Publications (peer-review)

(71) Chaikuad, A.; Pollinger, J.; Rühl, M.; Ni, X.; Kilu, W.; Heering, J.; Merk, D. Comprehensive set of tertiary complex structures and palmitic acid binding provide molecular insights into ligand design for RXR isoforms. *Int. J. Mol. Sci.*, **2020**, *21*, 8457.

(70) Meijer, I.; Willems, S.; Ni, X.; Heering, J.; Chaikuad, A.; Merk, D. Chemical starting matter for HNF4α ligand discovery and chemogenomics. *Int. J. Mol. Sci.*, **2020**, *21*, 7895.

(69) Heitel, P.; Faudone, G.; Helmstädter, M.; Schmidt, J.; Kaiser, A.; Tjaden, A.; Schröder, M.; Müller-Knapp, S.; Schierle, S.; Pollinger, J.; Merk, D. A Triple Farnesoid X Receptor and Peroxisome Proliferator-Activated Receptor α/δ Activator Reverses Hepatic Fibrosis in Diet-Induced NASH in Mice. *Commun. Chem.*, **2020**, *3*, 174.

(68) Hinnah, K.; Willems, S.; Morstein, J.; Heering, J.; Hartrampf, F.; Broichhagen, J.; Leippe, P.; Merk, D.; Trauner, D. Photohormones Enable Optical Control of the Peroxisome Proliferator-Activated Receptor Gamma (PPARγ). *J. Med. Chem.*, **2020**, *63*, 10908–10920.

(67) Schierle, S.; Neumann, S.; Heitel, P.; Willems, S.; Kaiser, A.; Pollinger, J.; Merk, D. Design and structural optimization of dual FXR/PPARδ activators. *J. Med. Chem.*, **2020**, *63*, 8369–8379.

(66) Willems, S.; Kilu, W.; Ni, X.; Chaikuad, A.; Knapp, S.; Heering, J.; Merk, D. The orphan nuclear receptor Nurr1 is responsive to non-steroidal anti-inflammatory drugs. *Commun. Chem.*, **2020**, *3*, 85.

(65) Gellrich, L.; Heitel, P.; Heering, J.; Kilu, W.; Pollinger, J.; Goebel, T.; Kahnt, A.; Arifi, S.; Pogoda, W.; Paulke, A.; Steinhilber, D.; Proschak, E.; Wurglics, M.; Schubert-Zsilavecz, M.; Chaikuad, A.; Knapp, S.; Bischoff, I.; Fürst, R.; Merk, D. L-thyroxin and the non-classical thyroid hormone TETRAC are potent activators of PPARγ. *J. Med. Chem.*, **2020**, *63*, 6727–6740.

(64) Hanke, T.; Cheung, S.-Y.; Kilu, W.; Heering, J.; Ni, X.; Planz, V.; Schierle, S.; Faudone, G.; Friedrich, M; Wanior, M.; Werz, O.; Windbergs, M.; Proschak, E.; Schubert-Zsilavecz, M.; Chaikuad, A.; Knapp, S.; Merk, D. A selective modulator of peroxisome proliferator-activated receptor γ with unprecedented binding mode. *J. Med. Chem.*, **2020**, *63*, 4555–4561.

(63) Moret, M.; Friedrich, L.; Grisoni, F.; Merk, D.; Schneider, G. Generative molecular design in low data regimes. *Nat. Mach. Intell.*, **2020**, *2*, 171–180.

(62) Morstein, J.; Trads, J.; Hinnah, K.; Willems, S.; Barber, D.; Trauner, M.; Merk, D.; Trauner, D. Optical Control of the Nuclear Bile Acid Receptor FXR with a Photohormone. *Chem. Sci.*, **2020**, *11*, 429–434.

(61) Schierle, S.; Helmstädter, M.; Schmidt, J.; Hartmann, M.; Horz, M.; Kaiser, A.; Weizel, L.; Heitel, P.; Proschak, A.; Hernandez-Olmos, V.; Proschak, E.; Merk, D. Dual farnesoid X receptor/soluble epoxide hydrolase modulators derived from Zafirlukast. *ChemMedChem*, **2020**, *15*, 50–67.

(60) Bruns, D.; Merk, D.; Kumar, K.; Baumgartner, M.; Schneider, G. Synthetic activators of cell migration designed by constructive machine learning. *Chemistry Open*, **2019**, *8*, 1303–1308.

(59) Pollinger, J.; Schierle, S.; Gellrich, L.; Ohrndorf, J.; Kaiser, A.; Heitel, P.; Chaikuad, A.; Knapp, S.; Merk, D. A novel biphenyl-based chemotype of retinoid X receptor ligands

enables subtype- and heterodimer-preference. *ACS Med. Chem. Letters*, **2019**, *10*(9), 1346–1352.

(58) Kramer, J.; Woltersdorf, S.; Duflot, T.; Hiesinger, K.; Lillich, F.; Knöll, F.; Wittmann, S.; Klingler, F.; Brunst, S.; Chaikuad, A.; Morisseau, C.; Hammock, B.; Buccellati, C.; Sala, A.; Rovati, E.; Leuillier, M.; Fraineau, S.; Rondeaux, J.; Hernandez Olmos, V.; Heering, J.; Merk, D.; Pogoryelov, D.; Steinhilber, D.; Knapp, S.; Bellien, J.; Proschak, E. Discovery of first in vivo active inhibitors of soluble epoxide hydrolase (sEH) phosphatase domain. *J. Med. Chem.*, **2019**, *62*(18), 8443–8460.

(57) Hernandez-Olmos, V.; Knape, T.; Heering, J.; von Knethen, A.; Kilu, W.; Kaiser, A.; Wurglics, M.; Helmstädter, M.; Merk, D.; Schubert-Zsilavecz, M.; Parnham, M.; Steinhilber, D.; Proschak, E. Structure Optimization of a New Class of PPARγ Antagonists. *Bioorg. Med. Chem.*, **2019**, *27*(21), 115082.

(56) Schierle, S.; Merk, D. Therapeutic modulation of retinoid X receptors – SAR and therapeutic potential of RXR ligands and recent patents. *Expert Opin. Ther. Pat.*, **2019**, 29(8), 605–621.

(55) Merk, D.; Sreeramulu, S.; Kudlinzki, D.; Saxena, K.; Linhard, V.; Gande, S.; Hiller, F.; Lamers, C.; Nilsson, E.; Aagaard, A.; Wissler, L.; Dekker, N.; Bamberg, K.; Schubert Zsilavecz, M.; Schwalbe, H. Molecular tuning of farnesoid X receptor partial agonism. *Nat. Commun.*, **2019**, *10*, 2915.

(54) Pollinger, J.; Schierle, S.; Neumann, S.; Ohrndorf, J.; Kaiser, A.; Merk, D. Computer-assisted selective optimization of side-activities - from cinalukast to a PPARα modulator. *ChemMedChem*, **2019**, *14*, 1343–1348.

(53) Hye Khan, M. A.; Schmidt, J.; Stavniichuk, A.; Imig, J.; Merk, D. A dual farnesoid X receptor/soluble epoxide hydrolase modulator treats non-alcoholic steatohepatitis in mice. *Biochem. Pharmacol.*, **2019**, *166*, 212–221.

(52) Button, A.; Merk, D.; Hiss, J.; Schneider, G. Automated de novo molecular design by hybrid machine intelligence and rule-driven chemical synthesis. *Nat. Mach. Intell.*, **2019**, *1*, 307–315.

(51) Grisoni, F.; Merk, D.; Friedrich, L.; Schneider, G. Design of natural-product-inspired multi-target ligands by machine learning. *ChemMedChem*, **2019**, *14*, 1129–1134.

(50) Goebel, T.; Diehl, O.; Wittmann, S.; Merk, D.; Angioni, C.; Buscató, E.; Kottke, R.; Heering, J.; Weizel, L.; Schader, T.; Maier, T.; Geisslinger, G.; Schubert-Zsilavecz, M.; Steinhilber, D.; Proschak, E.; Kahnt, A. Zafirlukast is a dual modulator of human soluble epoxide hydrolase and PPARgamma. *Front. Pharmacol.*, **2019**, *10*, 263.

(49) Pollinger, J.; Gellrich, L.; Schierle, S.; Kilu, W.; Schmidt, J.; Kalinowsky, L.; Ohrndorf, J.; Kaiser, A.; Heering, J.; Proschak, E.; Merk, D. Tuning nuclear receptor selectivity of Wy14,643 towards selective retinoid X receptor modulation. *J. Med. Chem.*, **2019**, *62*(4), 2112–2126.

(48) Heering, J.; Merk, D. Hybrid Reporter Gene Assays: Versatile In Vitro Tools to Characterize Nuclear Receptor Modulators. *Methods Mol. Biol.* **2019**, *1966*, 175–192.

(47) Heitel, P.; Gellrich, L.; Kalinowsky, L.; Heering, J.; Kaiser, A.; Ohrndorf, J.; Proschak, E.; Merk, D. Computer-Assisted Discovery and Structural Optimization of a Novel Retinoid X Receptor Agonist Chemotype. *ACS Med. Chem. Letters*, **2019**, *10*(2), 203–208.

(46) Heidenreich, D.; Moustakim, M; Schmidt, J.; Merk, D.; Brennan, P.; Fedorov, O.; Chaikuad, A.; Knapp, S. A structure-based approach towards identification of inhibitory

fragments for eleven-nineteen-leukemia protein (ENL). *J. Med. Chem.*, **2018**, *61*(23), 10929–10934.

(45) Grisoni, F.; Merk, D.; Byrne, R.; Schneider, G. Scaffold-Hopping from Synthetic Drugs by Holistic Molecular Representation. *Sci. Rep.*, **2018**, *8*, 16469.

(44) Schierle, S.; Schmidt, J.; Kaiser, A.; Merk, D. Selective optimization of Pranlukast to farnesoid X receptor modulators. *ChemMedChem*, **2018**, *13*(23), 2530–2545.

(43) Merk, D.; Grisoni, F.; Friedrich, L.; Schneider, G. Tuning artificial intelligence on the de novo design of natural-product-inspired retinoid X receptor modulators. *Commun. Chem.*, **2018**, *1*, 68.

(42) Heitel, P.; Gellrich, L.; Heering, J.; Goebel, T.; Kahnt, S.; Proschak, E.; Schubert-Zsilavecz, M.; Merk, D. Urate transporter inhibitor lesinurad is a selective peroxisome proliferator-activated receptor gamma modulator (sPPARγM) in vitro. *Sci. Rep.*, **2018**, *8*, 14658.

(41) Merk, D.; Grisoni, F.; Schaller, K.; Friedrich, L.; Schneider, G. Discovery of novel molecular frameworks of farnesoid X receptor modulators by ensemble machine learning. *Chemistry Open*, **2019**, *8*(1), 7–14.

(40) Proschak, E.; Stark, H.; Merk, D. Polypharmacology by Design: A Medicinal Chemist's Perspective on Multitargeting Compounds. *J. Med. Chem.*, **2019**, *62*(2), 420–444.

(39) Grisoni, F.; Merk, D.; Consonni, V.; Hiss, J.; Tagliabue, S.; Todeschini, R.; Schneider, G. Scaffold hopping from natural products to synthetic mimetics by holistic molecular similarity. *Commun. Chem.*, **2018**, *1*, 44.

(38) Schmidt, J.; Schierle, S.; Gellrich, L.; Kaiser, A.; Merk, D. Structural optimization and in vitro profiling of *N*-phenylbenzamide-based farnesoid X receptor antagonists. *Bioorg. Med. Chem.*, **2018**, *26*(14), 4240–4253.

(37) Schierle, S.; Flauaus, C.; Heitel, P.; Willems, S.; Schmidt, J.; Kaiser, A.; Weizel, L.; Goebel, T.; Kahnt, S.; Geisslinger, G.; Steinhilber, D.; Wurglics, M.; Rovati, E.; Schmidtko, A.; Proschak, E.; Merk, D. Boosting anti-inflammatory potency of zafirlukast by designed polypharmacology. *J. Med. Chem.*, **2018**, *61*(13), 5758–5764.

(36) Merk, D.; Grisoni, F.; Friedrich, L.; Gelzinyte, E.; Schneider, G. Computer-assisted discovery of retinoid X receptor modulating natural products and isofunctional mimetics. *J. Med. Chem.*, **2018**, *61*(12), 5442–5447.

(35) Gabler, M.; Kramer, S.; Schmidt, J.; Pollinger, J.; Weber, J.; Kaiser, A.; Löhr, F.; Proschak, E.; Schubert-Zsilavecz, M.; Merk, D. Allosteric modulation of the farnesoid X receptor by a small molecule. *Sci. Rep.*, **2018**, *8*, 6846.

(34) Merk, D.; Grisoni, F.; Friedrich, L.; Gelzinyte, E.; Schneider, G. Scaffold hopping from synthetic RXR modulators by virtual screening and de novo design. *Med. Chem. Commun.*, **2018**, *9*, 1289–1292.

(33) Schierle, S.; Merk, D. Development of nuclear receptor modulators. *Methods Mol. Biol.* **2018**, *1824*, 245-260.

(32) Merk, D.; Friedrich, L.; Grisoni, F.; Schneider, G. De novo design of bioactive small molecules by artificial intelligence. *Mol. Inform.* **2018**, *37*, 1700153.

(31) Gellrich, L.; Merk, D. Therapeutic potential of peroxisome proliferator-activated receptor modulation in non-alcoholic fatty liver disease and non-alcoholic steatohepatitis. *Nuclear Receptor Research* **2017**, *4*, 101310.

(30) Schmidt, J.; Rotter, M.; Weiser, T.; Wittmann, S.; Weizel, L.; Kaiser, A.; Heering, J.; Goebel, T.; Angioni, C.; Wurglics, M.; Paulke, A.; Geisslinger, G.; Kahnt, A.; Steinhilber, D.; Proschak, E.; Merk, D. A dual modulator of farnesoid X receptor and

soluble epoxide hydrolase to counter non-alcoholic steatohepatitis. *J. Med. Chem.* **2017**, *60*(18), 7703–7724.

(29) Flesch, D.; Cheung, S.; Schmidt, J.; Gabler, M.; Heitel, P.; Kramer, J.; Kaiser, A.; Hartmann, M.; Lindner, M.; Lüddens-Dämgen, K.; Heering, J.; Lamers, C.; Lüddens, H.; Wurglics, M.; Proschak, E.; Schubert-Zsilavecz, M.; Merk, D. Non-acidic farnesoid X receptor agonists. *J. Med. Chem.* **2017**, *60*(16), 7199–7205.

(28) Proschak, E.; Heitel, P.; Kalinowsky, L.; Merk, D. Opportunities and challenges for fatty acid mimetics in drug discovery. *J. Med. Chem.*, **2017**, *60*(13), 5235–5266.

(27) Heitel, P.; Achenbach, J.; Moser, D.; Proschak, E.; Merk, D. DrugBank screening revealed alitretinoin and bexarotene as liver X receptor modulators. *Bioorg. Med. Chem. Lett.*, **2017**, *27*(5), 1193–1198.

(26) Pollinger, J.; Merk, D. Therapeutic applications of the versatile fatty acid mimetic WY14643. *Expert Opin. Ther. Pat.*, **2016**, *27*(4), 517–525.

(25) Blöcher, R.; Lamers, C.; Wittmann, S.; Diehl, O.; Hanke, T.; Merk, D.; Steinhilber, D.; Schubert-Zsilavecz, M.; Kahnt, A.; Proschak E. Design and synthesis of fused soluble epoxide hydrolase/ peroxisome proliferator-activated receptor modulators. *Med. Chem. Commun.*, **2016**, *7*: 1209–1216.

(24) Lamers, C.; Merk, D.; Gabler, M.; Flesch, D.; Schubert-Zsilavecz, M. SAR-studies on FXR modulators with an aryloxypropyloxybenzoic acid scaffold led to the discovery of the first combined FXR antagonistic/TGR5 agonistic compound. *Future Med. Chem.*, **2015**, *8*(2): 133–148.

(23) Hanke, T. & Merk, D.; Steinhilber, D.; Geisslinger, G.; Schubert-Zsilavecz, M. Small molecules with anti-inflammatory properties in clinical development. *Pharmacol. Ther.*, **2016**, *157*, 163–187.

(22) Blöcher, R.; Lamers, C.; Wittmann, S.; Merk, D.; Hartmann, M.; Weizel, L.; Diehl, O.; Brüggerhof, A.; Boß, M.; Kaiser, A.; Schader, T.; Göbel, T.; Grundmann, M.; Angioni, C.; Geisslinger, G.; Wurglics, M.; Kostenis, E.; Brüne, B.; Steinhilber, D.; Schubert-Zsilavecz, M.; Kahnt, A.; Proschak E. N-Benzylbenzamides: a novel merged scaffold for orally available dual sEH/PPARγ modulators. *J. Med. Chem.*, **2016**, *59*(1): 61–81.

(21) Merk, D. Chances and challenges of retinoid X receptor gamma targeting for regenerative multiple sclerosis treatment. *Future Med. Chem.*, **2015**, *7*(18), 2411–2413.

(20) Schmidt, J.; Klingler, F.; Proschak, E.; Steinhilber, D.; Schubert-Zsilavecz, M.; Merk, D. NSAIDs ibuprofen, indometacin and diclofenac do not interact with farnesoid X receptor. *Sci. Rep.*, **2015**, 5, 14782.

(19) Merk, D.; Zettl, M.; Steinhilber, D.; Werz, O.; Schubert-Zsilavecz, M. Pirinixic acids: flexible fatty acid mimetics with various biological activities. *Future Med. Chem.*, **2015**, *12*(7), 1597–1616.

(18) Merk, D.; Schubert-Zsilavecz, M. Natural compound renews hope for diabetes and obesity therapeutic target. *Future Med. Chem.*, **2015**, *7*(7), 833–35.

(17) Flesch, D.; Gabler, M.; Lill, A.; Gomez, R.; Steri, R.; Schneider, G.; Stark, H.; Schubert-Zsilavecz, M.; Merk, D. Fragmentation of GW4064 led to a highly potent partial farnesoid X receptor agonist with improved drug-like properties. *Bioorg. Med. Chem.*, **2015**, *23*(13), 3490–3498.

(16) Merk, D. & Lamers, C.; Weber, J.; Flesch, D.; Gabler M.; Proschak, E.; Schubert-Zsilavecz, M. Anthranilic acid derivatives as nuclear receptor modulators – development of novel PPAR selective and dual PPAR/FXR ligands. *Bioorg. Med. Chem.*, **2015**, *23*(3), 499–514.

(15) Pellowska, M.; Stein, C.; Pohland, M.; Merk, D.; Klein, J., Eckert, G.P.; Schubert-Zsilavecz, M.; Wurglics, M. Pharmakokinetic properties of MH84, a γ-secretase modulator with PPARγ agonistic activity. *J. Pharm. Biomed. Analysis*, **2015**, *102*, 417–424.

(14) Lamers, C.; Schubert-Zsilavecz, M.; Merk, D. Medicinal Chemistry and Pharmacological Potential of FXR antagonists. *Curr. Trends Med. Chem.*, **2014**, *14*(19), 2188–2205.

(13) Merk, D.; Lamers, C.; Ahmad, K.; Carrasco Gomez, R.; Schneider, G.; Steinhilber, D.; Schubert-Zsilavecz, M. Extending the structure-activity relationship of anthranilic acid derivatives as farnesoid X receptor modulators – Development of a highly potent partial farnesoid X receptor agonist. *J. Med. Chem.*, **2014**, *57*(19), 8035–8055.

(12) Merk, D.; Gabler, M.; Gomez, R..; Flesch, D.; Hanke, T.; Kaiser, A.; Lamers, C.; Werz, O.; Schneider, G.; Schubert-Zsilavecz, M. Anthranilic acid derivatives as novel ligands for farnesoid X receptor (FXR). *Bioorg. Med. Chem.*, **2014**, *22*(8), 2447–2460.

(11) Merk, D.; Steinhilber, D.; Schubert-Zsilavecz, M. Characterizing ligands for farnesoid X receptor - available in vitro test systems for farnesoid X receptor modulator development. *Expert Opin. Drug Discov.*, **2014**, *9*(1), 27–37.

(10) Merk, D.; Schubert-Zsilavecz, M. Repairing mutated proteins – development of small molecules targeting defects in the cystic fibrosis transmembrane conductance regulator. *Expert Opin. Drug. Discov.*, **2013**, *8*(6), 691–708.

(9) Pellowska, M.; Merk, D.; Schubert-Zsilavecz M. Advances in personalized medicine – medicinal chemistry and pharmacology of vemurafenib and ivacaftor. *Pharmazie*, **2013**, *68*(7), 484–491.

(8) Flesch, D.; Merk, D.; Lamers, C.; Schubert-Zsilavecz, M. Novel prostaglandin receptor modulators: a patent review (2002 - 2012) – part II: EP receptor modulators. *Expert Opin. Ther. Pat.*, **2013**, *23*(2), 233–267.

(7) Lamers, C.; Flesch, D.; Schubert-Zsilavecz, M.; Merk, D. Novel prostaglandin receptor modulators: a patent review (2002 - 2012) – part I: non-EP receptor modulators. *Expert Opin. Ther. Pat.*, **2013**, *23*(1), 47–77.

(6) Merk, D.; Schubert-Zsilavecz, M. Novel strategies to control lipid metabolism: can the antisense drug mipomersen fulfill the unmet need? *Future Med. Chem.*, **2012**, *4*(14), 1773–1775.

(5) Lamers, C.; Schubert-Zsilavecz, M.; Merk, D. Therapeutic modulators of peroxisome proliferator-activated receptors (PPAR): a patent review (2008–present). *Expert Opin. Ther. Pat.*, **2012**, *22*(7), 803–841.

(4) Merk, D.; Steinhilber, D.; Schubert-Zsilavecz, M. Medicinal chemistry of farnesoid X receptor ligands: from agonists and antagonists to modulators. *Future Med. Chem.*, **2012**, *4*(8), 1015–1036.

(3) Merk, D.; Schubert-Zsilavecz, M. Nuclear receptors as pharmaceutical targets: rise of FXR and rebirth of PPAR? *Future Med. Chem.*, **2012**, *4*(5), 587–588.

(2) Merk, D.; Schubert-Zsilavecz, M. New hope or drawbacks: will chronic kidney disease be treatable with small molecules in the near future? *Future Med. Chem.*, **2012**, *4*(3), 269–271.

(1) Schubert-Zsilavecz, M.; Merk, D. Innovations in the treatment of cystic fibrosis: outriders for the treatment of diseases with other genetic defects? *Future Med. Chem.*, **2011**, *3*(16), 1969–1970.

Patents

(3) John Imig, Daniel Merk, Md Abdul Hye Khan: US62/902,771 Compounds and compositions for treating kidney disease (2019, filed).

(2) Daniel Merk, Pascal Heitel, Jurema Schmidt, Manfred Schubert-Zsilavecz: WO2019057969A1 Dual agonists of FXR and PPARδ and their uses (2019, granted).

(1) Daniel Merk, Jurema Schmidt, Manfred Schubert-Zsilavecz, Ewgenij Proschak: WO2018215610A1 Dual modulators of farnesoid X receptor and soluble epoxide hydrolase (2018, granted)

Books & Chapters

(4) Lamers, C.; Merk, D. *Discovery, structural refinement and therapeutic potential of farnesoid X receptor activators* in *Anti-fibrotic Drug Discovery*. Editors: Jehrod Brenneman, Malliga R Iyer. London, UK: Royal Society of Chemistry. ISBN: 978-1788015103.

(3) Merk, D.; Schubert-Zsilavecz, M. (2018). *The linker approach: drug conjugates* in *Drug Selectivity - an evolving concept in medicinal chemistry.* Editors: Norbert Handler, Helmut Buschmann. Weinheim, DE: Wiley-VCH Verlag GmbH & Co. KGaA. ISBN: 978-3-527-33538-1

(2) Wurglics, M.; Lamers, C.; Merk, D. (2016). *Arbeitsbuch Stöchiometrie*. Eschborn. DE: Govi Verlag. ISBN: 978-3-7741-1310-7

(1) Ammon, Hermann P. T.; Schubert-Zsilavecz, Manfred (2014). *Hunnius Pharmazeutisches Wörterbuch (11th Edition)*. Berlin, DE: De Gruyter. ISBN: 978-3-11-030990-4 *Contribution to chapters of organic chemistry and inorganic chemistry.*

Awards & Scholarships

- Innovationspreis 2020 in Medizinisch/Pharmazeutischer Chemie der GDCh und der DPhG
- Aventis Foundation Life Science Bridge Award 2019
- PHOENIX Pharmazie Wissenschaftspreis 2018 in Pharmaceutical Chemistry
- Johanna Quandt Young Academy at Goethe University Fellowship 2018
- EFMC-YMCS Presentation Prize 2017
- ETH Fellowship Scholar (03/2017 - 02/2019)
- Daiichi Sankyo Master Prize 2011