

## Curriculum Vitae

**NAME:** Hans Vink  
**DATE OF BIRTH:** January 31, 1967  
**PLACE OF BIRTH:** Waalwijk, The Netherlands  
**GENDER:** Male  
**CITIZENSHIP:** The Netherlands

### PRESENT POSITION:

Co-founder and Chief Science Officer  
BioRegenx Inc. (2021 – present)  
Chattanooga, USA  
Website: [www.bioregenx.com](http://www.bioregenx.com)

Co-founder and Chief Science Officer  
MicroVascular Health Solutions LLC (2014 – present)  
Alpine, Utah, USA  
Website: [www.microvascular.com](http://www.microvascular.com)  
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Founder and Chief Science Officer  
GlycoCheck BV (Dec 2010 – present)  
Schimmert, The Netherlands  
Website: [www.glycocheck.com](http://www.glycocheck.com)  
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Associate Professor of Vascular Physiology (2006 - 2021)  
Department of Physiology  
Cardiovascular Research Institute Maastricht,  
Maastricht, The Netherlands  
Email: [h.vink@maastrichtuniversity.nl](mailto:h.vink@maastrichtuniversity.nl)

### DISSERTATION TITLE:

The endothelial cell glycocalyx as determinant of capillary hematocrit (1994)

### RESEARCH INTERESTS:

Clinical assessment of endothelial glycocalyx to identify early vascular risk  
Glycocalyx biophysics and biochemistry in relation to vascular (dys)function

The endothelial glycocalyx forms a complex, hydrated mesh of cell surface proteoglycans, glycosaminoglycans, and plasma proteins that is situated between the vascular wall and flowing blood. Strategically situated between flowing blood and the vascular surface, an intact glycocalyx forms the first line of defence of blood vessels against atherogenic challenges by limiting leakage of atherogenic lipoproteins into the vessel wall and preventing adhesion of circulating coagulatory and inflammatory cells to the vascular endothelial lining. Recent clinical studies have demonstrated that monitoring glycocalyx damage identifies early vascular vulnerability in patients with e.g. early cognitive impairment (neurology), premature atherosclerosis and coronary microvascular disease (cardiology), impaired renal function (nephrology), insulin resistance (diabetes) and acute vascular vulnerability in critically ill patients (ICU).

As a spin-off of MUMC, GlycoCheck BV is developing a non-invasive test for early detection of personal vascular vulnerability in the context of increased cardiovascular risk by e.g. diabetes. The test is based on automated analysis of clinical videomicroscopic recordings of microvascular hemodynamics to check the quality of the endothelial glycocalyx, a protective coating on the luminal surface of blood vessels.

## RESEARCH EXPERIENCE:

Associate Professor of Vascular Physiology  
Department of Physiology, Cardiovascular Research Institute Maastricht,  
Maastricht University (2006 – 2021)

Full Professor of Circulatory Physics (Bijzonder Hoogleraar) by the Genootschap ter Bevordering van de Natuur-, Genees- en Heelkunde  
Department of Vascular Medicine, Academic Medical Center of Amsterdam,  
University of Amsterdam (2008 – 2013)

Established Investigator of the Netherlands Heart Foundation (NHF)  
Department of Physiology, Cardiovascular Research Institute Maastricht,  
Maastricht University (2006 – 2010)

Research fellow of the Royal Netherlands Academy of Arts and Sciences (KNAW),  
Department of Medical Physics / Academic Medical Center, UvA (2001 – 2005)

Assistant Professor of Medical Physics  
Department of Medical Physics, Academic Medical Center, UvA (June 1999 - 2001)

Postdoctoral Fellowship: “Capillary blood flow rheology and the role of plasma proteins”, Netherlands Organization for Scientific Research (NWO, # 902-16-205, 1996)  
Department of Medical Physics, Academic Medical Center, UvA (Sept 1996 – May 1999)

Postdoctoral Fellow,  
Department of Molecular Physiology and Biological Physics,  
University of Virginia, Health Sciences Center (1995-sept 1996)

Research Associate,  
Department of Molecular Physiology and Biological Physics,  
University of Virginia, Health Sciences Center (1994-1995)

## GRANTS AND FELLOWSHIPS:

Programme grant CRUCIAL (miCrovasculaR rarefaction in vascUlar Cognitive Impairment and heArT failure) (Horizon 2020) 2020 – 2024  
(133.000 euros project in consortium with total budget of 6 M euros)

Programme Grant HEALTHY AGING (InterReg Euregio Maas-Rijn) 2017 – 2021  
(230.000 euros project in consortium with total budget of 4,7 M euros)

Programme Grant: ‘GLYCOTREAT - The GLYCOcalyx and heparanase as biomarkers and therapeutic targets in TREATment of glomerular diseases’ (Dutch Kidney Foundation, 2017 - 2020, 1.050.000 euros, in collaboration with LUMC and RUNMC)

Founding of GlycoCheck BV (2010) – a MUMC spin-off for non-invasive assessment of glycocalyx dimension and permeability for early detection of personal vascular vulnerability in the context of increased cardiovascular risk

\* **(Patent Application PCT/EP2008/066524, “Diagnostic and therapeutic tools for diseases altering vascular function”, filled 01-12-2008 and published 04-06-2009 onder WO2009/068685)**

Programme Grant CTMM: Glycocalyx as early marker for vascular risk in diabetes (PREDICCT consortium, 2010 – 2013, extension of ongoing programme with 82.000 euros for clinical cohort study of 6000 patients and 200.000 euros for further product development).

Programme Grant: 'GLYCOREN - The structure and function of the glycocalyx in glomerular physiology and pathology' (Dutch Kidney Foundation, 2010 - 2015, 1.500.000 euros, in collaboration with LUMC and RUNMC)

Pre-Seed grant: 'GlycoCheck – Check Your Health' (Netherlands Genomics Initiative and ZonMW, 2010 – 2012, 250.000 euros for the start-up of MUMC spin-off for clinical measurement of glycocalyx)

Kenniswerkersregeling 'Glycocalyx Measurement Tool': 380.000 euros (Economische Zaken; 2010 - 2011, ism TOPIC)

Project Grant: Magnetic resonance imaging (MRI) of microvascular blood volume recruitment capacity in the heart: indicator of coronary endothelial glycocalyx loss and associated microvascular dysfunction? (Netherlands Heart Found, 2009, 233.000 euros)

Project Grant: "Role of the endothelial glycocalyx in renal glomerular and tubular function " (Kidney Foundation, 2009 – 2012; \$ 375,000.-).

Program Grant: "The endothelial glycocalyx: early marker and therapeutic target of vascular complications in diabetes" (CTMM Diabetes, PREDICCT Consortium, 2008 – 2013; \$ 1,300,000.-).

Project Grant: "An intact endothelial glycocalyx is required for adequate shear stress induced arteriogenesis" (Netherlands Heart Foundation, 2007 – 2011; \$ 300,000.-).

Project Grant: "Role of insulin-mediated glycocalyx modulation in insulin sensitivity" (Dutch Diabetes Research Foundation, 2007 – 2011; \$ 365,000.-).

Established Investigatorship "The endothelial glycocalyx: first line defense against cardiovascular disease" (Netherlands Heart Foundation, 2005 - 2011; \$ 675,000.-).

Research Fellowship for project "the endothelial cell glycocalyx and vascular function". (Royal Netherlands Academy of Arts and Sciences, 2001 – 2005; \$ 500,000.-).

Project Grant: "Contribution of capillary glycocalyx volume modulation to local control of coronary flow" (Netherlands Heart Foundation, 2004; \$ 200,000.-)

Project Grant: "Modulation of vascular function by binding of lipoprotein lipase to the endothelial cell glycocalyx" (Cardiovascular Research Institute Amsterdam, Acad. Medical Center, 2001; \$ 200,000.-)

Van Leeuwenhoek distinctive Travel Award donated by The European Society for Microcirculation "for Dr. Vink's contributions to the advancement of microcirculatory research." Stockholm, June 2000

Program Grant: "The role of the glycocalyx in myocardial perfusion and coronary endothelial function in health and disease" (NWO, 1999, co-investigator with prof Jos Spaan; \$ 500,000.- )

Project Grant: "The role of the capillary glycocalyx in microvascular permeability, rheology, and exchange" (The Whitaker Foundation, 1999, co-investigator with dr Ed Damiano; \$ 210,000.-)

Project Grant: "The role of the endothelial cell glycocalyx in development of atherosclerosis" (Cardiovascular Research Institute Amsterdam, Acad. Medical Center, 1997; \$ 150,000.-)

Postdoctoral Fellowship: Netherlands Organization for Scientific Research (NWO, 1996; \$ 150,000.-)  
Postdoctoral Fellowship, American Heart Association, Virginia Affiliate (1995; \$ 50,000.-)

## PUBLICATIONS:

Alexandros Rovas, Konrad Buscher, Irina Osiaevi, Jan Sackarnd, Phil-Robin Tepasse, Manfred Fobker, Joachim Kühn, Stephan Braune, Ulrich Göbel, Gerold Thölking, Andreas Gröschel, Jan Rossaint, **Hans Vink**, Alexander Lukasz, Hermann Pavenstädt, Philipp Kümpers  
Microvascular and proteomic signatures overlap in COVID-19 and bacterial sepsis – the MICROCODES Study  
Angiogenesis (accepted – May 2022, in press)

Yuan L, Cheng S, Sol WMPJ, van der Velden AIM, **Vink H**, Rabelink TJ, van den Berg BM.  
Heparan sulfate mimetic fucoidan restores the endothelial glycocalyx and protects against dysfunction induced by serum of COVID-19 patients in the intensive care unit.  
ERJ Open Res. 2022 May 3;8(2):00652-2021

Fuchs A, Neumann T, Drinhaus H, Herrmann A, **Vink H**, Annecke T.  
Effects of a single aerobic exercise on perfused boundary region and microvascular perfusion: a field study. J Clin Monit Comput. 2022 Apr;36(2):371-377

van der Velden AIM, van den Berg BM, de Mutsert R, van der Vlag J, Jukema JW, Rosendaal FR, Rabelink TJ, **Vink H**  
Microvascular differences in individuals with obesity at risk of developing cardiovascular disease. Obesity (Silver Spring). 2021 Sep;29(9):1439-1444

Rovas A, Sackarnd J, Rossaint J, Kampmeier S, Pavenstädt H, **Vink H**, Kümpers P.  
Identification of novel sublingual parameters to analyze and diagnose microvascular dysfunction in sepsis: the NOSTRADAMUS study.  
Crit Care. 2021 Mar 19;25(1):112.

Rovas A, Osiaevi I, Buscher K, Sackarnd J, Tepasse PR, Fobker M, Kühn J, Braune S, Göbel U, Thölking G, Gröschel A, Pavenstädt H, **Vink H**, Kümpers P.  
Microvascular dysfunction in COVID-19: the MYSTIC study.  
Angiogenesis. 2021 Feb;24(1):145-157

Fuchs A, Groß S, Neumann T, Illerhaus A, **Vink H**, Klasen G, Gathof B, Annecke T.  
Immediate effects of whole blood donation on the endothelial surface layer and glycocalyx shedding. Blood Transfus. 2021 May;19(3):190-196.

Hakvoort K, Otto L, Haeren R, Hoogland G, Schijns O, **Vink H**, Klein D, van Zandvoort M, Rijkers K.  
Shedding light on human cerebral lipofuscin: An explorative study on identification and quantification. J Comp Neurol. 2021 Feb;529(3):605-615

Lam PK, McBride A, Le DHT, Huynh TT, **Vink H**, Wills B, Yacoub S  
Visual and Biochemical Evidence of Glycocalyx Disruption in Human Dengue Infection, and Association With Plasma Leakage Severity.  
Front Med (Lausanne). 2020 Oct 16;7:545813

Zhang CE, Staals J, van Oostenbrugge RJ, **Vink H**.  
Uncoupling of Microvascular Blood Flow and Capillary Density in Vascular Cognitive Impairment. Front Neurol. 2019 Dec 3;10:1268

Rovas A, Seidel LM, **Vink H**, Pohlkötter T, Pavenstädt H, Ertmer C, Hessler M, Kümpers P.  
Association of sublingual microcirculation parameters and endothelial glycocalyx dimensions in resuscitated sepsis.  
Crit Care. 2019 Jul 24;23(1):260. doi: 10.1186/s13054-019-2542-2.

- van den Berg BM, Wang G, Boels MGS, Avramut MC, Jansen E, Sol WMPJ, Lebrin F, van Zonneveld AJ, de Koning EJP, **Vink H**, Gröne HJ, Carmeliet P, van der Vlag J, Rabelink TJ.  
Glomerular Function and Structural Integrity Depend on Hyaluronan Synthesis by Glomerular Endothelium.  
J Am Soc Nephrol. 2019 Jul 15. pii: ASN.2019020192. doi: 10.1681/ASN.2019020192. [Epub ahead of print]
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Neuraxial anesthesia is less harmful to the endothelial glycocalyx during elective joint surgery compared to general anesthesia.  
Clin Hemorheol Microcirc. 2019;72(1):11-21. doi: 10.3233/CH-180428.
- Haeren RHL, Rijkers K, Schijns OEMG, Dings J, Hoogland G, van Zandvoort MAMJ, **Vink H**, van Overbeeke JJ.  
In vivo assessment of the human cerebral microcirculation and its glycocalyx: A technical report.  
J Neurosci Methods. 2018 Jun 1;303:114-125. doi: 10.1016/j.jneumeth.2018.03.009. Epub 2018 Mar 22.
- Rovas A, Lukasz AH, **Vink H**, Urban M, Sackarnd J, Pavenstädt H, Kümpers P  
Bedside analysis of the sublingual microvascular glycocalyx in the emergency room and intensive care unit - the GlycoNurse study.  
Scand J Trauma Resusc Emerg Med. 2018 Feb 14;26(1):16. doi: 10.1186/s13049-018-0483-4.
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Automated Measurement of Microvascular Function Reveals Dysfunction in Systemic Sclerosis: A Cross-sectional Study.  
J Rheumatol. 2017 Nov;44(11):1603-1611. doi: 10.3899/jrheum.170120. Epub 2017 Sep 15.
- Jaarsma C, **Vink H**, van Haare J, Bekkers SCAM, van Rooijen BD, Backes WH, Wildberger JE, Crijns HJ, van Teeffelen J, Schalla S.  
Non-invasive assessment of microvascular dysfunction in patients with microvascular angina.  
Int J Cardiol. 2017 Dec 1;248:433-439. doi: 10.1016/j.ijcard.2017.05.010. Epub 2017 Jul 18.
- van Haare J, Kooi ME, van Teeffelen JW, **Vink H**, Slenter J, Cobelens H, Strijkers GJ, Koehn D, Post MJ, van Bilsen M.  
Metformin and sulodexide restore cardiac microvascular perfusion capacity in diet-induced obese rats.  
Cardiovasc Diabetol. 2017 Apr 11;16(1):47. doi: 10.1186/s12933-017-0525-7.  
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- Haeren RH, **Vink H**, Staals J, van Zandvoort MA, Dings J, van Overbeeke JJ, Hoogland G, Rijkers K, Schijns OE.  
Protocol for intraoperative assessment of the human cerebrovascular glycocalyx.  
BMJ Open. 2017 Jan 5;7(1):e013954. doi: 10.1136/bmjopen-2016-013954.
- Haeren RH, van de Ven SE, van Zandvoort MA, **Vink H**, van Overbeeke JJ, Hoogland G, Rijkers K.  
Assessment and Imaging of the Cerebrovascular Glycocalyx.  
Curr Neurovasc Res. 2016;13(3):249-60.
- Koning NJ, Vonk AB, **Vink H**, Boer C.  
Side-by-Side Alterations in Glycocalyx Thickness and Perfused Microvascular Density During Acute Microcirculatory Alterations in Cardiac Surgery.  
Microcirculation. 2016 Jan;23(1):69-74.
- van Haare J, Kooi ME, **Vink H**, Post MJ, van Teeffelen JW, Slenter J, Munts C, Cobelens H, Strijkers GJ, Koehn D, van Bilsen M.  
Early impairment of coronary microvascular perfusion capacity in rats on a high fat diet.  
Cardiovasc Diabetol. 2015 Nov 17;14:150.

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Am J Physiol Heart Circ Physiol. 2015 Aug 15;309(4):H711-7.
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Am J Physiol Renal Physiol. 2015 May 1;308(9):F956-66.
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Effects of Ultrapure Hemodialysis and Low Molecular Weight Heparin on the Endothelial Surface Layer. Blood Purif. 2014 Dec 16;38(3-4):203-210. [Epub ahead of print]
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Is the systemic microvascular endothelial glycocalyx in peritoneal dialysis patients related to peritoneal transport? Nephron Clin Pract. 2014;128(1-2):159-65. Epub 2014 Nov 6.
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Deeper penetration of erythrocytes into the endothelial glycocalyx is associated with impaired microvascular perfusion. PLoS One. 2014 May 9;9(5):e96477.
- Eskens BJ, Leurgans TM, **Vink H**, Vanteeffelen JW.  
Early impairment of skeletal muscle endothelial glycocalyx barrier properties in diet-induced obesity in mice. Physiol Rep. 2014 Jan 6;2(1):e00194.
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Microcirculatory effects of the transfusion of leukodepleted or non-leukodepleted red blood cells in patients with sepsis: a pilot study. Crit Care. 2014 Feb 17;18(1):R33.
- Groen BB, Hamer HM, Snijders T, van Kranenburg J, Frijns D, **Vink H**, van Loon LJ.  
Skeletal muscle capillary density and microvascular function are compromised with aging and type 2 diabetes. J Appl Physiol (1985). 2014 Feb 27. [Epub ahead of print]
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Clin J Am Soc Nephrol. 2014 Jan 23. [Epub ahead of print]
- Eskens BJ, Zuurbier CJ, van Haare J, **Vink H**, van Teeffelen JW.  
Effects of two weeks of metformin treatment on whole-body glycocalyx barrier properties in db/db mice. Cardiovasc Diabetol. 2013 Dec 5;12:175. doi: 10.1186/1475-2840-12-175.
- Brands J, van Haare J, **Vink H**, Vanteeffelen JW.  
Whole-body recruitment of glycocalyx volume during intravenous adenosine infusion.  
Physiol Rep. 2013 Oct;1(5):e00102. doi: 10.1002/phy2.102. Epub 2013 Oct 11.
- Mulders TA, Nieuwdorp M, Stroes ES, **Vink H**, Pinto-Sietsma SJ.  
Non-invasive assessment of microvascular dysfunction in families with premature coronary artery disease. Int J Cardiol. 2013 Oct 12;168(5):5026-8. doi: 10.1016/j.ijcard.2013.07.166. Epub 2013 Jul 25.
- Martens RJ, **Vink H**, van Oostenbrugge RJ, Staals J.  
Sublingual microvascular glycocalyx dimensions in lacunar stroke patients.  
Cerebrovasc Dis. 2013;35(5):451-4. doi: 10.1159/000348854. Epub 2013 May 31.

Dane MJ, van den Berg BM, Avramut MC, Faas FG, van der Vlag J, Rops AL, Ravelli RB, Koster BJ, van Zonneveld AJ, **Vink H**, Rabelink TJ.

Glomerular endothelial surface layer acts as a barrier against albumin filtration.

Am J Pathol. 2013 May;182(5):1532-40. doi: 10.1016/j.ajpath.2013.01.049. Epub 2013 Mar 19.

VanTeeffelen JW, Brands J, Janssen BJ, **Vink H**.

Effect of acute hyaluronidase treatment of the glycocalyx on tracer-based whole body vascular volume estimates in mice. J Appl Physiol (1985). 2013 May;114(9):1132-40. doi:

10.1152/jappphysiol.00842.2012. Epub 2013 Feb 28.

Eskens BJ, Mooij HL, Cleutjens JP, Roos JM, Cobelens JE, **Vink H**, Vanteeffelen JW.

Rapid insulin-mediated increase in microvascular glycocalyx accessibility in skeletal muscle may contribute to insulin-mediated glucose disposal in rats.

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Vlahu CA, Lemkes BA, Struijk DG, Koopman MG, Krediet RT, **Vink H**.

Damage of the endothelial glycocalyx in dialysis patients.

J Am Soc Nephrol. 2012 Nov;23(11):1900-8. doi: 10.1681/ASN.2011121181. Epub 2012 Oct 18.

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PLoS One. 2012;7(5):e37439. doi: 10.1371/journal.pone.0037439. Epub 2012 May 29.

Pacella JJ, Kameneva MV, Brands J, Lipowsky HH, **Vink H**, Lavery LL, Villanueva FS.

Modulation of pre-capillary arteriolar pressure with drag-reducing polymers: a novel method for enhancing microvascular perfusion.

Microcirculation. 2012 Oct;19(7):580-5. doi: 10.1111/j.1549-8719.2012.00190.x.

Brands J, **Vink H**, Van Teeffelen JW.

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Reitsma S, Oude Egbrink MG, Heijnen VV, Megens RT, Engels W, **Vink H**, Slaaf DW, van Zandvoort MA. Endothelial glycocalyx thickness and platelet-vessel wall interactions during atherogenesis.

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Broekhuizen LN, van Wijk DF, **Vink H**, Stalmach A, Crozier A, Hutten BA, Kastelein JJ, Hugenholtz PG, Koenig W, Stroes ES.

Reduction of monocyte chemoattractant protein 1 and macrophage migration inhibitory factor by a polyphenol-rich extract in subjects with clustered cardiometabolic risk factors.

Br J Nutr. 2011 Nov;106(9):1416-22. doi: 10.1017/S0007114511002431. Epub 2011 Jun 28.

Lekakis J, Abraham P, Balbarini A, Blann A, Boulanger CM, Cockcroft J, Cosentino F, Deanfield J, Gallino A, Ikonomidis I, Kremastinos D, Landmesser U, Protogerou A, Stefanadis C, Tousoulis D, Vassalli G, **Vink H**, Werner N, Wilkinson I, Vlachopoulos C.

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Reitsma S, oude Egbrink MG, **Vink H**, van den Berg BM, Passos VL, Engels W, Slaaf DW, van Zandvoort MA. Endothelial glycocalyx structure in the intact carotid artery: a two-photon laser scanning microscopy study.

J Vasc Res. 2011;48(4):297-306. doi: 10.1159/000322176. Epub 2011 Jan 27.

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Thromb Haemost. 2011 May;105(5):790-801. doi: 10.1160/TH10-08-0560. Epub 2010 Dec 21.

Meuwese MC, Broekhuizen LN, Kuikhoven M, Heeneman S, Lutgens E, Gijbels MJ, Nieuwdorp M, Peutz CJ, Stroes ES, **Vink H**, van den Berg BM.

Endothelial surface layer degradation by chronic hyaluronidase infusion induces proteinuria in apolipoprotein E-deficient mice.

PLoS One. 2010 Dec 8;5(12):e14262. doi: 10.1371/journal.pone.0014262.

Broekhuizen LN, Lemkes BA, Mooij HL, Meuwese MC, Verberne H, Holleman F, Schlingemann RO, Nieuwdorp M, Stroes ES, **Vink H**.

Effect of sulodexide on endothelial glycocalyx and vascular permeability in patients with type 2 diabetes mellitus.

Diabetologia. 2010 Dec;53(12):2646-55. doi: 10.1007/s00125-010-1910-x. Epub 2010 Sep 25.

Snøeijts MG, **Vink H**, Voesten N, Christiaans MH, Daemen JW, Peppelenbosch AG, Tordoir JH, Peutz-Kootstra CJ, Buurman WA, Schurink GW, van Heurn LW.

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Am J Physiol Renal Physiol. 2010 Nov;299(5):F1134-40. doi: 10.1152/ajprenal.00158.2010. Epub 2010 Sep 1.

VanTeeffelen JW, Brands J, **Vink H**.

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Brands J, Spaan JA, Van den Berg BM, **Vink H**, VanTeeffelen JW.

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Am J Physiol Heart Circ Physiol. 2010 Feb;298(2):H515-23. Epub 2009 Nov 25.

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J Lipid Res. 2009 Jan;50(1):148-53. Epub 2008 Aug 11.

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Commentary on Point: Counterpoint debate: "There is / is not capillary recruitment in active skeletal muscle during exercise."  
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