Dr Nicolaas Maré Vlok

Founder and Principal Scientist, Trace Labs

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SUMMARY

I am a biochemist with more than 20 years of experience specialising in proteomics and protein chemistry. My passion for the intricate world of proteins began at Stellenbosch University, where I earned my PhD in Biochemistry. I have contributed to the scientific community through 27 peer-reviewed publications, with more than 12,000 reads, more than 1,500 citations and an H-index of 15.

EMPLOYMENT EXPERIENCE

Sep 2024 - Present

Founder and Owner

Trace Labs (Pty) Ltd

- Manage all day-to-day operational activities.
- Engage directly with clients for project planning and development.
- Provide specialist experimental design guidance.
- Assist principal investigators with grant writing submissions.
- Conduct and supervise bench work, providing hands-on student training.
- Perform comprehensive data analysis and reporting.
- Handle all financial management for the company.
- Oversee stock control and inventory management.

Mar 2014 - Sep 2024

Senior Analyst

Central Analytical Facility, Stellenbosch University

- Solely managed the Proteomics Unit.
- Maintained and serviced key equipment, including Fusion and Orbitrap Velos mass spectrometers and Ultimate 3000 nano-LC systems.
- Compiled reports for the National Research Foundation on behalf of the sole grant holder for the Fusion mass spectrometer.
- Liaised with CAF Management, Facilities, and equipment vendors and industry.
- Developed the Proteomics Unit's customer base locally and internationally.
- Managed all customer communication, from project requirements to data presentation (written and oral).
- Trained and supervised researchers throughout the year, including arranging intensive training sessions.
- Developed, validated and implemented standard operating procedures (SOPs) and new methods.

Mar 2007 - Feb 2014

Platform Manager and Application Specialist

Centre for Proteomic and Genomic Research (CPGR)

- Established and managed the Proteomics Platform.
- Maintained and serviced key equipment, including the 4800 MALDI ToF/ToF mass spectrometer and Ultimate 3000 nano-HPLC.
- Reported to CPGR Management and prepared Board Reports.

- Prepared the Platform for ISO 9001 accreditation.
- Managed all client engagement, covering project development, data presentation and experiment expansion.
- Trained and supervised junior personnel, customers and NRF interns.
- Developed and validated standard operating procedures (SOPs) and performed process control.
- Led research and method development, including international proficiency tests for the Association of Biomolecular Resource Facilities (ABRF).
- Handled procurement and waste management for the Platform.

Jul 2006 - Dec 2006

Technical Assistant
Department of Biochemistry, Stellenbosch University

- Co-supervised Bachelor of Science (Honours) students in Biochemistry.
- Served as a peer review panel member, reviewing articles for *Applied and Environmental Microbiology*.
- Performed contract peptide synthesis for a UK-based pharmaceutical company, including end-to-end quality control, purification and quality assurance of reagents and final products.
- Interpreted data and submitted final reports for product release, with a complete audit trail for the entire process.

Feb 2006 - Jun 2006

Contract Lecturer
Department of Biochemistry, Stellenbosch University

- Prepared and presented first-year Biochemistry modules within the wider Biology course.
- Managed the assessment process, including setting and marking all test and examination scripts.

EDUCATION

2020 - 2024

Structured Master of Science (Pharmacology)
Stellenbosch University
First year completed; discontinued due to work responsibilities.

2005

Doctor of Philosophy (Biochemistry)
Stellenbosch University

1999

Bachelor of Science (Honours) (Biochemistry)
Stellenbosch University

1999

Bachelor of Science (Biochemistry)
Stellenbosch University

PROFESSIONAL AFFILIATIONS

2022 - 2024

Board Member
Chromatography Society of South Africa

2011 - 2013

Member
Association of Biomolecular Resource Facilities

TECHNICAL SKILLS

Instruments

Thermo Scientific Orbitrap Fusion, Q-Exactive and LTQ Orbitrap Velos; ABI 4800 MALDI ToF/ToF; Thermo Ultimate 3000 RS-nano-LC and RSLC; Thermo Scientific Easy-nLC; Dionex nano-LC; Agilent LC systems; Shimadzu 8040 LC-MS; Bio-

Rad Criterion PAGE system.

Software

FragPipe, Proteome Discoverer, Scaffold, Skyline, ProteinPilot, Xcalibur, Chromeleon, LabSolutions, 4000 Series Explorer, Data Explorer, Peak Explorer, GPS4000 Explorer, other proteomic data analysis software and the Microsoft product suite.

Leadership

Mentoring, postgraduate supervision, advising students and academics on projects and experimental design, problem-solving, multi-tasking, adaptability to change and interpersonal communication.

TEACHING AND LEARNING

YEAR	COURSE	CLASS SIZE
2021 - Present	BSc Honours and Structured MSc in Pharmacology, Stellenbosch University	8-12
2019 - Present	BSc Honours in Molecular Biology, University of the Western Cape	10-15
2015 - 2019	CAF Winter School, Stellenbosch University	12

External Moderation of Postgraduate Courses

YEAR	COURSE	INSTITUTION
2019 - Present	Proteomics module, Honours in Biotechnology	University of the Western Cape

POSTGRADUATE RESEARCH SUPERVISION

DEGREE	CANDIDATE	ROLE	GRADUATED
PhD	M. Maartens	Co-supervisor	2025
PhD	P. Dhanraj	Co-supervisor	2025
MSc	E. Johnstone	Co-supervisor	2017
MSc	K. Muvirimi	Co-supervisor	2017

EXAMINATION OF EXTERNAL DISSERTATIONS

YEAR	DEGREE	STUDENT	INSTITUTION	THESIS OR DISSERTATION TITLE
2024		J.J. de Jong	Stellenbosch University	The Development of a LC-MS/MS Assay for the Quantification of Colistin A and B in Plasma: Application to a Pharmacokinetic Study
2022	MSc	C.M. Phogole	Stellenbosch University	An Analytical Investigation of the Impact of Crushing of First-Line Antituberculosis Medication and Administration via a Nasogastric Tube
2022	PhD	A. Kuhar	University of Cape Town	Monoclonal Antibody Therapy: The Development of a Liquid Chromatography Tandem Mass Spectrometry Method to Measure Rituximab Concentrations in Human Plasma
2020	PhD	B.V. Twala	Rhodes University	Multiplexed Mass Spectrometry: Single, On-Bead, Detection Analysis Using MALDI-TOF MS

YEAR	DEGREE	STUDENT	INSTITUTION	THESIS OR DISSERTATION TITLE
2019	MSc	A. Ehlers	Stellenbosch University	Leveraging Shotgun Proteomics for Optimised Interpretation of Data-Independent Acquisition Data: Identification of Diagnostic Biomarkers for Paediatric Tuberculosis
2017	MSc	E. Johnstone	Stellenbosch University	Novel Biomarkers for Prostate Cancer
2017	MSc	K. Muvirimi	Stellenbosch University	Comparative Secretome Analysis of Benign Prostate Hyperplasia and Prostate Cancer Cell Models

BOOK CHAPTERS

1. Goss, D. M., Ayad, B. M., **Vlok, M.**, Hattingh, S., Van der Horst, G. and Du Plessis, S. S. (2021) 'Proteomics and Biomarker Identification in Improved Sperm Motility Parameters After 4 h of Ejaculatory Abstinence', in Du Plessis, S. S. and Agarwal, A. (eds) XIIIth International Symposium on Spermatology. Cham: Springer, pp. 497-508. doi: 10.1007/978-3-030-66292-9_48

PEER-REVIEWED PUBLICATIONS

1. Booyens, R. M., **Vlok, M.**, Bester, C., Hira, R., Khan, M. A., Kell, D. B., Raj, S. R. and Pretorius, E. (2026) 'Post-Translational Modifications in the Insoluble Fraction of Platelet-Poor Plasma Distinguish Pre-COVID-19 Postural Orthostatic Tachycardia Syndrome, Long COVID, and Long COVID-POTS: A Preliminary Study', Cardiovascular Diabetology. doi: 10.1186/s12933-026-03296-9
2. Waters, M., **Vlok, M.**, Kroon, E. E., Kotze, M. J., Moremi, K. E., Oladejo, S. O., Rajaratnam, K., Nunes, J. M., Venter, C., Scott, C. J., Kell, D. B. and Pretorius, E. (2026) 'Proteomic Signatures of COVID-19 Post-Vaccination/Post-Infection Syndrome (PV/PIS): Insights into Immune Dysregulation and Coagulopathy', Frontiers in Cellular and Infection Microbiology, 16, p. 1753348. doi: 10.3389/fcimb.2026.1753348
3. Boodhoo, K., **Vlok, M.** and van de Vyver, M. (2025) 'A Macrophage-Based Cell Therapy Approach Promotes Collagen Deposition in Diabetic Wounds', Wound Repair and Regeneration, 33(1), p. e70071. doi: 10.1111/wrr.70071
4. Phogole, C., Pretorius, L., Kellermann, T., **Vlok, M.** and Smith, C. (2025) 'The Sertraline Metabolite, Desmethylsertraline, May Be Implicated in Adverse Outcomes Reported After Gestational Sertraline Use: Insights from a Study in Zebrafish', Pharmacological Reports, 77(1), pp. 1-11. doi: 10.1007/s43440-025-00765-y
5. Maartens, M., **Vlok, M.** and van de Vyver, M. (2025) 'Antioxidants Improve the Viability of Diabetic Bone Marrow MSCs Without Rescuing Their Pro-Regenerative Secretome Function', Molecular and Cellular Endocrinology, 601, p. 112519. doi: 10.1016/j.mce.2025.112519
6. Isaiah, A. R., Luies, L., Loots, D. T., Williams, A. A., **Vlok, M.**, Chegou, N. N., van Furth, M. T., van der Kuip, M. and Mason, S. (2024) 'Protocol for Unified Metabolomics and Proteomics Analysis of Formalin-Fixed Paraffin-Embedded Tissue', STAR Protocols, 5(4), p. 103442. doi: 10.1016/j.xpro.2024.103442
7. Nunes, M., **Vlok, M.**, Proal, A., Kell, D. and Pretorius, E. (2024) 'Data-Independent LC-MS/MS Analysis of ME/CFS Plasma Reveals a Dysregulated Coagulation System, Endothelial Dysfunction, Downregulation of Complement Machinery', Cardiovascular Diabetology, 23(1), p. 1. doi: 10.1186/s12933-024-02315-x
8. Montague, C., Holt, Y., **Vlok, M.**, Dhanraj, P., Boodhoo, K., Maartens, M., Buthelezi, K., Niesler, C. and van de Vyver, M. (2024) 'Combined Therapeutic Use of Umbilical Cord Blood Serum and Amniotic Membrane in Diabetic Wounds', Biochimie, 227, pp. 1-11. doi: 10.1016/j.biochi.2024.07.012
9. Masoabi, M., Burger, F., Botha, A. M., Le Roux, M. S., **Vlok, M.**, Snyman, S. and van der Vyver, C. (2023) 'Overexpression of the Small Ubiquitin-Like Modifier Protease OTS1 Gene Enhances Drought Tolerance in Sugarcane (Saccharum spp. Hybrid)', Plant Biology, 25(6), pp. 1118-1127. doi: 10.1111/plb.13585
10. Cuttler, K., Fortuin, S., Müller-Nedebock, A., **Vlok, M.**, Cloete, R. and Bardien, S. (2022) 'Proteomics Analysis of the p.G849D Variant in Neurexin 2 Alpha May Reveal Insight into Parkinson's Disease Pathobiology', Frontiers in Aging Neuroscience, 14, p. 1002777. doi: 10.3389/fnagi.2022.1002777
11. Kruger, A., **Vlok, M.**, Turner, S., Venter, C., Laubscher, J., Kell, D. and Pretorius, E. (2022) 'Proteomics of Fibrin Amyloid Microclots in Long COVID/Post-Acute Sequelae of COVID-19 (PASC) Shows Many Entrapped Pro-Inflammatory Molecules That May Also Contribute to a Failed Fibrinolytic System', Cardiovascular Diabetology, 21(1), p. 1. doi: 10.1186/s12933-022-01623-4

12. Pretorius, E., **Vlok, M.**, Venter, C., Bezuidenhout, J., Laubscher, J., Steenkamp, J. and Kell, D. (2021) 'Persistent Clotting Protein Pathology in Long COVID/Post-Acute Sequelae of COVID-19 (PASC) Is Accompanied by Increased Levels of Antiplasmin', Cardiovascular Diabetology, 20(1), p. 1. doi: 10.1186/s12933-021-01359-7

13. Grobbelaar, L., Venter, C., **Vlok, M.**, Ngoepe, M., Laubscher, J., Lourens, P. J., Steenkamp, J., Kell, D. and Pretorius, E. (2021) 'SARS-CoV-2 Spike Protein S1 Induces Fibrin(ogen) Resistant to Fibrinolysis: Implications for Microclot Formation in COVID-19', Bioscience Reports, 41(8), p. BSR20210611. doi: 10.1042/BSR20210611

14. Ellero, A., Van Den Bout, I., **Vlok, M.**, Cromarty, D. and Hurrell, T. (2021) 'Continual Proteomic Divergence of HepG2 Cells As a Consequence of Long-Term Spheroid Culture', Scientific Reports, 11(1), p. 10563. doi: 10.1038/s41598-021-89907-9

15. Le Roux, M. S., Burger, F., **Vlok, M.**, Kunert, K., Cullis, C. and Botha, A. M. (2021) 'EMS Derived Wheat Mutant BIG8-1 (Triticum aestivum L.)-A New Drought Tolerant Mutant Wheat Line', International Journal of Molecular Sciences, 22(10), p. 5314. doi: 10.3390/ijms22105314

16. Boodhoo, K., **Vlok, M.**, Tabb, D. L., Myburgh, K. H. and van de Vyver, M. (2021) 'Dysregulated Healing Responses in Diabetic Wounds Occur in the Early Stages Postinjury', Journal of Molecular Endocrinology, 66(2), pp. 141-155. doi: 10.1530/JME-20-0256

17. Lukman, V., Odeyemi, S., Roth, R., Mbabala, L., Tshililo, N., **Vlok, M.**, Dewar, M. and Kenyon, C. (2020) 'Novel Kinase Platform for the Validation of the Anti-Tubercular Activities of Pelargonium sidoides (Geraniaceae)', BMC Biotechnology, 20(1), p. 62. doi: 10.1186/s12896-020-00643-w

18. Le Roux, M. S., Burger, F., **Vlok, M.**, Kunert, K., Cullis, C. and Botha, A. M. (2020) 'Wheat Line "RYNO3936" Is Associated with Delayed Water Stress-Induced Leaf Senescence and Rapid Water-Deficit Stress Recovery', Frontiers in Plant Science, 11, p. 1053. doi: 10.3389/fpls.2020.01053

19. Swart, P., Russell, V., **Vlok, M.** and Dimatelis, J. (2018) 'Early-Ethanol Exposure Induced Region-Specific Changes in Metabolic Proteins in the Rat Brain: A Proteomics Study', Journal of Molecular Neuroscience, 65(4), pp. 638-647. doi: 10.1007/s12031-018-1097-z

20. Rautenbach, M., **Vlok, M.**, Eyéghé-Bickong, H., van der Merwe, M. and Stander, M. (2017) 'An Electrospray Ionization Mass Spectrometry Study on the "In Vacuo" Hetero-Oligomers Formed by the Antimicrobial Peptides, Surfactin and Gramicidin S', Journal of the American Society for Mass Spectrometry, 28(7), pp. 1435-1442. doi: 10.1007/s13361-017-1685-0

21. Pretorius, E., Africander, D., **Vlok, M.**, Perkins, M., Quanson, J. and Storbeck, K. H. (2016) '11-Ketotestosterone and 11-Ketodihydrotestosterone in Castration Resistant Prostate Cancer: Potent Androgens Which Can No Longer Be Ignored', PLoS One, 11(7), p. e0159867. doi: 10.1371/journal.pone.0159867

22. Dimatelis, J., Hsieh, J., Sterley, T. L., Marais, L., Womersley, J., **Vlok, M.** and Russell, V. (2015) 'Impaired Energy Metabolism and Disturbed Dopamine and Glutamate Signalling in the Striatum and Prefrontal Cortex of the Spontaneously Hypertensive Rat Model of Attention-Deficit Hyperactivity Disorder', Journal of Molecular Neuroscience, 56(3), pp. 605-614. doi: 10.1007/s12031-015-0491-z

23. Rautenbach, M., Eyéghé-Bickong, H., **Vlok, M.**, Stander, M. and Beer, A. (2012) 'Direct Surfactin-Gramicidin S Antagonism Supports Detoxification in Mixed Producer Cultures of Bacillus subtilis and Aneurinibacillus migulanus', Microbiology, 158(Pt 5), pp. 1290-1299. doi: 10.1099/mic.0.063131-0

24. Troskie, A., **Vlok, M.** and Rautenbach, M. (2012) 'A Novel 96-Well Gel-Based Assay for Determining Antifungal Activity Against Filamentous Fungi', Journal of Microbiological Methods, 91(3), pp. 493-498. doi: 10.1016/j.mimet.2012.09.025

25. Dimatelis, J., Hendricks, S., Hsieh, J., **Vlok, M.**, Bugarith, K., Daniels, W. and Russell, V. (2012) 'Exercise Partly Reverses the Effect of Maternal Separation on Hippocampal Proteins in 6-Hydroxydopamine-Lesioned Rat Brain: Exercise Partly Reverses the Effect of Maternal Separation in Rat Brain', Experimental Physiology, 98(3), pp. 787-796. doi: 10.1113/expphysiol.2012.066720

26. Rautenbach, M., **Vlok, M.**, Stander, M. and Hoppe, H. (2007) 'Inhibition of Malaria Parasite Blood Stages by Tyrocidines, Membrane-Active Cyclic Peptide Antibiotics from Bacillus brevis', Biochimica et Biophysica Acta (BBA) - Biomembranes, 1768(6), pp. 1488-1497. doi: 10.1016/j.bbamem.2007.01.015

27. Rautenbach, M., Gerstner, G. D., **Vlok, N. M.**, Kulenkampff, J. and Westerhoff, H. V. (2006) 'Analyses of Dose-Response Curves to Compare the Antimicrobial Activity of Model Cationic α-Helical Peptides Highlights the Necessity for a Minimum of Two Activity Parameters', Analytical Biochemistry, 350(1), pp. 81-90. doi: 10.1016/j.ab.2005.11.027

SUBMITTED FOR REVIEW

1. Mbabala, L., Tshililo, N., **Vlok, M.**, Vandrell, I., Fisher, R., Tabb, D. L., Overduin, M., Butterworth, S. and Kenyon, C. (Submitted, Awaiting Review) 'Proteomic Snapshots of Structural Cross-Linking Rearrangements in Ca2+/Calmodulin-Dependent Kinase-1-Delta Associated with Its Regulation by ATP, Ca2+/Calmodulin and Reduction Potential'.

CONFERENCE PRESENTATIONS

1. Gqamana, P. P., Nel, A., Ganief, T., McDonald, Z., Garnett, S., **Vlok, N. M.** and Blackburn, J. (2011) 'The Effect of Chemical Modification of HIV-1 Tat on Its Biological Function: A Cell-Culture and Mass Spectrometry Study'. Paper presented at the 59th Annual American Association of Mass Spectrometry, Denver, Colorado, USA.
2. **Vlok, N. M.**, Khoury, G., Hornby, J. and Hiller, R. (2010) 'A Quality Centric Workflow for iTRAQ'. Paper presented at the Human Proteome Organisation (HUPO), Sydney, Australia, September 2010.
3. **Vlok, N. M.** (2008) 'Development of a High Throughput Quality Controlled Workflow for Peptide Mass Fingerprint on a MALDI 4000 ToF/ToF Mass Spectrometer'. Paper presented at the Cape Biotechnology Forum, Stellenbosch.
4. **Vlok, N. M.** and Rautenbach, M. (2005) 'The Effect of Bacillus Peptides on the Antimicrobial Activity of Gramicidin S'. Poster presented at the 19th SASBMB Conference, Stellenbosch.
5. **Vlok, N. M.** and Rautenbach, M. (2005) 'An Electrospray Mass Spectrometry Study of the Nature of Gramicidin S-Surfactin Interaction'. Poster presented at the 19th SASBMB Conference, Stellenbosch.
6. **Vlok, N. M.** and Rautenbach, M. (2001) 'Sensitive Standardised Microtitre Plate-Based Assays for the Determination of Antifungal Activity'. Poster presented at the Third Gordon Research Conference on Antimicrobial Peptides, California, USA.