

Research Topics studied in the Institute of Physiology (Czech Academy of Sciences) 1954 - 2024

For the detailed description of particular research topics and their representative papers see

Presentation IPHYS Brochure (2024)

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Research Topics studied in the Institute of Physiology (Czech Academy of Sciences) 1954 - 2024

Critical periods of development, perinatal programming, late effects of early interventions (1954-2024) Hahn, Křeček, Koldovský, Houštěk, Kopecký

- Hahn P, Křeček J, Křečková J. The development of thermoregulation. I. The development of thermoregulatory mechanisms in young rats. *Physiol Bohemoslov* 1956;5:283-290. **26 citations**
- Nováková V, Faltin J, Flandera V, Hahn P, Koldovský O. Effect of early and late weaning on learning in adult rats. *Nature* 1962;193:280. **38 citations**
- Kraus M, Křeček J, Popp M. Development of corticosterone production by adrenal gland in normally and prematurely weaned rats. *Physiol Bohemoslov* 1967;16:120-127. **30 citations**
- Hahn P, Koldovsky O. Development of metabolic processes and their adaptation during postnatal life. In: *Physiology and Pathology of Adaptation Mechanisms*, ed. E. Bajusz, Pergamon Press, Oxford, 1969, pp. 48-74. **20 citations**
- Křeček J. The theory of critical developmental periods and post-natal development of endocrine functions. In: *The Biopsychology of Development*, eds E. Tobach et al., Academic Press, New York, 1971, pp. 233-248. **39 citations**
- *Hahn P, Kirby L. Immediate and late effects of premature weaning and of feeding a high fat or high carbohydrate diet to weanling rats. *J Nutr* 1973;103: 690-696. **92 citations**
- Křeček J. Sex differences in salt taste: the effect of testosterone. *Physiol Behav* 1973;10:683-688. **62 citations**
- *Coates PM, Brown SA, Sonawane BR, Koldovsky O. Effect of early nutrition on serum cholesterol levels in adult rats challenged with high fat diet. *J Nutr* 1983;113:1046-1050. **32 citations**
- *Hahn P. Effect of litter size on plasma cholesterol and insulin and some liver and adipose tissue enzymes in adult rodents. *J Nutr* 1984;114:1231-1234. **89 citations**
- *Koldovský O. Response of the gastrointestinal tract to premature weaning in experimental animals. *Pediatrics* 1985;75:199-206. **29 citations**
- Houštěk J, Vízek K, Pavelka S, Kopecký J, Krejčová E, Heřmanská E, Čermáková S. Type II iodothyronine 5'-deiodinase and uncoupling protein in brown adipose tissue of human newborns. *J Clin Endocrinol Metab* 1993;77:382-387. **73 citations**
- Pavelka S, Kopecký P, Bendlová B, Štolba P, Vítková I, Vobruba V, Plavka R, Houštěk J, Kopecký J. Tissue metabolism and plasma levels of thyroid hormones in critically ill very premature infants. *Pediatr Res* 1997;42:812-818. **48 citations**
- Kus V, Prazak T, Brauner P, Hensler M, Kuda O, Flachs P, Janovska P, Medrikova D, Rossmeisl M, Jilkova Z, Stefl B, Pastalkova E, Drahota Z, Houstek J, Kopecky J. Induction of muscle thermogenesis by high-fat diet in mice: association with obesity-resistance. *Am J Physiol Endocrinol Metab* 2008;295:E356-E367. **65 citations**

Muscle physiology (1954-1979) Gutmann, Hanzlíková, Hník, Bass, Syrový

- Hník P, Jirmanová I, Vyklický L, Zelená J. Fast and slow muscles of the chick after nerve cross-union. *J Physiol* 1967;193:309-325. **118 citations**
- Syrový I, Gutmann E. Changes in speed of contraction and ATPase activity in striated muscle during old age. *Exp Gerontol* 1970;5:31-35. **60 citations**
- Gutmann E, Hanzlíková V, Vyskočil F. Age changes in cross striated muscle of the rat. *J Physiol* 1971;216:331-343. **130 citations**
- Gutmann E, Schiaffino S, Hanzlíková V. Mechanism of compensatory hypertrophy in skeletal muscle of the rat. *Exp Neurol* 1971;31:451-464. **168 citations**
- Carlson BM, Gutmann E. Development of contractile properties of minced muscle regenerates in the rat. *Exp Neurol* 1972;36:239-249. **107 citations**
- Bass A, Gutmann E, Hanzlíková V. Biochemical and histochemical changes in energy supply enzyme pattern of muscles of the rat during old age. *Gerontologia* 1975;21:31-45. **109 citations**
- Gutmann E, Carlson BM. Contractile and histochemical properties of regenerating cross-transplanted fast and slow muscles in the rat. *Pflügers Arch* 1975;353:227-239. **64 citations**
- Syrový I, Gutmann E. Differentiation of myosin in soleus and extensor digitorum longus muscle in different animal species during development. *Pflügers Arch* 1977;369:85-89. **65 citations**

Neurotrophic effects in skeletal muscle (1954-1993) Gutmann, Žák, Vrbová, Beránek, Hník, Srový, Vejsada, Paleček

- Žák R, Gutmann E, Vrbová G. Quantitative changes of muscle proteins after stimulation of the muscle. *Experientia* 1957;13:80-81. [9 citations](#)
- Beránek R, Hník P. Long-term effects of tenotomy on spinal monosynaptic response in the cat. *Science* 1959;130: 981. [49 citations](#)
- Žák R, Gutmann E. Lack of correlation between synthesis of nucleic acids and proteins in denervated muscle. *Nature* 1960;185:766-767. [14 citations](#)
- Gutmann E, Žák R. Nervous regulation of nucleic acid level in cross-striated muscle. Changes in denervated muscle. *Physiol Bohemoslov* 1961;10:493-500. [35 citations](#)
- Gutmann E, Sandow A. Caffeine-induced contracture and potentiation of contraction in normal and denervated rat muscle. *Life Sci* 1965;4:1149-1156. [85 citations](#)
- Gutmann E, Melichna J, Srový I. Contraction properties and ATPase activity in fast and slow muscle of the rat during denervation. *Exp Neurol* 1972;36:488-497. [70 citations](#)
- Carlson BM, Gutmann E. Regeneration in free grafts of normal and denervated muscles in the rat: morphology and histochemistry. *Anat Rec* 1975;183:47-62. [151 citations](#)
- Carlson BM, Gutmann E. Regeneration in grafts of normal and denervated rat muscles. Contractile properties. *Pflügers Arch* 1975;353:215-225. [80 citations](#)
- Gutmann E. Neurotrophic relations. *Annu Rev Physiol* 1976;38:177-216. [316 citations](#)
- Vejsada R, Hník P, Navarrete R, Paleček J, Soukup T, Borecka U, Payne R. Motor functions in rat hindlimb muscles following neonatal sciatic nerve crush. *Neuroscience* 1991;40:267-275. [34 citations](#)
- *Vejsada R, Sagot Y, Kato AC. Quantitative comparison of the transient rescue effects of neurotrophic factors on axotomized motoneurons in vivo. *Eur J Neurosci* 1995;7:1081-1015. [153 citations](#)
- *Vejsada R, Tseng JL, Lindsay RM, Acheson A, Aebischer P, Kato AC. Synergistic but transient rescue effects of BDNF and GDNF on axotomized neonatal motoneurons. *Neuroscience* 1998;84:129-139. [91 citations](#)

Mechanoreceptors development, morphology and function (1954-2016) Zelená, Hník, Hudlická, Jirmanová, Soukup, Vejsada

- Zelena J. The morphogenetic influence of innervation on the ontogenetic development of muscle spindles. *J Embryol Exp Morphol* 1957;5:283-292. [199 citations](#)
- Zelená J. Development, degeneration and regeneration of receptor organs. *Prog Brain Res* 1964;13:175-213. [134 citations](#)
- Zelená J, Lubińska L, Gutmann E. Accumulation of organelles at the ends of interrupted axons. *Z Zellforsch Mikrosk Anat* 1968;91:200-219. [186 citations](#)
- Hník P, Hudlická O, Kucera J, Payne R. Activation of muscle afferents by nonproprioceptive stimuli. *Am J Physiol* 1969;217:1451-1457. [88 citations](#)
- Jirmanová I, Thesleff S. Ultrastructural study of experimental muscle degeneration and regeneration in the adult rat. *Z Zellforsch Mikrosk Anat* 1972;131:77-97. [153 citations](#)
- Zelená J, Soukup T. Development of muscle spindles deprived of fusimotor innervation. *Z Zellforsch Mikrosk Anat* 1973;144:435-452. [82 citations](#)
- Zelená J, Soukup T. The differentiation of intrafusal fibre types in rat muscle spindles after motor denervation. *Cell Tissue Res* 1974;153:115-136. [89 citations](#)
- Zelená J. The development of Pacinian corpuscles. *J Neurocytol* 1978;7:71-91. [89 citations](#)
- Hník P, Vejsada R, Goldspink DF, Kasicki S, Krekule I. Quantitative evaluation of electromyogram activity in rat extensor and flexor muscles immobilized at different lengths. *Exp Neurol* 1985;88:515-528. [80 citations](#)
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- Zelená J. *Nerves and Mechanoreceptors: the Role of Innervation in the Development and Maintenance of Mammalian Mechanoreceptors*. Chapman and Hall, London, 1994. [172 citations](#)
- Soukup T, Zachařová G, Smerdu V. Fibre type composition of soleus and extensor digitorum longus muscles in normal female inbred Lewis rats. *Acta Histochem* 2002;104:399-405. [111 citations](#)

Spreading depression (1954-1999) Bureš, Burešová, Křivánek

- Bureš J, Burešová O. The use of Leao spreading depression in the study of interhemispheric transfer of memory traces. *J Comp Physiol Psychol* 1960;53:558-563. [82 citations](#)
- Křivánek J. Some metabolic changes accompanying Leao's spreading cortical depression in the rat. *J Neurochem* 1961;6:183-189. [84 citations](#)

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- Bureš J, Burešová O, Křivánek J. *The Mechanism and Applications of Leao's Spreading Depression of Electroencephalographic Activity*. Academic Press: Cambridge, MA, USA, 1974. [641 citations](#)
- Gorelova NA, Bureš J. Spiral waves of spreading depression in the isolated chicken retina. *J Neurobiol* 1983;14:353-363. [261 citations](#)
- Hernández-Cáceres J, Macías-González R, Brožek G, Bureš J. Systemic ketamine blocks cortical spreading depression but does not delay the onset of terminal anoxic depolarization in rats. *Brain Res* 1987;437:360-364. [139 citations](#)

Water and electrolyte metabolism, body fluids, ion transport (1954-2021) Křeček, Jelínek, Dlouhá, Kuneš, Zicha

- Čapek K, Jelínek J. The development of the control of water metabolism. I. The excretion of urine in young rats. *Physiol Bohemoslov* 1956;5:91-96. [57 citations](#)
- Křeček J, Křečková J. The development of the regulation of water metabolism. III. The relation between water and milk intake in infant rats. *Physiol Bohemoslov* 1957;6:26-34. [44 citations](#)
- Jelínek J. The development of the regulation of water metabolism. 6. Changes in the volume of cellular and extracellular fluid in the body of the rat during development. *Physiol Bohemoslov* 1961;10:259-266. [23 citations](#)
- Dlouhá H, Křeček J, Zicha J. Postnatal development and diabetes insipidus in Brattleboro rats. *Ann N Y Acad Sci* 1982;394:10-20. [42 citations](#)
- Kuneš J, Štolba P, Pohlová I, Jelínek J, Zicha J. The importance of endogenous digoxin-like factors in rats with various forms of experimental hypertension. *Clin Exp Hypertens A* 1985;7:707-720. [35 citations](#)
- *Zicha J, Duhm J. Kinetics of Na⁺ and K⁺ transport in red blood cells of Dahl rats. Effects of age and salt. *Hypertension* 1990;15:612-627. [49 citations](#)
- Zicha J, Kuneš J, Devynck MA. Abnormalities of membrane function and lipid metabolism in hypertension. *Am J Hypertens* 1999;12:315-331. [186 citations](#)
- Zicha J, Negrin CD, Dobešová Z, Carr F, Vokurková M, McBride MW, Kuneš J, Dominiczak AF. Altered Na⁺-K⁺ pump activity and plasma lipids in salt-hypertensive Dahl rats: relationship to Atp1a1 gene. *Physiol Genomics* 2001;6:99-104. [20 citations](#)

Toxic effects of mercury and cadmium (1956-1976) Pařízek

- Pařízek J, Záhoř Z. Effect of cadmium salts on testicular tissue. *Nature* 1956;177:1036. [350 citations](#)
- Pařízek J. The destructive effect of cadmium ion on testicular tissue and its prevention by zinc. *J Endocrinol* 1957;15:56-63. [4168 citations](#)
- Pařízek J. Sterilization of the male by cadmium salts. *J Reprod Fertil* 1960;1:294-309. [212 citations](#)
- Pařízek J. Vascular changes at sites of oestrogen biosynthesis produced by parenteral injection of cadmium salts: the destruction of placenta by cadmium salts. *J Reprod Fertil* 1964;7:263-265. [145 citations](#)
- Pařízek J. The peculiar toxicity of cadmium during pregnancy – an experimental "toxaemia of pregnancy" induced by cadmium salts. *J Reprod Fertil* 1965;9:111-112. [100 citations](#)

Clinical and translational epileptology (1958-2024) Servít, Mareš P, Jirůška

- Servít Z. Prophylactic treatment of post-traumatic audiogenic epilepsy. *Nature* 1960;188:669-670. [17 citations](#)
- Servít Z, Machek J, Štercová A, Dudáš D, Křištof M, Červenková V. Reflex influences in the pathogenesis of epilepsy in the light of clinical statistics. *Epilepsia* 1962;3:315-322. [25 citations](#)
- Hrbek A, Mareš P. Cortical evoked responses to visual stimulation in full-term and premature newborns. *Electroenceph Clin Neurophysiol* 1964;16:575-581. [86 citations](#)
- Servít Z, Musil F. Prophylactic treatment of posttraumatic epilepsy: results of a long-term follow-up in Czechoslovakia. *Epilepsia* 1981;22:315-320. [59 citations](#)
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- Janca R, Jezdik P, Cmejla R, Tomasek M, Worrell GA, Stead M, Wagenaar J, Jefferys JG, Krsek P, Komarek V, Jirůška P, Marusic P. Detection of interictal epileptiform discharges using signal envelope distribution modelling: application to epileptic and non-epileptic intracranial recordings. *Brain Topogr* 2015;28:172-183. [86 citations](#)

Jiruska P, Alvarado-Rojas C, Schevon CA, Staba R, Stacey W, Wendling F, Avoli M. Update on the mechanisms and roles of high-frequency oscillations in seizures and epileptic disorders. *Epilepsia* 2017;58:1330-1339. [133 citations](#)

Higher brain functions (1958-2000) Radil, Bohdanecký, Indra, Mates

Lánský P, Radil T. Statistical inference on spontaneous neuronal discharge patterns. I. Single neuron. *Biol Cybern* 1987;55:299-311. [33 citations](#)

Paus T, Babenko V, Radil T. Development of an ability to maintain verbally instructed central gaze fixation studied in 8- to 10-year-old children. *Int J Psychophysiol* 1990;10:53-61. [40 citations](#)

Franěk M, Mates J, Radil T, Beck K, Pöppel E. Finger tapping in musicians and nonmusicians. *Int J Psychophysiol* 1991;11:277-279. [53 citations](#)

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Mates J, Müller U, Radil T, Pöppel E. Temporal integration in sensorimotor synchronization. *J Cogn Neurosci* 1994;6:332-340. [191 citations](#)

Radil T, Wysocki CJ. Spatiotemporal masking in pure olfaction. *Ann N Y Acad Sci* 1998;855:641-644. [40 citations](#)

Lipid metabolism – cholesterol transport (1959-2011) Hahn, Koldovský, Dobiášová

Drahota Z, P Hahn P, Kleinzeller A, Kostolánská A: Acetoacetate formation by liver slices from adult and infant rats. *Biochem J* 1964;93:61-65. [73 citations](#)

Dobiasova M, Hahn P, Koldovsky O. Fatty acid composition in developing rats. Fatty acid composition of triglycerides and phospholipids in some organs of the rat during postnatal development. *Biochim Biophys Acta* 1964;84:538-549. [46 citations](#)

*Hahn P, Koldovsky O. Late effect of premature weaning on blood cholesterol levels in adult rats. *Nutr Rep Int* 1976;13:87-91. [45 citations](#)

*Hahn P, Girard J, Assan R, Frohlich J, Kervran A. Control of blood cholesterol levels in suckling and weanling rats. *J Nutr* 1977;107:2062-2066. [38 citations](#)

Dobiášová M, Frohlich J. The plasma parameter log (TG/HDL-C) as an atherogenic index: correlation with lipoprotein particle size and esterification rate in apoB-lipoprotein-depleted plasma (FERHDL). *Clin Biochem* 2001;34:583-588. [838 citations](#)

Dobiášová M, Frohlich J, Šedová M, Cheung MC, Brown BG. Cholesterol esterification and atherogenic index of plasma correlate with lipoprotein size and findings on coronary angiography. *J Lipid Res* 2011;52:566-571. [156 citations](#)

Ontogeny of animal behavior (1959-1987) Lát J, Nováková V, Martínek Z

Nováková V, Faltin J, Flandera V, Hahn P, Koldovský O. Effect of early and late weaning on learning in adult rats. *Nature* 1962;193:280. [36 citations](#)

Nováková V. Weaning of young rats: effect of time on behavior. *Science* 1966;151:475-476. [36 citations](#)

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Sandritter W, Nováková V, Pilny J, Kiefer G. Cytophotometrische Messungen des Nukleisäure und Proteingehaltes von Ganglienzellen der Ratte während der postnatalen Entwicklung und im Alter. *Z Zellforsch Mikrosk Anat* 1967;80:145-152. [71 citations](#)

Martínek Z, Lát J. Ontogenetic differences in spontaneous reactions of dogs to a new environment. *Physiol Bohemoslov* 1968;17:545-552. [19 citations](#)

Martínek Z, Lát J. Interindividual differences in habituation of spontaneous reactions of dogs to a new environment. *Physiol Bohemoslov* 1968;17:329-36. [18 citations](#)

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Irmiš F, Radil-Weiss T, Lát J, Krekule I. Inter-individual differences in hippocampal theta activity during habituation. *Electroencephalogr Clin Neurophysiol* 1970;28:24-31. [31 citations](#)

Nováková V, Sandritter W, Schlueter G. DNA content of neurons in rat central nervous system. *Exp Cell Res* 1970;60:454-6. [35 citations](#)

Flandera V, Nováková V. The development of interspecies aggression of rats towards mice during lactation. *Physiol Behav* 1971;6:161-164. [20 citations](#)

- Křeček J, Nováková V, Stibral K. Sex differences in the taste preference for a salt solution in the rat. *Physiol Behav* 1972;8:183-188. [79 citations](#)
- Lát J. The analysis of habituation. *Acta Neurobiol Exp (Wars)* 1973;33:771-789. [65 citations](#)

Epilepsy and brain metabolism (1960-2024) [Folbergrová, Kubová, Otáhal](#)

- Folbergrová J, Passonneau JV, Lowry OH, Schulz DW. Glycogen, ammonia and related metabolites in the brain during seizures evoked by methionine sulfoximine. *J Neurochem* 1969;16:191-203. [260 citations](#)
- Folbergrová J, Zhao Q, Katsura K, Siesjö BK. N-tert-butyl-alpha-phenylnitron improves recovery of brain energy state in rats following transient focal ischemia. *Proc Natl Acad Sci U S A* 1995;92:5057-5061. [232 citations](#)
- Folbergrová J, Haugvicová R, Mareš P. Behavioral and metabolic changes in immature rats during seizures induced by homocysteic acid: the protective effect of NMDA and non-NMDA receptor antagonists. *Exp Neurol* 2000;161:336-345. [67 citations](#)
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- Folbergrová J, Ješina P, Kubová H, Druga R, Otáhal J. Status epilepticus in immature rats is associated with oxidative stress and mitochondrial dysfunction. *Front Cell Neurosci* 2016;10:136. [31 citations](#)
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- Daněk J, Danačíková Š, Kala D, Svoboda J, Kapoor S, Pošusta A, Folbergrová J, Tauchmannová K, Mráček T, Otáhal J. Sulforaphane ameliorates metabolic changes associated with status epilepticus in immature rats. *Front Cell Neurosci* 2022;16:855161.

Cardiac development and sensitivity to hypoxia (1963-2024) [Poupa, Ošťádal, Kolář, Ošťádalová](#)

- Rakušan K, Poupa O. Changes in the diffusion distance in the rat heart muscle during development. *Physiol Bohemoslov* 1963;12:220-227. [58 citations](#)
- Poupa O, Ošťádal B. Experimental cardiomegalies and "cardiomegalies" in free-living animals. *Ann N Y Acad Sci* 1969;156:445-468. [58 citations](#)
- Dušek J, Ošťádal B, Dušková M. Postnatal persistence of spongy myocardium with embryonic blood supply. *Arch Pathol* 1975;99:312-317. [212 citations](#)
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- Ošťádalová I, Kolář F, Ošťádal B, Rohlíček V, Rohlíček J, Procházka J. Early postnatal development of contractile performance and responsiveness to Ca^{2+} , verapamil and ryanodine in the isolated rat heart. *J Mol Cell Cardiol* 1993;25:733-740. [49 citations](#)
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Mitochondrial calcium metabolism and glycerol-3-phosphate dehydrogenase (1963-2020) [Drahota, Houštěk, Mráček](#)

- Drahota Z, Carafoli E, Rossi CS, Gamble RL, Lehninger AL. Steady state maintenance of accumulated Ca^{++} in rat liver mitochondria. *J Biol Chem* 1965;240:12-20. [232 citations](#)
- Drahota Z, Lehninger AL. Movements of H^+ , K^+ , and Na^+ during energy-dependent uptake and retention of Ca^{2+} in rat live mitochondria. *Biochem Biophys Res Commun* 1965;19:351-356. [18 citations](#)
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- Mráček T, Holzerová E, Drahota Z, Kovářová N, Vrbacký M, Ješina P, Houštěk J. ROS generation and multiple forms of mammalian mitochondrial glycerol-3-phosphate dehydrogenase *Biochim Biophys Acta Bioenerg* 2014;1837:98-111. [56 citations](#)
- Mráček T, Drahota Z, Houštěk J. The function and the role of the mitochondrial glycerol-3-phosphate dehydrogenase in mammalian tissues. *Biochim Biophys Acta Bioenerg* 2012;1827:401-410. [312 citations](#)

Neurocytology (1963-2012) [Lodin, Mareš V](#)

- Mareš V, Lodin Z, Šrajter J. The cellular kinetics of the developing mouse cerebellum. I. The generation cycle, growth fraction and rate of proliferation of the external granular layer. *Brain Res* 1970;23:323-342. [85 citations](#)
- Mareš V, Lodin Z. The cellular kinetics of the developing mouse cerebellum. II. The function of the external granular layer in the process of gyrification. *Brain Res* 1970;23:343-352. [105 citations](#)
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Cell cultures (1964-2016) [Holečková, Michl, Baudyšová, Tolar, Mareš V](#)

- Soukupová M, Holečková E. The latent period of explanted organs of newborn, adult and senile rats. *Exp Cell Res* 1964;33:361-367. [53 citations](#)
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