Npof.

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Decision on research misconduct

Decision

The Swedish National Board for Assessment of Research Misconduct ("the Board") finds [redacted] guilty of research misconduct. The Board finds [redacted] not guilty of research misconduct.

Background

On 9 September 2021, Lund University submitted a case on research misconduct to the Board. This submission took place in accordance with Section 6 of the Act (2019:504) on responsibility for good research practice and the examination of research misconduct.

The submission relates to suspicions of fabrication or falsification in the article entitled "CCM3 is a gatekeeper in focal adhesions regulating mechanotransduction and YAP/TAZ signalling" by [redacted] in *Nature Cell Biology*, 2021. The submission included a report in which images from western blot measurements belonging to the article are analysed and a large number of suspected errors are identified. The article states as follows regarding the contributions of the various co-authors:

> [redacted] carried out the experiments. [redacted] performed, designed and analysed the traction-force measurements. [redacted] performed the bioinformatics analysis. [redacted] developed software and conducted analyses for focal adhesion measurements. [redacted] analysed the data. [redacted] designed and supervised the project. [redacted] wrote the manuscript. All authors discussed the results and commented on the manuscript text."

All the co-authors of the article have been given the opportunity to express their views.

[redacted] attached to his statement a report from the review of raw data from the western blot analyses. This report states that some 50% of the western blot results presented are erroneous and that this does not conform to good research practice. The conclusions of the article are still regarded as correct, but the authors have nevertheless asked for the article to be withdrawn. [redacted] states that [redacted] is entirely responsible for the making the errors. In his view, as research leader he is himself partly responsible for not having detected the errors before the article was published. However, he

denies all responsibility for the breaches of good research practice that have taken place. In his opinion, he had relied on [redacted] and it is unreasonable to expect him to check her work in detail at the level that would have been required to discover the errors. He considers that the other co-authors are completely free from liability for the errors in the article since they had worked on other, separate parts of the article.

[redacted] confirms that it was she who initially produced the western blot figures for the article. She is sorry about the errors that arose in the experiments and results that she was responsible for. She cites heavy pressure in her private life and the fact that the corona pandemic had affected her working life as reasons why the mistakes were made. She says that [redacted] had been deeply involved in her work throughout, and that she believed he should have raised any problems with the experiments with her, and that she would in that case have corrected them in time. She also states that all the authors had had access to the western blot results in the course of the work, but no one pointed out anything dubious. She wants to emphasise that the results from the western blot measurements had been confirmed by other experiments carried out for the article, and that the overall conclusions drawn in the article still apply, despite the errors in the western blot figures.

[redacted] states that he was not involved in the western blot experiments at all.

[redacted] explains that she joined the project after the article had been sent in to the journal and was being reviewed. She helped with certain aspects that the reviewers had asked to be clarified, and she assumed that the other material reported in the article was correct. Her contribution was independent from the western blot experiments.

[redacted] confirms that the article contains errors in the figures. He sees no reason to suspect that the errors arose through intentional manipulation of the images. He thinks he joined the research group after the western blot experiments had been concluded, and that his responsibility relates to other parts of the article.

[redacted] have submitted a joint statement. They confirm that there are errors in the western blot figures, but think they would not have been able to detect these errors previously, because they did not have access to raw data. Their contribution to the article relates to parts other than those involving western blots.

[redacted] have submitted a joint statement. They assert that their contributions were entirely independent from the western blot experiments. They also state that in order to detect errors in the western blot results, one has to have access to raw data. They think raw data were sent to the journal after the co-authors' final review of the manuscript, and that they therefore did not have the opportunity to discover the errors while work on the article was under way.

[redacted] explains that she is a physicist, was responsible for other parts of the work than the western blot experiments, and lacks the expertise required to detect errors in them.

[redacted] claims that both he and [redacted] were responsible for parts of the article other than the western blot experiments. He too thinks that it would have been difficult to detect the errors in the western blot figures without access to raw date, which they did not have while work on the article was in progress.

[redacted] were given the opportunity to submit statements in the case, but have opted not to express their views.

The Board has obtained an expert statement concerning the allegations. The expert[1] confirms that the article contains a mixture of falsification and fabrication regarding a high proportion of the western blot results. In her view, there is nothing in the material associated with the case to suggest that there are reasons to suspect that the errors arose owing to intentional manipulation of data or images. Moreover, the expert thinks that [redacted] bore a shared and equally large responsibility for the breaches of good research practice that the western blot results reported represent. She thinks that it is normal practice for not everyone who takes part in projects of this kind to have a detailed understanding of every part of the manuscript. Instead, it is up to all the individuals involved to familiarise themselves with other co-authors' work. Summing up, her assessment is that the first author [redacted], who was in charge of the western blot experiments, and the last author [redacted], as project manager, bear responsibility for the breaches from good research practice.

All the respondents received the expert statement. [redacted] have written a joint statement in which they state that they also represent [redacted] This has been confirmed by [redacted] who repeat that they did not have access to raw data during the course of the work; that the article is a result of collaboration between researchers and various experts; and that they relied on their fellow co-authors.

[redacted] has submitted a statement in which he expresses disappointment in the expert statement and says he thinks the investigation forming the basis for the expert opinion is inadequate. He claims that this opinion is mainly based on what the article specified, but that the respondents' statements have been disregarded. He repeats that [redacted] alone is responsible for the western blot figures shown in the manuscript. In his view he, as research leader, may be seen as partly responsible for the breaches of good research practice, but that his responsibility is not as great as [redacted].

Grounds for decision

Legal regulation

The Board's remit is to examine issues of research misconduct under the Swedish Act (2019:504) on responsibility for good research practice and the examination of research misconduct ("the Act"). Section 2 of the Act defines research misconduct as a serious deviation from good research practice in the form of fabrication, falsification or plagiarism, committed with intent or through gross negligence, in the planning, conduct or reporting of research.

Fabrication, falsification or plagiarism

The forms of misconduct the Board is tasked to examine are fabrication, falsification and plagiarism, These concepts are not defined by the Act, but the preparatory legislative work

[1] Professor Anette Gjörloff Wingren, Department of Biomedical Science,| Malmö University.

on it refers to the fact that they are described in codes (codices) and guidelines on research ethics, such as *The European Code of Conduct for Research Integrity*.[2,3] They are also explained in the Swedish Research Council's publication *Good Research Practice*.[4] According to the preparatory legislative work, "fabrication" is often described as inventing results and documenting them as if they were genuine. "Falsification" refers to manipulation of research material, equipment or processes, or alteration, omission or suppression of data or results without justification. Finally, the description of plagiarism is a researcher's use of other people's texts, ideas or work without due acknowledgement of the original source.[5]

It is evident from the documents in the case that a high proportion of results from the western blot analyses that are reported in the article contain errors. In several cases, the figures do not show results from the western blot analyses they are said to represent, and in some cases, data have been selected to give the impression of a better result, rather than to report what is representative of the measurements. According to the expert, the errors are a mixture of fabrication and falsification.

The Board's assessment is that there has been falsification and fabrication of the western blot results reported in the article.

Serious breach

Only serious breaches of good research practice constitute research misconduct and fall within the scope of investigation by the Board. Other breaches are, instead, dealt with by the entities responsible for the research (the higher education institutions), pursuant to Chapter 1, Section 17 of the Swedish Higher Education Ordinance (1993:100). It is stated in the preparatory legislative work on the Act that fabrication and falsification are always, in principle, severe breaches of good research practice. In certain cases, for example concerning a minor infraction on a single occasion, plagiarism should not be considered a serious breach of good research practice.[6]

Since fabrication or falsification are always serious breaches, in principle, the Board's conclusion is that the errors in the western blot results reported in the article represent a serious breach of good research practice.

Intent or gross negligence

Under Section 2 of the Act, the serious breach of good research practice must have been committed with intent or through gross negligence to be considered research misconduct. "Intent" means, according to the preparatory legislative work on the Act, that the researcher understands what (s)he has done, while "negligence" means that the researcher should have understood this in any case. "Gross negligence" requires the conduct to stand out as particularly serious or reprehensible. Oversights, carelessness or misunderstanding should not, as a rule, be regarded as gross negligence according to the preparatory

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[2] *The European Code of Conduct for Research Integrity*, revised edition. Berlin: All European Academies (ALLEA); 2018, section 3.1.
[3] Swedish Government Bill 2018/19:58, pp. 45, 100.
[4] *Good Research Practice*. Stockholm: Swedish Research Council 2017, Chapter 8.
[5] Swedish Government Bill 2018/19:58, pp. 45, 100.
[6] Swedish Government Bill 2018/19:58, p. 100.

legislative work.[7]

Since 1 January 2020, researchers' responsibility to follow good research practice in their research has been subject to statutory regulation under Section 4 of the Act. There must be investigation and assessment of how far-reaching this responsibility may or should be in each individual case. According to international guidelines,[8] all authors are jointly responsible unless it is otherwise stated, for ensuring that the content of an article is correct and compliant with good research practice. The corresponding author bears the main responsibility for communication with the journal regarding these obligations and during the review process. In the present case, the various authors' contributions are clarified in the article. The various parts of the project require different areas of knowledge and expertise, and the documents included in the case show that the various authors had distinct separate areas of responsibility.

The article (excluding expanded material) contains six figures, five of which report results from western blot analyses. Of these five figures, three (Figures 1, 3 and 5) are based on incorrect western blot results. Results from the western blot analyses are also reported in six of ten figures in the expanded material of the article. Several of these figures, too, are based on incorrect western blot data. The Board deems that the errors found affect such an extensive part of the western blot results reported in the article that it must be considered grossly negligent to have failed to notice the mistakes before the article was sent for publication. The Board considers that [redacted], as the person primarily responsible for the experiments, must be seen as responsible for the errors arising.

The Board also considers that [redacted], as research leader and corresponding author, bore responsibility for thoroughly checking the results before the article was sent for publication. The Board considers that it has become clear that the other co-authors were responsible for other parts of the experiments, analyses or calculations, and should therefore be discharged from liability for misconduct in the research.

Summing up, the Board therefore finds [redacted] and [redacted] guilty of research misconduct. The Board also finds [redacted] not guilty of research misconduct.

The Board has decided in this case following its presentation by caseworker Sofia Ramstedt.

Catarina Barketorp	Sofia Ramstedt
Chair	Caseworker

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[7] Swedish Government Bill 2018/19:58, pp. 50–51, 100.

[8] *Vancouver Rules*, International Committee of Medical Journal Editors. *Recommendations for the Conduct, Reporting, Editing. and Publication of Scholarly Work in Medical Journals*. Updated, December 2016. http://www.icmje.org/recommendations/.