

# Xaver König, PhD

## Current address

Center for Physiology and Pharmacology, Dept. Neurophysiology and –  
pharmacology, Medical University of Vienna, Schwarzschanerstrasse 17,  
1090 Vienna, Austria

## Personal Data

Date of birth 08.03.1979  
Place of birth Vienna, Austria  
Nationality Austria

## Career history

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- 2021 - ... **Associate Professor**, Department for Neurophysiology and  
–pharmacology, Medical University of Vienna, Austria
- 2018 – 2021 **Assistant Professor**, Department for Neurophysiology and  
–pharmacology, Medical University of Vienna, Austria
- 2017 – 2018 **Postdoctoral Research Fellow**, Department for Neurophysiology and  
–pharmacology, Medical University of Vienna, Austria
- 2015 – 2017 **Postdoctoral Research Fellow**, Muscle Research Laboratory, School of Biomedical  
Sciences, Queensland University, Brisbane, Australia
- 2012 – 2015 **Postdoctoral Research Fellow**, Department for Neurophysiology and  
–pharmacology, Medical University of Vienna, Austria
- 2007 – 2012 **Ph.D., Medical University of Vienna, Austria**  
Thematic program: "Molecular Signal Transduction"  
Thesis title: "*Impaired ion channel function in Duchenne muscular dystrophy*",  
Supervisor: Prof. Karlheinz Hilber
- 1998 – 2006 **M.S., Physics, Technical University of Vienna, Austria**  
At the Institute of Atomic and Subatomic Physics  
Thesis title: "*Investigation of the phase transition in the model of topological  
fermions*", Supervisor: Prof. Manfred Faber

## Teaching

- 2015 – 2017 within BIOM2011, University of Queensland  
– Practical courses in physiology
- 2013 – ... within curriculum N202: human medicine, Medical University of Vienna  
– block 2, Lecture: Muscle physiology  
– block 4, Lecture: Functional systems and biological regulation  
Seminar and Practical course: Neurophysiology  
– block 18, Practical course: skin and sensory organs  
– block 19, Practical course: brain and nervous system
- 2020 – ... – block 11, Seminar: Cardiac pharmacology  
– thesis seminar: Applied experimental pharmacology

## Student supervision

- 2020 - ... Benjamin Hackl (Phd Student)  
2019 - ... Elena Lilliu (PhD Student)  
2018 - 2020 Nicholas Hächl (Diploma student)  
2015 – 2017 Co-supervision of honor (Joshua Haywood), master (Zoe Macourt), and PhD students (Rocky Choi)  
2007 – 2015 Co-supervision of master (Markus Mille, Michael Kovar) and PhD students (Lena Rubi, Agnes Mike)

## Main research areas

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- Skeletal and cardiac muscle physiology in the context of muscular dystrophies
- Pharmacology of ion channels, in particular cardiac ion channels
- Calcium handling in skeletal muscle
- Store-operated Calcium entry in skeletal muscle
- Metabolic changes in heart failure

## Scientific talks and awards

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- 2009 15<sup>th</sup> Scientific Symposium of APHAR, Graz, Austria; *“Ion channel impairments in dystrophic cardiomyocytes”*, prize for best oral communication  
2010 16<sup>th</sup> Scientific Symposium of APHAR, Vienna, Austria; *“Altered sodium channel function in dystrophin/utrophin-deficient cardiomyocytes”*, prize for best oral communication  
2013 19<sup>th</sup> Scientific Symposium of APHAR, Vienna, Austria; *“The indole alkaloid ibogaine and its mechanism of K<sub>v</sub>11.1 (hERG) channel block”*  
2016 AuPS/ASB joint meeting, Adelaide, 2016 *“Real time imaging of trans-sarcolemma Ca<sup>2+</sup>-fluxes in mammalian skeletal muscle”*  
2016 Nomination for „österreichischer Staatspreis Patent“ (category „Spezialpreis Hedy-Lamarr“), *“Pyridine und Pyrimidine als cardiogene Wirkstoffe“*  
2017 FEPS meeting, Vienna, Austria; *“Towards the role of store-operated Ca<sup>2+</sup> entry in skeletal muscle”*  
2018 15<sup>th</sup> International meeting of the European Calcium Society, Hamburg, Germany; *“Store-operated Calcium entry is activated during excitation-contraction coupling in skeletal muscle”* Roland Pochet poster award,  
2019 Invited seminar talk, University of Innsbruck, Innsbruck, Austria; *“Store-operated Calcium entry in skeletal muscle”*  
2021 Invited talk, Austrian Neuroscience meeting, Salzburg, Austria; *“Ion channel defects in the dystrophic heart”*  
2021 Invited seminar talk, Karl Landsteiner University, Krems, Austria; *“On the Physiological Role of Store-Operated Calcium Entry in Skeletal Muscle”*

## Invention notifications and patents

*“Composition for the treatment of cystic fibrosis”*

PCT: WO2011015630, Co-inventors: Freissmuth M. & Gloeckel C.

*“Substituted pyridines and pyrimidines for the production of cardiomyocyte-like cells”*

PCT: WO2011079343, Co-inventors: Mihovilovic M., Schnuerch M., Koley M. & Hilber K.

*„Triazin-Derivate als Differenzierungsbeschleuniger“*

AT 511441, Co-inventors: Mihovilovic M., Schnuerch M., Hilber K., Linder T. & Mike A.

## Memberships

Österreichische Pharmakologische Gesellschaft (APHAR)  
Österreichische Biophysikalische Gesellschaft (OeBG)  
Australian Physiological Society (AuPS)  
European Calcium Society (ECS)

### **Third-party funding**

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- 2009 „*Cardiogenic agents*“, AWS (Austria Wirtschaftsservice) PRIZE project: Z090391, 38.000 EUR
- 2018 – 2020 „*Defining the Role of Store-operated Calcium Entry in Dystrophic Skeletal Muscle*“, Österreichische Muskelforschung, 17.320 EUR
- 2019 – 2022 „*Store-operated Calcium Entry in Skeletal Muscle*“, Fonds zur Förderung der wissenschaftlichen Forschung (FWF), 330.000EUR
- 2020 – 2022 “*Metabolic therapy of heart failure: which role for B vitamins*”, Era-Net CVD Joint Transnational Call 2019, 260.000EUR

### **Reviewer for**

Journal of Molecular and Cellular Cardiology, Neuropharmacology, British Journal of Pharmacology, Natural product research, Journal of psychoactive drugs, International Journal of Molecular Sciences, Scientific Reports

### **10 most relevant publications**

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1. Koenig, X. *et al.* Mechanistic insights into store-operated Ca<sup>2+</sup> entry during excitation-contraction coupling in skeletal muscle. *Biochim. Biophys. Acta - Mol. Cell Res.* **1866**, 1239–1248 (2019).
2. Rubi, L., Todt, H., Kubista, H., Koenig, X. & Hilber, K. Calcium current properties in dystrophin-deficient ventricular cardiomyocytes from aged mdx mice. *Physiol. Rep.* **6**, 1–8 (2018).
3. Koenig, X., Choi, R. H. & Launikonis, B. S. Store-operated Ca<sup>2+</sup> entry is activated by every action potential in skeletal muscle. *Commun. Biol.* **1**, (2018).
4. Rubi, L., Koenig, X., Kubista, H., Todt, H. & Hilber, K. Decreased inward rectifier potassium current I<sub>K1</sub> in dystrophin-deficient ventricular cardiomyocytes. *Channels* **11**, 101–108 (2017).
5. Choi, R. H., Koenig, X. & Launikonis, B. S. Dantrolene requires Mg<sup>2+</sup> to arrest malignant hyperthermia. *Proc. Natl. Acad. Sci.* **114**, 4811–4815 (2017).
6. Mills, R. J. *et al.* Functional screening in human cardiac organoids reveals a metabolic mechanism for cardiomyocyte cell cycle arrest. *Proc. Natl. Acad. Sci.* **2017**, 201707316 (2017).

7. Rubi, L. *et al.* Proper Voltage-Dependent Ion Channel Function in Dysferlin-Deficient Cardiomyocytes. *Cell. Physiol. Biochem.* **36**, 1049–1058 (2015).
8. Thurner, P. *et al.* Mechanism of hERG channel block by the psychoactive indole alkaloid ibogaine. *J. Pharmacol. Exp. Ther.* **348**, 346–58 (2014).
9. Koenig, X. *et al.* Enhanced currents through L-type calcium channels in cardiomyocytes disturb the electrophysiology of the dystrophic heart. *Am. J. Physiol. Heart Circ. Physiol.* **306**, H564-73 (2014).
10. Koenig, X., Kovar, M., Boehm, S., Sandtner, W. & Hilber, K. Anti-addiction drug ibogaine inhibits hERG channels: A cardiac arrhythmia risk. *Addict. Biol.* **19**, 237–239 (2014).

### **Peer-reviewed Publications in the past 5 years**

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1. Hackl, B., Todt, H., Kubista, H., Hilber, K. & Koenig, X. Psilocybin Therapy of Psychiatric Disorders Is Not Hampered by hERG Potassium Channel-Mediated Cardiotoxicity. *Int. J. Neuropsychopharmacol.* **25**, 280–282 (2022).
2. Hackl, B., Lukacs, P., Ebner, J., Pesti, K., Haechl, N., Földi, M. C., Lilliu, E., Schicker, K., Kubista, H., Sary-Weinzinger, A., Hilber, K., Mike, A., Todt, H. & Koenig, X. The Bradycardic Agent Ivabradine Acts as an Atypical Inhibitor of Voltage-Gated Sodium Channels. *Front. Pharmacol.* **13**, 809802 (2022).
3. Lilliu, E., Koenig, S., Koenig, X. & Frieden, M. Store-operated calcium entry in skeletal muscle: What makes it different? *Cells* **10**, 1–32 (2021).
4. Meyer, C., Kettner, A., Hoehenegg, U., Rubi, L., Hilber, K., Koenig, X., Boehm, S., Hotka, M. & Kubista, H. On the Origin of Paroxysmal Depolarization Shifts: The Contribution of Cav1.x Channels as the Common Denominator of a Polymorphous Neuronal Discharge Pattern. *Neuroscience* **468**, 265–281 (2021).
5. Szabó, P. L., Ebner, J., Koenig, X., Hamza, O., Watzinger, S., Trojanek, S., Abraham, D., Todt, H., Kubista, H., Schicker, K., Remy, S., Anegon, I., Kiss, A., Podesser, B. K. & Hilber, K. Cardiovascular phenotype of the DMDmdx rat - A suitable animal model for Duchenne muscular dystrophy. *DMM Dis. Model. Mech.* **14**, 0–3 (2021).
6. Amstetter, D., Badt, F., Rubi, L., Bittner, R. E., Ebner, J., Uhrin, P., Hilber, K., Koenig, X. & Todt, H. The bradycardic agent ivabradine decreases conduction velocity in the AV node and in the ventricles in-vivo. *Eur. J. Pharmacol.* **893**, 173818 (2021).
7. Ebner, J., Cagalinec, M., Kubista, H., Todt, H., Szabo, P. L., Kiss, A., Podesser, B. K., Cserne Szappanos, H., Hool, L. C., Hilber, K. & Koenig, X. Neuronal nitric oxide synthase regulation of calcium cycling in ventricular cardiomyocytes is independent of Cav1.2 channel modulation under basal conditions. *Pflugers Arch. Eur. J. Physiol.* **472**, 61–74 (2020).
8. Ebner, J., Uhrin, P., Szabo, P. L., Kiss, A., Podesser, B. K., Todt, H., Hilber, K. & Koenig, X. Reduced Na<sup>+</sup> current in Purkinje fibers explains cardiac conduction defects and arrhythmias in Duchenne muscular dystrophy. *Am. J. Physiol. Circ. Physiol.* **318**, H1436–H1440 (2020).

9. Lilliu, E., Hilber, K., Launikonis, B. S. & Koenig, X. Phasic Store-Operated Ca<sup>2+</sup> Entry During Excitation-Contraction Coupling in Skeletal Muscle Fibers From Exercised Mice. *Front. Physiol.* **11**, 1–11 (2020).
10. Todt, H., Dorninger, F., Rothauer, P. J., Fischer, C. M., Schranz, M., Bruegger, B., Lüchtenborg, C., Ebner, J., Hilber, K., Koenig, X., Erdem, F. A., Gawali, V. S. & Berger, J. Oral batyl alcohol supplementation rescues decreased cardiac conduction in ether phospholipid-deficient mice. *J. Inherit. Metab. Dis.* jimd.12264 (2020).
11. Haechl, N., Ebner, J., Hilber, K., Todt, H. & Koenig, X. Pharmacological profile of the bradycardic agent ivabradine on human cardiac ion channels. *Cell. Physiol. Biochem.* **53**, 36–48 (2019).
12. Koenig, X., Choi, R. H., Schicker, K., Singh, D. P., Hilber, K. & Launikonis, B. S. Mechanistic insights into store-operated Ca<sup>2+</sup> entry during excitation-contraction coupling in skeletal muscle. *Biochim. Biophys. Acta - Mol. Cell Res.* **1866**, 1239–1248 (2019).
13. Cervenka, R., Lukacs, P., Gawali, V. S. V. S. V. S., Ke, S., Koenig, X., Rubi, L., Zarrabi, T., Hilber, K., Sandtner, W., Stary-Weinzinger, A. & Todt, H. Distinct modulation of inactivation by a residue in the pore domain of voltage-gated Na<sup>+</sup> channels: mechanistic insights from recent crystal structures. *Sci. Rep.* **8**, 631 (2018).
14. Koenig, X., Ebner, J. & Hilber, K. Voltage-dependent sarcolemmal ion channel abnormalities in the dystrophin-deficient heart. *Int. J. Mol. Sci.* **19**, (2018).
15. Koenig, X., Choi, R. H. & Launikonis, B. S. Store-operated Ca<sup>2+</sup> entry is activated by every action potential in skeletal muscle. *Commun. Biol.* **1**, (2018)
16. Rubi, L., Todt, H., Kubista, H., Koenig, X. & Hilber, K. Calcium current properties in dystrophin-deficient ventricular cardiomyocytes from aged mdx mice. *Physiol. Rep.* **6**, 1–8 (2018).
17. Choi, R. H., Koenig, X. & Launikonis, B. S. Dantrolene requires Mg<sup>2+</sup> to arrest malignant hyperthermia. *Proc. Natl. Acad. Sci.* **114**, 4811–4815 (2017).
18. Rubi, L., Eckert, D., Boehm, S., Hilber, K. & Koenig, X. Anti-addiction Drug Ibogaine Prolongs the Action Potential in Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes. *Cardiovasc. Toxicol.* **17**, 215–218 (2017).
19. Rubi, L., Koenig, X., Kubista, H., Todt, H. & Hilber, K. Decreased inward rectifier potassium current IK1 in dystrophin-deficient ventricular cardiomyocytes. *Channels* **11**, 101–108 (2017).
20. Rubi, L., Kovar, M., Zebedin-Brandl, E., Koenig, X., Dominguez-Rodriguez, M., Todt, H., Kubista, H., Boehm, S. & Hilber, K. Modulation of the heart's electrical properties by the anticonvulsant drug retigabine. *Toxicol. Appl. Pharmacol.* **329**, (2017).
21. Salzer, I., Erdem, F. A., Chen, W. Q., Heo, S., Koenig, X., Schicker, K. W., Kubista, H., Lubec, G., Boehm, S. & Yang, J. W. Phosphorylation regulates the sensitivity of voltage-gated Kv7.2 channels towards phosphatidylinositol-4,5-bisphosphate. *J. Physiol.* **595**, 759–776 (2017).
22. Mills, R. J., Titmarsh, D. M., Koenig, X., Parker, B. L., Ryall, J. G., Quaipe-Ryan, G. A., Voges, H. K., Hodson, M. P., Ferguson, C., Drowley, L., Plowright, A. T., Needham, E. J.,

Wang, Q. D., Gregorevic, P., Xin, M., Thomas, W. G., Parton, R. G., Nielsen, L. K., Launikonis, B. S., *et al.* Functional screening in human cardiac organoids reveals a metabolic mechanism for cardiomyocyte cell cycle arrest. *Proc. Natl. Acad. Sci. U. S. A.* **114**, E8372–E8381 (2017).