Research Publication

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The Romanian Ministry of Research, Innovation and Digitalization is in charge of the universities and institutes which conduct research and development activities. Throughout its recent history, Romania encountered many challenges in research, despite being an EU Member State. Inconsistent funding and qualified research staff immigration are among the main reasons. In 2022, Romania's recorded Research and Development (R&D) expenditure as % of GDP was less than 0.5%. For now measures are trying to be implemented to increase this percentage. [1, 2] However, the scientific productivity has been on an increasing trend. [3, 4]. University of Bucharest (UB) is the largest university in Romania. It is a comprehensive higher education and research institution with a scientific productivity that places it in top 3 at national level. 40% of the publications from 2016-2022 are open-access. In the last 5 years, funding of the research activities has been creered by resources obtained from national and international community (~20%). Moreover, University of Bucharest is a CIVIS member (European University Alliance) and it is open for international collaborations in order to increase the funding and scientific productivity levels. [3, 4] The goal of this study is to highlight the most relevant barriers in conducting research, seen through the lens of different researchers.

INTRODUCTION

Several questions covering diverse issues in the research field in Romania have been formulated into an online form that has been distributed to different participants activating in this field (mainly from the UB) and the anonymity of the answers has been kept. In total, 28 people have taken this survey 18 of them conducting only research activity and 10 being university professors.

RESULTS AND DISCUSSION

All of the questions regarding publication, infrastructure and equipment had mainly neutral or positive responses.

The questions regarding ease of publication had predominantly neutral or positive responses - 75% of participants. In addition, the participants had good experiences regarding publication of the results obtained within the studies conducted in collaboration with other researchers - 39%, 29% and 10% of participants chose “neutral”, “partially agree” and “completely agree” respectively -, therefore, 78% of participants had positive responses. However, the survey disclosed that Romanian researchers experience a constant pressure to publish their results because approximately 43% of number of participants had negative responses (25% have responded “completely disagree”, 18% have responded “partially disagree”) and 35% had neutral responses.

The question regarding the access to infrastructure and equipment had mainly neutral or positive responses, approximately 78% of total participants: 71% of participants chose “neutral” and “easy”, and 7% chose “very easy”.

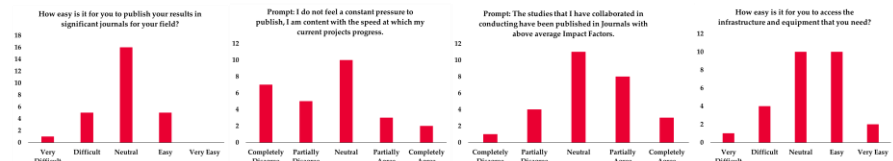


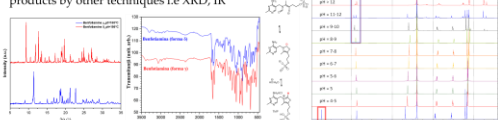
Figure 1. Questions regarding publication and the easy of accesses at infrastructure and equipment

Collaboration with industry

The organic chemistry group has developed a strong collaboration with private company Microsin [5] - the only Romanian manufacturer of active pharmaceutical ingredients (APIs), which has materialized in conducting common research projects [6] and employing graduates of the Faculty of Chemistry, covering both production and R&D.

The common research projects involve: i) fundamental research through use of modern techniques to study old processes. ii) strengthening relationship between higher education and research institution and private company. iii) industrial level through validation a reliable synthetic methodology for large scale synthesis.

Figure 2. Monitoring reactions by NMR in synthesis of APIs and quality control of the products by other techniques like XRD, IR



CONCLUSIONS AND PERSPECTIVES

In conclusion, this study followed ease to publish in a journal with high impact factor and the pressure to publish constantly in Romania as ongoing issues, as well as the access to the infrastructure required to conduct studies. This study confirmed that we have the possibility to perform high quality research and we are working constantly to achieve it.

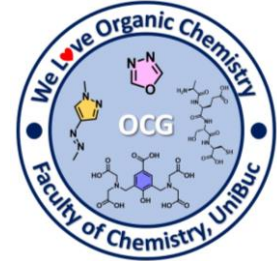
ACKNOWLEDGMENTS

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REFERENCES

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- [4] M. Chioncel, 2020, Analysis of the factors that obstruct the diffusion of innovation.
- [5] www.microsin.ro
- [6] <https://bensynth.unibuc.ro/>

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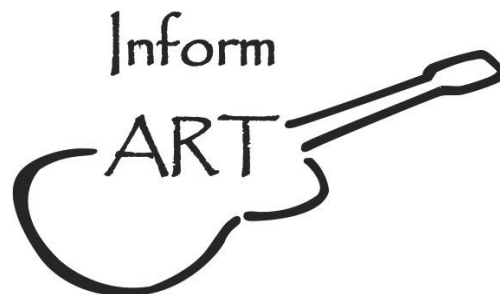


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