The quarterly distinction 'Paper of the Quarter' of the 3R-Competence Network NRW recognizes outstanding contributions to the 3R principles. We are delighted to announce the winners for the fourth quarter of 2024.

Congratulations to

Christin Elster & Ashley Duplessis

Heinrich Heine University Düsseldorf

for their publication

"Novel Fluorescence-Based Methods to Determine Infarct and Scar Size in Murine Models of Reperfused Myocardial Infarction"

The "Paper of the Quarter" award was given to their publication because they strive in a special way to further develop the 3R principle—"Replace, Reduce, Refine"—which has been applied in laboratory animal science for more than 60 years.

The paper "Novel Fluorescence-Based Methods to Determine Infarct and Scar Size in Murine Models of Reperfused Myocardial Infarction" presents an innovative method that improves the analysis of infarct and scar tissue, **reduces the number of laboratory animals required, and enhances data quality**. By using fluorescence-based techniques, the study **enables more precise and resource-efficient examination of tissue samples** without having to forgo classical histological methods. The research team impressively demonstrates how **scientific progress and ethical responsibility can go hand in hand**.

▶ **You can read the original article here**

Duplessis A, Elster C, Becher S, et al. Novel Fluorescence-Based Methods to Determine Infarct and Scar Size in Murine Models of Reperfused Myocardial Infarction. Cells. 2024;13(19):1633.
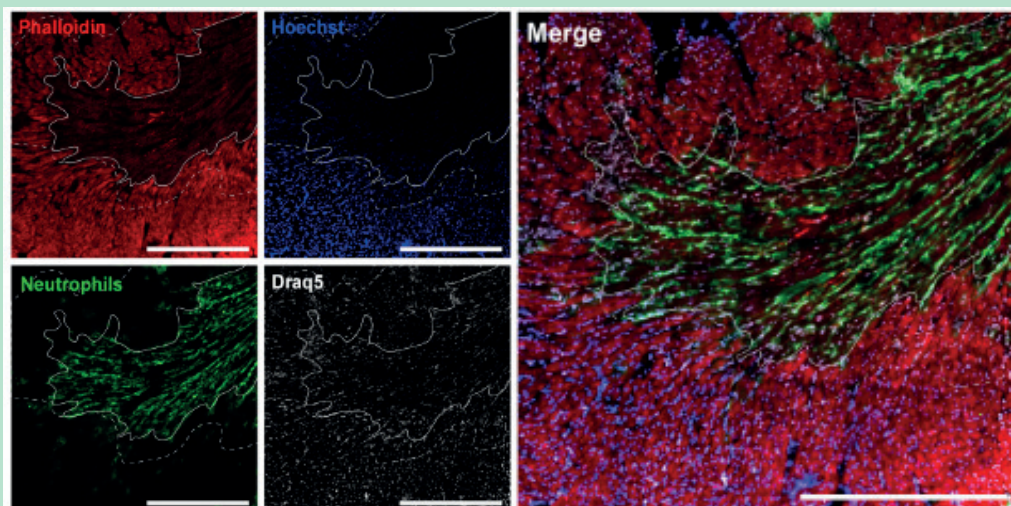
Co-staining of infarct area with immune cells. Neutrophils (Ly6G(+), green) within the infarct zone (phalloidin(−);Hoechst(−)). Nuclei were stained with Draq5™.

Scale bar 500 µm. Adapted from ©Christin Elster, HHU Düsseldorf

How did this research come about?

Myocardial infarction (MI) is one of the leading causes of death worldwide and inflammation plays an important role in cardiac repair after MI. Our working group aims to identify potential therapeutic strategies to reduce inflammation and damage in the heart to preserve myocardial function following MI. Determination of infarct size is commonly used to evaluate the efficacy of potential cardio-protective treatments in animal models. The standard technique to determine infarct size and area at risk 24 h after MI is 2,3,5-triphenyltetrazolium chloride (TTC) staining. A big disadvantage of TTC staining is that it requires the complete consumption of the tissue sample and does not allow further analyses on the same heart. Since we wanted to localize immune cells in hearts affected by infarction, we developed a new fluorescence technology to determine the infarcted area and the area at risk. This allowed us to perform multiple staining variants on the same cardiac tissue. The ability to determine the degree of tissue damage and simultaneously localize immune cells in the infarct opens up new possibilities for research into post-infarct inflammatory processes and the development of targeted therapies.

What is the contribution of this research to the 3Rs?

Our fluorescence-based method to determine infarct size enables multiple analyses on the same heart. In addition to determining the size of the infarct, this technique can also be used to investigate the spatial localization of immune cells in the tissue. In other words, the same heart can be used for several examinations and to answer several questions. This dramatically reduces the number of laboratory animals required, generates more data, and is therefore in line with the reduction and refinement of animal experiments in accordance with the 3R principle.

Members of the research group led by Prof. Norbert Gerdes at the "Cardiovascular Research Laboratory" ©Christin Elster, HHU Düsseldorf

What is your next 3R research question that you would like to answer?

Unfortunately, it is not possible to completely replace animal experiments in cardiovascular research, as the systemic complexity of the cardiovascular system cannot be accurately represented in other models. With our newly established fluorescence staining, however, we are already taking a major step towards reducing animal experiments. This method is now used as standard in our laboratory and those of our cooperating labs. We aim to further reduce animal numbers by establishing cardiovascular micro-tissues and immortal bone marrow-derived macrophage cell lines in our lab. Furthermore, we plan to utilize spatial proteomics. With this technique up to 50 antibodies can be stained on the same tissue section. All these techniques will further reduce the required number of animals in our lab while generating high-parametric and thus advanced quality of research data.

What is "Paper of the Quarter"?

The quarterly distinction „Paper of the Quarter" serves to recognize outstanding publications in the field of 3R principle of the 3R Competence Network NRW. The aim is to recognize the diversity of research achievements and in particular those publications for which the extraordinary quality cannot be adequately reflected by quantitative evaluation criteria such as the Journal Impact Factor (JIF). A high JIF is not an exclusion criterion, but it is not a selection criterion either.

The award is presented as part of a quarterly open competition. The decision on the publication to be awarded is made by the network's Steering Committee which is formed by the representatives of the eight faculties of medicine in NRW. Each location represented on the Steering Committee has one vote, so that the winner is determined by a simple majority of votes. The selection can be made if at least 50% of the site representatives are present at the relevant meeting. The selected paper will be made visible as „Paper of the Quarter" by the network. The award is also recognized with a certificate.

For more information and submissions for the next round **until May 31st, 2025**, please visit
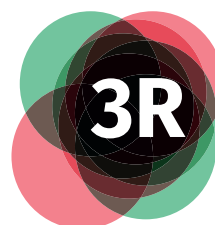► **PAPER OF THE QUARTER**

3R Kompetenznetzwerk NRW