

## PERSONAL INFORMATION

Pauliina Lehtolainen-Dalkilic

## WORK EXPERIENCE

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- October 2011- Present **Senior Researcher**  
FIMEA, Finnish Medicines Agency (Finland)  
Non-clinical assessor for biological medicinal products and biosimilars
- March 2011-September 2011 **Senior Manufacturing Development Scientist**  
ArkTherapeutics Oy (Finland)  
Company expertise on the early generation phase of the biological medicinal products; involvement in the design of manufacturing and analysis of the adenovirus-based large scale production of the candidate biological product.
- September 2008-March 2011 **Senior Research Scientist**  
ArkTherapeutics Oy (Finland)  
Company expertise on the early generation phase of the biological medicinal products.
- January 2007-September 2008 **Senior Research Scientist**  
Institute of Child Health, University College London (UCL) (United Kingdom)  
Post doctoral fellow in research in endothelial progenitor cells, cardiovascular regeneration, MRI imaging, targeted therapies utilising paramagnetic nanoparticles
- July 2002-December 2006 **Research Fellow**  
University College London (UCL, Center for Cardiovascular Biology and Medicine, British Heart Foundation Laboratories (United Kingdom)  
Post doctoral fellow in research area of stem cells and cardiovascular regeneration; research focusing on the programming, characterisation of human bone marrow stem cells, endothelial progenitor cells, CD133+ and CD34+ cells and their therapeutic use in the development of stem cell therapies to myocardial ischaemia, research requiring broad spectrum of in vitro and in vivo methodologies.
- January 1995-June 2002 **Researcher**  
A.I.Virtanen -institute, University of Kuopio (Finland)

## EDUCATION AND TRAINING

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- January 1995-November 2002 **PhD**  
University of Kuopio, Faculty of Medicine (Finland)
- September 1989-December 1994 **MSc**  
University of Jyväskylä (Finland)

## ADDITIONAL INFORMATION

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- Expertise** Pharmacotoxicological evaluation of the medicinal products, including biosimilar, biological, advanced therapy and small chem. medicinal products (marketing authorisation and clinical trial application assessments, scientific advice, certifications).  
GMO-ERA assessment.  
Previous academic/scientific expertise on human bone marrow stem cells, gene therapy, viral vectors, targeted therapies, disease animal models for cancer and myocardial ischaemia.  
Member of PDCO NcWG.  
Appointed rapporteur for The Board for Gene Technology (GTLK) for the environmental risk

assessment of human drug products containing genetically modified organisms (GMO).

## Publications

(h-index 18, total citations 1837, by Google Scholar, cut of date 26.1.2021)

1. Martikainen M, Lehtolainen-Dalkilic P, Ruokoniemi P. Myyntiluvallisten rokotteiden sisältämään alumiiniin ei liity turvallisuusrisiä. Sic! verkkoversio Julkaistu numerossa 3-4/2017 / Biologiset lääkkeet.
2. Soininen SK, Lehtolainen-Dalkilic P, Karppinen T, Puustinen T, Dragneva G, Kaikkonen MU, Jauhiainen M, Allart B, Selwood DL, Wirth T, Lesch HP, Määttä AM, Mönkkönen J, Ylä-Herttua S, Ruponen M (2012) Targeted delivery via avidin fusion protein: intracellular fate of biotinylated doxorubicin derivative and cellular uptake kinetics and biodistribution of biotinylated liposomes. *Eur J Pharm Sci.* Dec 18;47(5):848-56.
3. Wirth T, Pikkarainen JT, Samaranyake HD, Lehtolainen-Dalkilic P, Lesch HP, Airene KJ, Marjomäki V, Ylä-Herttua SP (2012). Efficient gene therapy based targeting system for the treatment of inoperable tumors. *J Gene Med.* Apr;14(4):221-30.
4. Turhanen PA, Weisell J, Lehtolainen-Dalkilic P, Määttä AM, Vepsäläinen J, Närvänen A (2011). A novel strategy for the synthesis of enzymatically stable biotinDOTA conjugates for in vivo use. *Med Chem Comm*; 2:886-888
5. Kyrätos P, Lehtolainen P, Junemann-Ramirez M, Garcia-Prieto A, Price NA, Martin JF, Gadian DG, Pankhurst QA, Lythgoe MF (2009). Magnetic tagging increases delivery of circulating progenitors in vascular injury. *JACC Cardiovasc Interv.* Aug;2(8): 794-802
6. Lesch HP, Pikkarainen JT, Kaikkonen MU, Taavitsainen M, Samaranyake H, Lehtolainen-Dalkilic P, Vuorio T, Määttä AM, Wirth T, Airene KJ, Ylä-Herttua S (2009). Avidin fusion protein-expressing lentiviral vector for targeted drug delivery. *Hum Gene Ther.* Aug 20(8): 871-82.
7. Frankel P, Pellet-Many C, Lehtolainen P, D'Abaco GM, Tickner ML, Cheng L, Zachary IC (2008). Chondroitin sulphate-modified neuropilin 1 is expressed in human tumour cells and modulates 3D invasion in the U87MG human glioblastoma cell line through a p130Cas-mediated pathway. *EMBO Rep.* Aug 15.
8. Lehtolainen P, Laukkanen MO, Ylä-Herttua S (2007): Gene therapy. *Encyclopedia of Life Support Systems*, Eolss Publishers Co. Ltd., Oxford, UK.
9. Kankkonen HM, Turunen MP, Hiltunen MO, Lehtolainen P, Koponen J, Leppanen P, Turunen AM, Ylä-Herttua S (2004). Feline immunodeficiency virus and retrovirus-mediated adventitial ex vivo gene transfer to rabbit carotid artery using autologous vascular smooth muscle cells. *J Mol Cell Cardiol.* 36(3):333-41
10. Raty JK, Airene KJ, Marttila AT, Marjomäki V, Hytonen VP, Lehtolainen P, Laitinen OH, Mahonen AJ, Kulomaa MS, Ylä-Herttua S. (2004). Enhanced gene delivery by avidin-displaying baculovirus. *Mol Ther* 9(2):282-91
11. Lehtolainen P, Wirth T, Taskinen AK et al (2003). Targeting of biotinylated compounds to its target tissue using a low-density lipoprotein receptor-avidin fusion protein. *Gene Ther.* 10: 2090-2097.
12. Lehtolainen P, Wirth T, Taskinen AK, Lehenkari P, Leppänen O, Lappalainen M, Pulkkanen K, Marttila A, Marjomäki V, Airene KJ, Horton M, Kulomaa MS, Ylä-Herttua S: (2003). Targeting of biotinylated compounds to its target tissue using low-density lipoprotein avidin fusion protein. *Gene Ther.* Dec;10(25):2090-7.
13. Kukkonen,S.P., Airene,K.J., Marjomäki,V., Laitinen,O.H., Lehtolainen,P., Kankaanpää,P., Mahonen,A.J., Raty,J.K., Nordlund,H.R., Oker-Blom,C., Kulomaa,M.S., and Ylä-Herttua,S (2003): Baculovirus capsid display: a novel tool for transduction imaging. *Mol Ther* 8:853-862
14. Laurema A, Heikkilä A, Keski-Nisula L, Heikura T, Lehtolainen P, Manninen H, Tuomisto TT, Heinonen S, Ylä-Herttua S (2003): Transfection of oocytes and other types of ovarian cells in rabbits after direct injection into uterine arteries of adenoviruses and plasmid/liposomes. *Gene Ther.* Apr;10(7):580-4.
15. Lehtolainen P (2002): Lipoprotein Receptor-Avidin Fusion Proteins: A new concept for drug targeting. Doctoral dissertation, Kuopio University Publications G -A.I.V. Institute for Molecular Sciences 5. 72p.
16. Lehtolainen P, Tyynelä K, Kannasto J, Airene K,J, Ylä-Herttua S (2002): Baculoviruses exhibit restricted cell type specificity in rat brain: a comparison of baculovirus- and adenovirus-mediated intracerebral gene transfer in vivo. *Gene Ther.* Dec;9(24):1693-9
17. Kossila M, Jauhiainen S, Laukkanen MO, Lehtolainen P, Jaaskelainen M, Turunen P, Loimas S, Wahlfors J, Ylä-Herttua S (2002): Improvement in adenoviral gene transfer efficiency after preincubation at +37 degrees C in vitro and in vivo. *Mol Ther.* Jan;5(1):87-93.

18. Lehtolainen P, Taskinen A, Laukkanen J, Airene KJ, Heino S, Lappalainen M, Ojala K, Marjomaki V, Martin JF, Kulomaa MS, Ylä-Herttuala S (2002): Cloning and characterization of Scavidin, a fusion protein for the targeted delivery of biotinylated molecules. *J Biol Chem.* Mar 8;277(10):8545-50.
19. Brigelius-Flohe R, Maurer S, Lotzer K, Bol G, Kallionpää H, Lehtolainen P, Viita H and Ylä-Herttuala S (2000): Overexpression of PHGPx inhibits hydroperoxide-induced oxidation, Nf activation and apoptosis and affects oxLDL-mediated proliferation of rabbit aortic smooth muscle cells. *Atherosclerosis.* 152(2):307-317
20. Sandmair AM, Loimas S, Puranen P, Immonen A, Kossila M, Puranen M, Hurskainen H, Tyynela K, Turunen M, Vanninen R, Lehtolainen P, Paljarvi L, Johansson R, Vapalahti M, Ylä-Herttuala S (2000): Thymidine kinase gene therapy for human malignant glioma, using replication-deficient retroviruses or adenoviruses. *Hum Gene Ther.* 11:2197-2205.
21. Laukkanen MO, Lehtolainen P, Turunen P, Aittomaki S, Oikari P, Marklund SL, Ylä-Herttuala S (2000): Rabbit extracellular superoxide dismutase: expression and effect on LDL oxidation. *Gene.* 22;254(1-2):173-9
22. Lehtolainen P, Takeya M, Ylä-Herttuala S (2000): Retrovirus-mediated, stable scavenger-receptor gene transfer leads to functional endocytotic receptor expression, foam cell formation, and increased susceptibility to apoptosis in rabbit aortic smooth muscle cells. *Arterioscler Thromb Vasc Biol.* 20:52-60.
23. Laukkanen J, Lehtolainen P, Gough PJ, Greaves DR, Gordon S, Ylä-Herttuala S (2000): Adenovirus-mediated gene transfer of a secreted form of human macrophage scavenger receptor inhibits modified low-density lipoprotein degradation and foam-cell formation in macrophages. *Circulation,* 101:1091-1096.
24. Ylitalo R, Jaakkola O, Lehtolainen P, Ylä-Herttuala S (1999): Metabolism of modified LDL and foam cell formation in murine macrophage-like RAW 264 cells. *Life Sci.* 64:1955-1965.
25. Pakkanen TM, Laitinen M, Hippeläinen M, Kallionpää H, Lehtolainen P, Leppänen P, Luoma JS, Tarvainen R, Alhava E, Ylä-Herttuala S (1999): Enhanced plasma cholesterol lowering effect of retrovirus-mediated LDL receptor gene transfer to WHHL rabbit liver after improved surgical technique and stimulation of hepatocyte proliferation by combined partial liver resection and thymidine kinase ganciclovir treatment. *Gene Ther.* 6:34-41.
26. Pakkanen TM, Laitinen M, Hippeläinen M, Hiltunen MO, Lehtolainen P, Leppänen P, Luoma JS, Alhava E, Ylä-Herttuala S (1999): Improved gene transfer efficiency in liver with vesicular stomatitis virus G-protein pseudotyped retrovirus after partial liver resection and thymidine kinase-ganciclovir pre-treatment. *Pharmacol Res.* 40:451-457.
27. Puumalainen AM, Vapalahti M, Agrawal RS, Kossila M, Laukkanen J, Lehtolainen P, Viita H, Paljarvi L, Vanninen R, Ylä-Herttuala S (1998): beta-galactosidase gene transfer to human malignant glioma in vivo using replication-deficient retroviruses and adenoviruses. *Hum Gene Ther.* 9:1769-1774.
28. Thorsen F, Visted T, Lehtolainen P, Ylä-Herttuala S, Bjerkvig R (1997): Release of replication-deficient retroviruses from a packaging cell line: interaction with glioma tumor spheroids in vitro. *Int. J Cancer.* 71:874-880.
29. Pakkanen T, Hippeläinen M, Laitinen M, Kallionpää H, Lehtolainen P, Viita H, Ylä-Herttuala S (1997): In vivo transfer of LDL receptor gene for the treatment of familial hypercholesterolemia. *Atherosclerosis.* 134:42-42.
30. Laitinen M, Pakkanen T, Donetti E, Baetta R, Luoma J, Lehtolainen P, Viita H, Agrawal R, Miyanochara A, Friedmann T, Risau W, Martin JF, Soma M, Ylä-Herttuala S (1997): Gene transfer into the carotid artery using an adventitial collar: comparison of the effectiveness of the plasmid-liposome complexes, retroviruses, pseudotyped retroviruses, and adenoviruses. *Hum Gene Ther.* 8:1645-1650.

#### Projects

Named researcher in BBRSC grant on 2006 on the topic of MR imaging and targeting of progenitor cells using externally applied magnetic field on vascular injury model, PI Dr. Mark Lythgoe, director of Centre of Advanced Imaging in UCL, Institute of Child Health, University College London, Centre for Biophysics, Guildford Street, London, UK.

Investigator in Patents (Right to patents owned by ArkTherapeutics Ltd/Oy) :

10/21/04 | #2004020890 : Gene delivery of a viral vector. K Airene, P Lehtolainen, S Ylä-Herttuala  
 09/23/04 | #20040185059 : Biotin-binding receptor molecules. K Airene, Kulomaa, P Lehtolainen,

**Memberships** Award: Nomination as a finalist for the EU Descartes Research Price 2004 (excellence in scientific research). Local delivery of novel therapeutics for cardiovascular disease and cancer. Prof. J Martin, I Zachary, J Erusalimsky, N Parker from UCL. Prof S Yla-Herttuala, M Hedman, P Lehtolainen, K Airene from University of Kuopio. Prof. G Breier, W Risau from University of Dresden. Prof R Paoletti, M Soma, R Baetti, E Donetti from University of Milan

**Other Relevant Information**