

## LIST of PUBLICATIONS – Diana Toivola

### Articles in Refereed Scientific Journals - ORIGINAL PAPERS:

1. SILVANDER, J.S.G., KVARNSTRÖM, S.M., KUMARI-ILIEVA, A., SHRESTHA, A, ALAM, C., **TOIVOLA, D.M.** Keratins regulate  $\beta$ -cell mitochondrial morphology, motility, and homeostasis.(2017) FASEB J. 31: 4578-4587.
2. LÄHDENIEMI, I.A.K., MISIOREK, J.O., ANTILA, C.J.M., LANDOR, S.K-J., STENVALL, C-G., A., FORTELIUS, L.E., BERGSTRÖM, L., SAHLGREN, C.#, **TOIVOLA, D.M.#** (2017) Keratins regulate colonic epithelial cell differentiation through the Notch1 signaling pathway. *Cell Death Diff.*, 24: 984-996. # *equal contribution*
3. MISIOREK, J.O., LÄHDENIEMI, I.A.K., NYSTRÖM, J.H., PARAMONOV, V.M., GULLMETS, J.A., SAARENTO, H., RIVERO-MÜLLER, A., HUSØY, T., TAIMEN, P., **TOIVOLA, D.M.** (2016) Keratin 8-deletion induced colitis predisposes to murine colorectal cancer enforced by the inflammasome and IL-22 pathway. *Carcinogenesis* 37: 777-786.
4. HELENIUS, T.O., ANTMAN, C.A., ASGHAR, M.N., NYSTRÖM, J.H., **TOIVOLA, D.M.** (2016) Keratins are altered in intestinal disease-related stress responses. *Cells* 5, Pii E35.
5. ASGHAR, M.N., PRIYAMAVADA, S., NYSTRÖM, J.H., ANBAZHAGAN, A, DUDEJA, P., **TOIVOLA, D.M.** (2016) Keratin 8 knockdown leads to loss of the chloride transporter DRA in the colon, *Am. J. Physiol. Gastrointest. Liver Physiol.* 310: G1147-G1154.
6. DESAI, D., PRABHAKAR, N., MAMAEVA, V., KARAMAN, D.S, LÄHDENIEMI, I.A.K., SAHLGREN, C. ROSENHOLM, J. **TOIVOLA, D.M.** (2016) Targeted Modulation of Cell Differentiation in Distinct Regions of the Gastrointestinal Tract via Oral Administration of Differently PEI-PEG Functionalized Mesoporous Silica Nanoparticles. *Int. J. Nanomedicine*, 11:299-313.
7. **TOIVOLA, D.M.**, HABTEZION, A., MISIOREK, J.O., ZHANG, L.X., NYSTRÖM, J.H., SHARPE, O., ROBINSON, W.H., KWAN, R., OMARY, M.B. (2015) Absence of keratins 8 and 18 leads to antimitochondrial autoantibodies in aging male mice. *FASEB J.* 29; 5081-5089.
8. HELENIUS, T.O., MISIOREK, J.O., NYSTRÖM, J.H., FORTELIUS, L.E., HABTEZION, A., LIAO, J., ASGHAR, M.N., ZHANG, H., AZGHAR, S., OMARY, M.B., **TOIVOLA, D.M.** (2015) Keratin 8 absence downregulates colonocyte HMGCS2 and modulates colonic ketogenesis and energy metabolism. *Mol. Biol. Cell*, 26: 2298-2310.
9. ASGHAR, M.N., SILVANDER, J.S.G., HELENIUS, T.O., LÄHDENIEMI, I.A.K., ALAM, C., FORTELIUS, L.E., HOLMSTEN, R.O., **TOIVOLA, D.M.** (2015). The amount of keratin matters in stress protection of the colonic epithelium. *PLOS One*,10(5):e0127436. doi: 10.1371/journal.pone.0127436. eCollection 2015
10. ASGHAR, M.N., EMANI, R., ALAM, C., HELENIUS, T.O., GRÖNROOS, T.J., SAREILA, O., DIN, M.U. HOLMDAHL, R., HÄNNINEN, A., **TOIVOLA, D.M.** (2014). In vivo imaging of reactive oxygen and nitrogen species in murine colitis. *Inflamm. Bowel Dis.* 20: 1435-1447.
11. DESAI, D., ŞEN KARAMAN, D.S., PRABHAKAR, N., TADAYON, S., DUCHANOY, A., **TOIVOLA, D.M.**, RAJPUT, S., NÄREOJA, T., ROSENHOLM, J.M. (2014) Design considerations for mesoporous silica nanoparticulate systems in facilitating biomedical applications. *Mesoporous Biomaterials*, 1: 16-43.
12. VÉLIZ D.S., ALAM, C., **TOIVOLA, D.M.**, TOIVAKKA, M., ALAM, P. (2014) On the non-linear attachment characteristics of blood to bacterial cellulose/kaolin biomaterials. *Colloids and Surfaces B: Biointerfaces* 116: 176-182. **This paper was highlighted as “Key Scientific Articles” on the journal webpage.**
13. ALAM, C.M., SILVANDER, J.S.G., DANIEL, E.N., TAO, G.-Z., KVARNSTRÖM, S.M. ALAM, P., OMARY, M.B., HÄNNINEN, A., **TOIVOLA, D.M.** (2013) Keratin 8 modulates  $\beta$ -cell stress responses and normoglycaemia. *J. Cell Sci.* 126; 5635-5644.
14. WANNA, D., ALAM, C., **TOIVOLA, D.M.** , ALAM, P. (2013) Bacterial cellulose-kaolin nanocomposites for application as biomedical wound healing materials. *Advances in Natural Sciences: Nanoscience and Nanotechnology*, 4(4)45002. doi:10.1088/2043-6262/4/4/045002
15. EMANI, R., ASGHAR, M.N., TOIVONEN, R., LAUREN, L., SÖDERSTRÖM, M., **TOIVOLA, D.M.**, van Tol, E.A.F., HÄNNINEN, A. (2013) Casein hydrolysate diet controls intestinal T-cell activation, free radical production and microbial colonisation in NOD mice. *Diabetologia*, 56: 1781-1791.

16. VESTERKVIST, P.S.M., MISIOREK, J.O., SPOOF, L.E.M., **TOIVOLA, D.M.** MERILUOTO, J.A.O. (2012) Comparative cellular toxicity of hydrophilic and hydrophobic microcystins in Caco-2 cells. *Toxin*, 4, 1008-1023. doi:10.3390/toxins4111008
17. KARAMAN, S.D., DESAI, D., SENTHILKUMAR, R., JOHANSSON E.M., RÄTTIS, N., ODÉN, M., ERIKSSON, J.E., SAHLGREN, C., **TOIVOLA, D.M.** , ROSENHOLM, J.M. (2012). Shape-engineering vs. organic modification of inorganic nanoparticles as a tool for enhancing cellular internalization. *Nanoscale research Letters*. 7: 358. doi:10.1186/1556-276X-7-358
18. MAMAEVA, V., ROSENHOLM, J.M., EL BATE-EYA, L., BERGMAN, L., PEUHU, E., FORTELIUS, L.E., **TOIVOLA, D.M.** , LINDÉN, M., SAHLGREN, C. (2011). Mesoporous silica nanoparticles as drug delivery system for targeted inhibition of Notch signaling in cancer. *Mol. Therapy*. 19:1538-1546.
19. NÄREOJA, K., KUKKONEN, J., RONDINELLI, S., **TOIVOLA, D.M.** MERILUOTO, J.M., NÄSMAN, J. (2011) Adrenoreceptor activity of muscarinic toxins identified from mamba venoms. *Br. J. Pharmacol.* 164: 538-550.
20. HABTEZION#, A., **TOIVOLA, D.M.#**, ASGHAR, M.N., KRONMAL, G.S., BROOKS, J.D., BUTCHER, E.C., OMARY, M.B. (2011). Absence of keratin 8 confers a paradoxical microflora-dependent resistance to apoptosis in the colon. **#equal contribution**. *Proc. Natl. Acad. Sci. USA*, 108:1445-1450.
21. KU, N.-O., **TOIVOLA, D.M.**, STRNAD, P., OMARY, M.B. (2010). Cytoskeletal keratin glycosylation protects from epithelial tissue injury. *Nature Cell Biology*, 12: 876-885.
22. TAO, G.Z., LOOI, K.S., **TOIVOLA, D.M.**, STRNAD, P., ZHOU, Q. LIAO, J., WEI, Y., HABTEZION, A., OMARY, M.B. (2009). Keratins modulate the shape and function of hepatocyte mitochondria: A mechanism for protection from apoptosis. *J. Cell Sci.* 122: 3851-3855.
23. **TOIVOLA, D.M.**, OSTROWSKI, S., BARIBAULT, H., MAGIN, T.M., RAMSINGH, A.OMARY, M.B. (2009) Keratins provide virus-dependent protection or predisposition to injury in coxsackievirus-induced pancreatitis. *Cell Health and Cytoskeleton*, 1: 51-65.
24. HARADA, M., HANADA, S., **TOIVOLA, D.M.**, GHORI, N., OMARY, M.B. (2008). Autophagy activation by rapamycin eliminates mouse Mallory-Denk bodies and blocks their proteasome inhibitor-mediated formation. *Hepatology*, 47:2026-2035.
25. TAO, G.-Z., LI, D.H., **TOIVOLA, D.M.**, ZHOU, Q., STRNAD, P., SANDESARA, N., CHEUNG, R.C., HONG, A., OMARY, M.B. (2008). Monitoring of epithelial cell caspase activation via detection of durable keratin fragment formation. *J. Pathology*, 215: 164-174.
26. HARADA, M., STRNAD, P., **TOIVOLA, D.M.**, OMARY, M.B. (2008). Autophagy modulates keratin-containing inclusion formation and apoptosis in cell culture in a context-dependent fashion. *Exp. Cell Res.*, 314: 1753-1764.
27. STRNAD, P., TAO, G.-Z., ZHOU, Q., HARADA, M. **TOIVOLA, D.M.**, BRUNT, E.M., OMARY, M.B. (2008). Keratin mutation predisposes to mouse liver fibrosis and unmasks differential effects of the carbon tetrachloride and thioacetamide models. *Gastroenterology*, 134: 1169-1179.
28. **TOIVOLA, D.M.**, NAKAMICHI, I., STRNAD, P., MICHIE, S.A., GHORI, N., OSHIMA, R.G, BARIBAULT, H., OMARY, M.B. (2008). Keratin overexpression levels correlate with the extent of spontaneous pancreatic injury. *Am. J. Pathol.*, 172: 882-892.
29. STONE, M.R., O'NEILL, A., LOVERING, R.M., STRONG, J., RESNECK, W.G., REED, P.W., **TOIVOLA, D.M.**, URSITTI, J.A, OMARY, M.B, BLOCH, R.J. (2007). Absence of keratin 19 in mice causes skeletal myopathy with mitochondrial reorganization. *J. Cell Sci.*120: 3999-4008.
30. ZHONG, B., STRNAD, P., **TOIVOLA, D.M.**, TAO, G.Z., JI, X., GREENBERG, H.B., OMARY, M.B. (2007). Reg-II is an exocrine pancreas injury-response product that is up-regulated by keratin absence or mutation. *Mol. Biol. Cell.* 18: 4969-4978.
31. STRNAD, P., SIEGEL, M., **TOIVOLA, D.M.**, CHOI, K., KOSEK, J.C., KHOSLA, C., OMARY, M.B. (2006). Pharmacologic transglutaminase inhibition attenuates drug-primed hypertrophy but not Mallory body formation. *FEBS Lett.* 580: 2351-2357.
32. TAO, G.-Z., **TOIVOLA, D.M.**, ZHOU, Q., STRNAD, P., XU, B., MICHIE, S.A., OMARY, M.B. (2006). Protein phosphatase-2A associates with and dephosphorylates keratin-8. *J. Cell Sci* 119: 1425-1432.
33. NAKAMICHI, I.#, **TOIVOLA, D.M.#**, STRNAD, P., MICHIE, S.A., OSHIMA, R.G, BARIBAULT, H., OMARY, M.B. (2005) Keratin 8 overexpression promotes Mallory body formation. *J. Cell Biol.*, 171, 931-937. **#equal contribution**.

34. HABTEZION, A., **TOIVOLA, D.M.**, BUTCHER, E.C., OMARY, M.B. (2005) Keratin-8-deficient mice develop chronic spontaneous Th2 colitis amenable to antibiotic treatment. *J. Cell Sci.*, 118: 1971-1980.
35. **TOIVOLA, D.M.#**, KRISHNAN, S.#, BINDER, H.B., SINGH, S., OMARY, M.B. (2004) Keratins modulate colonocyte electrolyte transport via protein mistargeting. *J. Cell Biol.* 164: 911-921. # equal contribution. **This paper was highlighted by the editor in the issue of J. Cell Biol.** <http://jcb.rupress.org/content/164/6/793.1>
36. **TOIVOLA, D.M.**, KU, N.-O., RESURECCION, E., NELSON, D.K, WRIGHT, T.L., OMARY, M.B. (2004) Keratin 8 and 18 phosphorylation as a marker of human liver disease. *Hepatology*, 40: 459-466.
37. ZHONG, B., ZHOU, Q., **TOIVOLA, D.M.**, TAO, G.-Z., RESURRECCION, E.Z., OMARY, M.B. (2004) Organ-specific stress induces mouse pancreatic keratin overexpression in association with NF-kappaB activation. *J. Cell Sci.* 117: 1709-1719.
38. TAO, G.-Z., **TOIVOLA, D.M.**, ZHONG, B., MICHIE, S., RESURRECCION, E.Z., TAMARI, Y., TAKETO, M.M., OMARY, M.B. (2003) Keratin-8 null mice have different gallbladder and liver susceptibility to lithogenic diet-induced injury. *J. Cell Sci.* 116: 4629-4638.
39. ZHOU, Q., **TOIVOLA, D.M.**, FRANKE, W.W, OMARY, M.B. (2003) Keratin 20 helps maintain intermediate filament organization in digestive epithelia. *Mol. Biol. Cell* 14: 2959-7291.
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41. **TOIVOLA, D.M.**, NIEMINEN, M., HESSE, M., TAO, H., BARIBAULT, H., MAGIN, T.M., OMARY, M.B., ERIKSSON, J.E. (2001). Disturbances in hepatic cell cycle regulation in mice with assembly-deficient keratins 8/18. *HEPATOLOGY* 34:1174-1183.
42. **TOIVOLA, D.M.**, BARIBAULT, H., MAGIN, T., MICHIE, S.A., OMARY, M.B. (2000). Simple epithelial keratins are dispensable for cytoprotection in two pancreatitis models. *Am. J. Physiol. Gastrointest. Liver Physiol.* 279:G1343-1354.
43. **TOIVOLA, D.M.**, KU, N.-O., GHORI, N., LOWE A.W., MICHIE, S.A., OMARY, M.B. (2000). Effects of keratin filament disruption on exocrine pancreas-stimulated secretion and susceptibility to injury. *Exp. Cell Res.* 255:156-170.
44. **TOIVOLA, D.M.**, OMARY, M.B., KU, N.-O., PELTOLA, O., BARIBAULT, H., ERIKSSON, J.E. (1997). Protein phosphatase inhibition in normal and keratin 8/18 assembly-incompetent mouse strains supports a functional role of keratin intermediate filaments in preserving hepatocyte integrity. *HEPATOLOGY*, 28:116-128.
45. **TOIVOLA, D.M.**, GOLDMAN, R.D., GARROD, D., ERIKSSON, J.E. (1997). Protein phosphatases maintain the organization and structural interactions of hepatic intermediate filaments. *J. Cell Sci.* 110:23-33.
46. MERILUOTO, J., HÄRMÄLÄ-BRASKÉN, A.-S., ERIKSSON, J., **TOIVOLA, D.**, LINDHOLM, T. (1996). Choosing analytical strategy for microcystins. *Phycologia* 35:125-132.
47. **TOIVOLA, D.M.**, ERIKSSON, J.E., BRAUTIGAN, D.L. (1994) Identification of protein phosphatase 2A as the primary target for microcystin-LR in rat liver homogenates. *FEBS Lett.* 344: 175-180.
48. JANSSON, C., HÄRMÄLÄ, A.-S., **TOIVOLA, D.M.**, SLOTTE, J.P. (1993). Effects of phospholipid environment in the plasma membrane on receptor interaction with the adenylyl cyclase complex of intact cells. *Biochem. Biophys. Acta* 1145: 311-319.
49. ISOMAA, B., HÄGERSTRAND, H., **TOIVOLA, D.** (1991). Anomalous dose-response relationship due to association colloidal behaviour of soluble amphiphilic compounds. *ATLA (Alternatives to Laboratory Animals)* 19:194-1991.
50. **TOIVOLA, D.M.**, ISOMAA, B. (1991) Effects of dehydroabietic acid on the erythrocyte membrane. *Chem.-Biol. Interactions*, 79: 65-78.
51. **TOIVOLA, D.**, ERIKSSON, J.E. (1991). Morphological changes and cytotoxicity in isolated hepatocytes. *ATLA (Alternatives to Laboratory Animals)*. 19: 181-186.
52. ERIKSSON, J.E., **TOIVOLA, D.**, MERILUOTO, J.A.O., HAN, Y-H., KARAKI, H., HARTSHORNE, D. (1990). Hepatocyte deformation induced by cyanobacterial toxins reflects inhibition of protein phosphatases. *Biochem. Biophys. Res. Commun.*, 173:1347-1353.

#### Articles in Refereed Scientific Journals – REVIEWS:

1. SAHLGREN, C., MEINANDER, A., ZHANG, H., CHENG, F., PREI, M., XU, C., SALMINEN, T., **TOIVOLA, D.**, ABANKWA, D., ŞEN KARAMAN, D., SALO-AHEN, O.M.H., ÖSTERBACKA, R., ERIKSSON, J.E., WILLFÖR, S., PETRE, I., PELTONEN, J., LEINO, R., JOHNSON, M., ROSENHOLM, J., SANDLER, N. (2017) Tailored approaches in

- drug development and diagnostics – from molecular design to biological model systems. *Advanced Health Care Materials*, Invited Review 6 (21).
2. STRNAD, P., GULDIKEN, N., HELENIUS, T.O., MISIOREK, J.O., NYSTRÖM, J.H., LÄHDENIEMI, I.A.K, SILVANDER, J.S.G., KUSCUOGLU, D., **TOIVOLA, D.M.** (2016) Simple epithelial keratins. *Methods Enzymol*, 568: 351-388.
  3. **TOIVOLA, D.M.**, ALAM, C., BOOR, P. and STRNAD, P. (2015) Keratins in health and disease. *Curr. Opin. Cell Biol.* 32C: 73-81.
  4. **TOIVOLA, D.M.**, HABTEZION, A., STRNAD, P., OMARY, M.B. (2010). Intermediate filaments take the heat as stress proteins, *Trends Cell Biol.* 20: 79-91.
  5. ZATLOUKAL, K., FRENCH, S.W., STUMPTNER C., STRNAD, P., HARADA, M., **TOIVOLA, D.M.**, CADRIN, M., OMARY, M.B. (2007). From Mallory to Mallory-Denk bodies: what, how and why? *Exp. Cell Res.* 313: 2033-2049.
  6. OMARY, M.B., KU, N.-O., TAO, G.-Z., **TOIVOLA, D.M.**, LIAO, J. (2006). "Heads and tails" of intermediate protein phosphorylation: Multiple sites and functional insights. *Trends Bioch. Sci.* 31, 383-394.
  7. **TOIVOLA, D.M.**, TAO, G.-Z., HABTEZION, A., LIAO, J., OMARY, M.B. (2005) Cellular integrity plus: Organelle-related and protein-targeting functions of intermediate filament proteins. *Trends Cell Biol.*, 15: 608-617.
  8. KU, N.-O., **TOIVOLA, D.M.**, ZHOU, Q., TAO, G.Z., OMARY, M.B. (2004). Studying simple epithelial keratins in cells and tissues. *Methods Cell Biol.* 78: 489-517.
  9. OMARY, M.B., KU, N.-O., **TOIVOLA, D.M.** (2002). Keratins: Guardians of the liver. *HEPATOLOGY* 35:251-257.
  10. KU, N.-O.#, ZHOU, X.#, **TOIVOLA, D.M.#**, OMARY, M.B.# (1999). The cytoskeleton of digestive epithelia in health and disease. *Am. J. Physiol. Gastrointest. Liver Physiol.*, 277:G1108-1137. **#equal contribution.**
  11. **TOIVOLA, D.M.**, ERIKSSON, J.E. (1999). Toxins affecting cell signaling and alteration of cytoskeletal structure. *Toxicol. In Vitro.* 13:521-530.
  12. ERIKSSON, J.E., **TOIVOLA, D.M.**, SAHLGREN, C., MIKHAILOV, A., HÄRMÄLÄ-BRASKÉN, A.-S. (1998) Strategies to assess phosphoprotein phosphatase and protein kinase-mediated regulation of the cytoskeleton. *Meth. Enzymol.* 298:542-569.

**Book Chapter:** ERIKSSON, J.E., **TOIVOLA, D.M.**, REINIKAINEN, M., RÄBERGH, C.M.I., MERILUOTO, J.A.O. (1994). Testing of toxicity in cyanobacteria by cellular assays. *In: Detection Methods for Cyanobacterial Toxins.* Eds. G.A. Codd., T.M. Jefferies, C.W. Keevil, E. Potter. The Royal Society of Chemistry, Special Publication No. 149. pp: 75-84.

**Television Program:** Participating in the Finnish TV (YLE/FST) popularizing science program "Det krökta rummet", Dec. 5, 2007 on Gene modified organisms (GMO).

**PhD-Thesis:** **TOIVOLA, D.M.** (1997) Microcystins - Potent tools to study serine/threonine protein phosphatases and their role in cytoskeletal regulation. PhD-thesis. Åbo Akademis Tryckeri, Åbo, Finland, ISBN 952-12-0049-9.

#### Research reports

1. **TOIVOLA, D.**, ERIKSSON, J., MERILUOTO, J. (1988). In Swedish: The occurrence of toxic blue green algae in lakes on Åland. Forskningsrapport till Ålands landskapsstyrelse No: 63, 28 pp. (Research report to the County Government of Åland).
2. **TOIVOLA, D.**, MERILUOTO, J., ERIKSSON, J. (1989). In Swedish: The occurrence of blue green algae in lakes Långsjön and Markusbölefjärden. Forskningsrapport till Ålands landskapsstyrelse No: 68, 16 pp. (Research report to the County Government of Åland).