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High-dimensional imaging of the HPV-induced tumor microenvironment to improve clinical outcomes

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Appendices

The background of the page is a deep space image showing a complex network of galaxies and intergalactic matter. Thin, glowing filaments of light in various colors (blue, green, orange, purple) crisscross the dark void, representing the cosmic web. Numerous bright, multi-pointed star-like objects are scattered throughout, some appearing as dense clusters of light.

List of publications

The immune microenvironment in vulvar (pre)cancer: review of literature and implications for immunotherapy

Z. Abdulrahman, K.E. Kortekaas, P.J. de Vos van Steenwijk, S.H. van der Burg, M.I.E. van Poelgeest

Expert Opinion on Biological Therapy, October 2018

doi: 10.1080/14712598.2018.1542426

Cancer immunophenotyping by 7 colour multispectral imaging without tyramide signal amplification

M. IJsselsteijn, T. Brouwer, Z. Abdulrahman, A. Ramalheiro, A. Vahrmeijer, K. Jordanova, N.F.C.C. de Miranda

Journal of Pathology: Clinical Research, January 2019

doi: 10.1002/cjp2.113

High numbers of activated helper T cells are associated with better clinical outcome in early-stage vulvar cancer, irrespective of HPV or p53 status

K.E. Kortekaas, S.J. Santegoets, Z. Abdulrahman, V. van Ham, M. van der Tol, I. Ehsan, H.C. van Doorn, T. Bosse, M.I.E. van Poelgeest, S.H. van der Burg

Journal for ImmunoTherapy of Cancer, September 2019

doi: 10.1186/s40425-019-0712-z

Pre-existing inflammatory immune microenvironment predicts the clinical response of vulvar high-grade squamous intraepithelial lesions to therapeutic HPV16 vaccination

Z. Abdulrahman, N.F.C.C. de Miranda, E.M.G. van Esch, P.J. de Vos van Steenwijk, H.W. Nijman, M.J.P. Welters, M.I.E. van Poelgeest, S.H. van der Burg

Journal for ImmunoTherapy of Cancer, March 2020

doi: 10.1136/jitc-2020-000563

Lack of myeloid cell infiltration as an acquired resistance strategy to immunotherapy

E. Beyranvand, Z. Abdulrahman, C. Labrie, M. van Elsas, E. Rademaker, J. Kleinovink, T. van der Sluis, S. Duikeren, A. Teunisse, A. Jochemsen, J. Oosting, N.F.C.C. de Miranda, T. van Hall, R. Arens, S.H. van der Burg

Journal for ImmunoTherapy of Cancer, September 2020

doi: 10.1136/jitc-2020-001326

A pre-existing coordinated inflammatory microenvironment is associated with complete response of vulvar high-grade squamous intraepithelial lesions to different forms of immunotherapy

Z. Abdulrahman, N.F.C.C. de Miranda, B.W.J. Hellebrekers, P.J. de Vos van Steenwijk, E.M.G. van Esch, S.H. van der Burg, M.I.E. van Poelgeest
International Journal of Cancer, November 2020
doi: 10.1002/ijc.33168

CD161 expression and regulation defines rapidly responding effector CD4+ T cells associated with improved survival in HPV16-associated tumors

C.L. Duurland, S.J. Santegoets, Z. Abdulrahman, N.M. Loof, G. Sturm, T.H. Wesselink, R. Arens, S. Boekestijn, I. Ehsan, M.I.E. van Poelgeest, F. Finotello, H. Hackl, Z. Trajanoski, P. ten Dijke, V.M. Braud, M.J.P. Welters, S.H. van der Burg
Journal for ImmunoTherapy of Cancer, October 2021
doi: 10.1136/jitc-2021-003995

Tumor-specific T cells support chemokine-driven spatial organization of intratumoral immune microaggregates needed for long survival

Z. Abdulrahman, S.J. Santegoets, G. Sturm, P. Charoentong, M.E. Ijsselsteijn, A. Somarakis, T. Höllt, F. Finotello, Z. Trajanoski, S.L. van Egmond, D. Mustafa, M.J.P. Welters, N.F.C.C. de Miranda, S.H. van der Burg
Journal for ImmunoTherapy of Cancer, January 2022
doi: 10.1136/jitc-2021-004346

Immune-based biomarker accurately predicts response to imiquimod immunotherapy in cervical high-grade squamous intraepithelial lesions

Z. Abdulrahman, N. Hendriks, A.J. Kruse, A. Somarakis, A. van de Sande, H.J. van Beekhuizen, J.M.J. Piek, N.F.C.C. de Miranda, L. Kooreman, B. Slangen, S.H. van der Burg, P.J. de Vos van Steenwijk, E.M.G. van Esch
Journal for ImmunoTherapy of Cancer, September 2022
doi: 10.1136/jitc-2022-005288

The ratio between monocytic myeloid derived suppressor cells/monocytes and dendritic cells is a prognostic intratumoral and blood biomarker for survival of epithelial ovarian cancer patients

A.F. de Groot, S.J. Santegoets, Z. Abdulrahman, E.M. Dijkgraaf, J.R. Kroep, S.H. van der Burg
Gynecology & Obstetrics Open Access, June 2024
doi: 10.29011/2577-2236.100202

Monocyte infiltration is an independent positive prognostic biomarker in vulvar squamous cell carcinoma

Z. [Abdulrahman](#), K.E. Kortekaas, M.J.P. Welters, M.I.E. van Poelgeest, S.H. van der Burg

Cancer Immunology, Immunotherapy, July 2024

doi: 10.1007/s00262-024-03755-w

Single-cell spatial transcriptomics unravels cell states and ecosystems associated with clinical response to immunotherapy

Z. [Abdulrahman](#), R.C. Slieker, D. McGuire, M.J.P. Welters, M.I.E. van Poelgeest, S.H. van der Burg

Journal for ImmunoTherapy of Cancer, March 2025

doi: 10.1136/jitc-2024-011308

Pre-existing infiltration with T cells and CD14+ myeloid cells is associated with treatment response to imiquimod in primary and recurrent vulvar high-grade squamous intraepithelial lesions

C.L. Muntinga, P.J. de Vos van Steenwijk, L.F.S. Kooreman, S. Regauer, Z. [Abdulrahman](#), R.L.M. Bekkers, S.H. van der Burg, G. Trutnovsky, E.M.G. van Esch

Journal for ImmunoTherapy of Cancer, October 2025

doi: 10.1136/jitc-2025-012666

The local cellular response to Human Papillomavirus focuses on basal layer restoration as visualized in situ by specific cellular neighborhoods near infected cells

R.C. Slieker, Z. [Abdulrahman](#), S.J. Santegoets, M.I.E. van Poelgeest, M.J.P. Welters, S.H. van der Burg

Frontiers in Immunology, December 2025

doi: 10.3389/fimmu.2025.1728629

Frailty of older patients is not reflected in the melanoma tumor microenvironment and treatment response to immune checkpoint blockade therapy

A. Özkan, M.E. Ijsselsteijn, Z. [Abdulrahman](#), M. van der Ploeg, E. Kapiteijn, M. Slingerland, E.M.E. Verdegaal, M. J. P. Welters, S.H. van der Burg, J.E.A. Portielje, N.F.C.C. de Miranda, N. A. de Glas

In press, 2026

Curriculum vitae

Ziena Abdulrahman studied at Leiden University. Following her graduation, she conducted doctoral research at the departments of Gynaecology, Oncology and Pathology at Leiden University Medical Center. Her PhD research focused on the tumor immune microenvironment in HPV-induced tumors and its impact on immunotherapy response and patient survival. She applied various high-dimensional imaging techniques and uncovered novel insights about the clinical importance of spatial immune architectures.

Acknowledgements

الْعُلْمُ فِي الصِّغَرِ كَالنَّقْشِ عَلَى الْحَجَرِ

'Knowledge in childhood is like engraving on stone' (Arabic proverb)

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