RECENT HIGH-IMPACT PAPERS FROM RADBOUDUMC RESEARCHERS

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Summary

With over 3,000 publications per year, scientific research is a cornerstone of the Radboud university medical center [1]. In this section, recent high-impact papers with an impact factor higher than 5 – published by researchers from the Radboudumc – will be discussed.

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Rare immune cells kick-start anti-cancer immune response

To reduce the mortality rates from cancer, there is need for new treatments. The past years, a lot of research is being done in immunotherapy, specifically on a vaccination that enhances immune cells to clear cancer cells [2]. This article from Nature Communications (impact factor 12) focusses on dendritic cells in this subject. Dendritic cells (DCs) are a rare type of immune cells that scan the body for infectious invaders and also cancers, which make them important for immunotherapy. Type I interferon (IFN) is a messenger molecule that plays a central role in the initiation of immune responses and that is the key driver of immunity to infections and cancer. Plasmacytoid DCs (pDCs) are a certain type of DCs that produce large quantities of type I IFN. The mechanisms that control this process are key to more effective treatment for cancer but are poorly understood. To shed some light on these processes, researchers from Radboudumc and Eindhoven University of Technology developed a nano lab to better understand cell-cell variability and the fundamentals of cellular communication. In the developed device, millions of droplets containing a single cell were produced. In this way, the type I IFN response could be studied at the single-cell level within a tunable microenvironment. The research team of Florian Wimmers (from the Radboudumc research group Dendritic Cell Therapy) tested thousands of single pDCs for their ability to produce type I IFN. They discovered that only a subset of pDCs produces type I IFN and that the pDCs collaborate to amplify their activity and generate population-driven type I IFN responses. Developing future interventions that target pDCs should take into account that not all pDCs are the same and that their activity is dependent on their local density.

Influence of breast compression pressure in mammography screening

In mammography, breast compression is applied to reduce the thickness of the breast to ensure acceptable image quality. A parameter indicating the amount of compression is not available and little is known about the relationship between the amount of breast compression and breast cancer screening outcomes. The research of Katharina Holland, Nico Karssemeijer and Ritse Mann from the Department of Radiology and Nuclear Medicine of the Radboudumc found results that indicate that when high pressure is applied during mammography, this may reduce sensitivity [3]. Sensitivity was computed by the number of screen-detected cancers and interval cancers diagnosed between two screening rounds. Results showed a decrease in sensitivity between the groups with lower and higher forces. The cause for this reduction in sensitivity is not clear. In contrast, if pressure is low this may decrease specificity. More research into this subject and more attention to a meaningful standardisation of compression levels might improve the quality of mammography in the future. This article was published in Breast Cancer Research (impact factor 6).

Thermogels to the rescue

The changing of wound covers can cause pain and possibly disrupts wound repair. Novel synthetic thermosensitive hydrogels based on polyisocyanopeptide (PIC) may offer a solution. The architecture and mechanical properties of PIC gels closely resemble collagen and fibrin, which are essential for wound repair. The gels are liquid below 16 °C and become gels beyond room temperature. This reversible thermoresponsive behaviour facilitates that PIC gels are easy to apply and remove. Adding arginyl-glycyl-aspartic acid (abbreviated to RGD-peptide, which is a ligand for integrins) to the PIC gel may increase biocompatibility due to enhanced cell binding capacities. Roel op 't Veld from the Department of Biomaterials of the Radboud Institute for Molecular Life Sciences studied the use of PIC gels in mice wounds together with a multidisciplinary team from the Radboudumc (Dentistry; theme Reconstructive and regenerative medicine), Radboud University (Molecular Materials), and the Association of Dutch Burn Centres [4]. Full-thickness dorsal skin wound models were compared to wounds treated with PIC gel and PIC-RGD gel for three and seven days. No foreign body reactions and similar wound closure rates were found in all groups. Granulocyte populations (indicating an immune response against bacteria) in the wound decreased significantly in the PIC-gel groups, probably because bacteria could not penetrate the gel. RGD-peptides did not improve the effect observed for the PIC gel. In short, the PIC gels did not show adverse effects, were easy to apply and their possibilities for bio-functionalisation make them suitable for further development into wound dressings. The article was published in Biomaterials (impact factor 8).

References

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