MEETINGS AND ABSTRACTS OF THE CZECHOSLOVAK BIOLOGICAL SOCIETY IN 2005 YEAR

SCHŮZE BRNĚNSKÉ POBOČKY ČESKOSLOVENSKÉ BIOLOGICKÉ SPOLEČNOSTI V ROCE 2005

Členská schůze 19. ledna 2005

M. Dostálek (Farmakologický ústav Lékařské fakulty MU v Brně): **Vliv psychotropních látek (metamfetaminu a třezalky tečkované) na metabolickou aktivitu klinicky nejvýznamnějších izoenzymů cytochromu P-450**.

Členská schůze 9. února 2005

P. Bravený (Fyziologický ústav Lékařské fakulty MU v Brně): **50 roků kardiofyziologické laboratoře LF MU v Brně**.

J. Šimurda (Fyziologický ústav Lékařské fakulty MU v Brně): **Akční napětí a iontové proudy u srdečních buněk**.

M. Bébarová (Fyziologický ústav Lékařské fakulty MU v Brně): **Vliv ajmalinu na průběh akčního napětí a iontových proudů**.

M. Šimurdová (Fyziologický ústav Lékařské fakulty MU v Brně): **Draslíkový proud citlivý na $[ATP]_i$ u srdečních buněk. Inhibice antiarytmiky**.

M. Nováková (Fyziologický ústav Lékařské fakulty MU v Brně): **Ovlivnění membránových proudů kardiomyocytu potkana ligandy sigma receptorů**.

M. Pásek (Fyziologický ústav Lékařské fakulty MU v Brně): **Fyziologické důsledky iontově koncentračních změn v membránovém tubulárním systému během aktivity srdečních buněk**.

Členská schůze 9. března 2005

(Schůze konaná při příležitosti životního jubilea prof. MUDr. Augustina Svobody, CSc.)

M. Gabriel (Biologický ústav Lékařské fakulty MU v Brně): **Pár slov úvodem k jubilantovi**.

M. Kopecká, M. Gabriel, A. Svoboda, M. David, M. Yamaguchi, K. Takeo** (Biologický ústav Lékařské fakulty MU v Brně a *Research Center for Pathogenic Fungi and Microbial Toxicoses, Chiba University, Chiba, Japonsko): **Cytoskelet u patogenních kvasinek jako terč antifungálních látek**.

R. Veselská, J. Neradil (Biologický ústav Lékařské fakulty MU v Brně): **Cytoskelet savčích buněk *in vitro* v průběhu apoptózy**.

D. Šmajs (Biologický ústav Lékařské fakulty MU v Brně): **Komparativní genomika patogenních spirochet**.

*I. Slaninová, E. Táborská** (Biologický ústav Lékařské fakulty MU v Brně a *Biochemický ústav Lékařské fakulty MU v Brně): **Studium biologické aktivity benzo(c)phenanthridinových alkaloidů**.

M. Koutná, R. Janisch, M. Unucka, M. Druckmüller** (Biologický ústav Lékařské fakulty MU v Brně a *Ústav matematiky Fakulty strojního inženýrství VUT v Brně): **Model protozoí a počítačové zpracování obrazu v experimentální buněčné biologii**.

Členská schůze 11. března 2005

(Schůze konaná ve spolupráci s Farmakologickým ústavem Lékařské fakulty MU v Brně)

W. Siegmund (Institut Pharmakologie, Abteilung für Klinische Pharmakologie, Medizinische Fakultät, Ernst Moritz Arndt Universität Greifswald, Bundesrepublik Deutschland): **Intestinal drug transporter proteins: Clinical significance for pharmacokinetics of cardiovascular drugs**.

Členská schůze 6. dubna 2005

(Schůze konaná ve spolupráci s Českou anatomickou společností v Praze)

Susan Amin (Department of Craniofacial Development, Guy´s Hospital, London, UK): **The genetics and morphology of the developing middle ear**.

Členská schůze 12. dubna 2005

(Schůze konaná ve spolupráci s děkanem a VR Lékařské fakulty MU v Brně – habilitační přednáška)

M. Sedláčková (Ústav histologie a embryologie Lékařské fakulty MU v Brně): **Oplození a vývoj lidského embrya in vitro – některé aktuální problémy**.

Členská schůze 13. dubna 2005

(Schůze s prezentaci výsledků Výzkumného centra RECETOX Přírodovědecké fakulty MU v Brně – Moderní ekotoxikologie: Ekologické a zdravotní důsledky chronického působení chemických látek v životním prostředí)

L. Bláha (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Ekotoxikologie: Studium účinků cizorodých látek na různých úrovních – věda a praktické aspekty**.

K. Hilscherová, P. Čupr (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Moderní přístupy studia biochemických a buněčných mechanismů toxicity**.

J. Janošek, J. Novák (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Nové poznatky o působení významných organických kontaminantů**.

R. Zounková (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Ekotoxikologické biotesty a studium efektů léčiv v životním prostředí**.

B. Burýšková (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Chronická toxicita organických kontaminantů pro bezobratlé a obojživelníky**.

P. Babica (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Masové rozvoje sinic ve vodách – globální problém znečištění prostředí a jeho důsledky**.

J. Bezchlebová, J. Hofman (Výzkumné centrum RECETOX, Přírodovědecká fakulta MU v Brně): **Půdní prostředí – význam a možnosti studia negativních důsledků lidských činností**.

Členská schůze 12. října 2005

(Schůze konaná ve spolupráci s Farmakologickým ústavem Lékařské fakulty MU v Brně při příležitosti životního jubilea prof. MUDr. Alexandry Šulcové, CSc.)

M. Kršiak (Farmakologický ústav 3. lékařské fakulty UK v Praze): **Slovo úvodem**.

J. Nováková (Farmakologický ústav Lékařské fakulty MU v Brně): **Úloha serotonergního systému v průběhu experimentálních lékových závislostí**.

J. Vinklerová (Farmakologický ústav Lékařské fakulty MU v Brně): **Behaviorální a imunologické účinky kanabinergik a jejich interakce s vybranými látkami**.

J. Pistovčáková (Farmakologický ústav Lékařské fakulty MU v Brně): **Behaviorálne, imunitné a endokrinné účinky vybraných látok vo zvieracích modeloch depresie**.

L. Landa (Farmakologický ústav Lékařské fakulty MU v Brně): **Interakce procesů behaviorální sensitizace k metamfetaminu a kanabinoidům**.

O. Starobová (Farmakologický ústav Lékařské fakulty MU v Brně): **K farmakologické regulaci aktivity cytochromu P-450 2D.**

M. Dostálek (Farmakologický ústav Lékařské fakulty MU v Brně): **Vliv LI 160 na metabolickou aktivitu klinicky nejvýznamnějších izoenzymů cytochromu P-450**.

Členská schůze 7. listopadu 2005

(Schůze konaná ve spolupráci s Biologickým ústavem Lékařské fakulty MU v Brně)

M. Yamaguchi (Research Center for Pathogenic Fungi and Microbial Toxicoses, Chiba University, Chiba, Japan): **Quantitative three-dimensional structural analysis of yeast cells by freeze-substitution and serial ultrathin sectioning**.

Členská schůze 9. listopadu 2005

(Odpoledne Mikrobiologického ústavu Lékařské fakulty MU a FN u sv. Anny v Brně)

F. Růžička, M. Votava, V. Holá (Mikrobiologický ústav Lékařské fakulty MU a FN u sv. Anny v Brně): **Význam mikrobiálního biofilmu v medicíně**.

L. Černohorská (Mikrobiologický ústav Lékařské fakulty MU a FN u sv. Anny v Brně): **Biofilm a jeho rezistence na antibiotika**.

V. Holá, L. Horáková, F. Růžička (Mikrobiologický ústav Lékařské fakulty MU a FN u sv. Anny v Brně): **Biofilmpozitivní mikroby izolované z prostředí LIFE boxů pro imunokompromitované pacienty**.

V. Woznicová (Mikrobiologický ústav Lékařské fakulty MU a FN u sv. Anny v Brně): **Nálezy DNA *Treponema pallidum* u latentní syfilis**.

M. Dvořáčková (Mikrobiologický ústav Lékařské fakulty MU a FN u sv. Anny v Brně): **Detekce nosokomiálních infekcí vyvolaných *Pseudomonas aeruginosa***.

Členská schůze 23. listopadu 2005

(Schůze konaná ve spolupráci s Ústavem anatomie, histologie a embryologie Fakulty veterinárního lékařství Veterinární a farmaceutické univerzity v Brně u příležitosti 110. výročí narození Prof. MVDr. Jana Koldy, DrSc.)

O. Štěrba (Ústav anatomie, histologie a embryologie Fakulty veterinárního lékařství VFU v Brně): **Osobnost prof. MVDr. Jana Koldy**.

Č. Červený (Ústav anatomie, histologie a embryologie Fakulty veterinárního lékařství VFU v Brně): **Ústav veterinární anatomie a výuka anatomie v Koldově pojetí**.

V. Páral, M. Pyszko (Ústav anatomie, histologie a embryologie Fakulty veterinárního lékařství VFU v Brně): **Koldovy bytové textilie**.

R. Böhm, O. Štěrba (Ústav anatomie, histologie a embryologie Fakulty veterinárního lékařství VFU v Brně): **Prof. Dr. Jan Kolda a užitá anatomie a histologie**.

Členská schůze 9. prosince 2005

(Schůze konaná ve spolupráci s Biologickým ústavem Lékařské fakulty MU v Brně)

G. M. Weinstock (Human Genome Sequencing Center, Baylor College of Medicine, Houston, USA): **The Genomics Revolution: From Microbes to Mammals to Medicine**.

Členská schůze 14. prosince 2005

L. Novák (Lékařská fakulta MU v Brně): **Růst a jeho modelování v biologických vědách**.

L. Kukla (Oddělení preventivní a sociální pediatrie Ústavu sociálního lékařství a veřejného zdravotnictví, Lékařská fakulta MU v Brně): **ELSPAC – Evropská dlouhodobá studie těhotenství a dětství**.

M. Čuta, L. Novák, L. Kukla (Oddělení preventivní a sociální pediatrie Ústavu sociálního lékařství a veřejného zdravotnictví, Lékařská fakulta MU v Brně): **Příklad využití bioverze růstových funkcí při analýze longitudinálních dat**.

P. Bláha (Katedra antropologie a genetiky Přírodovědecké fakulty UK v Praze): **6. celostátní antropologický výzkum dětí a mládeže 2001**.

ABSTRACTS

P. Bravený (Department of Physiology, Faculty of Medicine, Masaryk University, Brno): **Fifty years of the Electrophysiological Laboratory at the Department of Physiology**.

Soon after the late Vladislav Kruta became head of our Department (1951), he tried to reassume his pre-war studies of the frequency-force relationship in the heart. He succeeded in establishing a modest lab and a germ of a team only four years later. Soon they won international recognition due to their novel concept of mechanical restitution. Since it appeared to reflect the processes of then discovered coupling of excitation and contraction, it became imperative to introduce electrophysiological methods. In the coming years, clinically relevant phenomena were studied, e.g. pulsus alternans, aftercontractions, the effects of cardiotropic drugs. After J. Šumbera joined the team (1965), a pioneer work was done on inotropic effects of low temperature and on electromechanical correlations in the heart. During the politically motivated purges 1970), V. Kruta was dismissed and the laboratory had to move to the Research Institute of Medical Technology, the workplace of our external co-workers, Drs. J. and M. Šimurda. There, the very first records of Na/Ca exchange current and of the transient potassium current in the working myocardium were obtained. Immediately after the „velvet revolution", the Laboratory was transferred back the Faculty of Medicine, new methods were introduced (patch-clamp, mathematical modelling) and the team expanded. The current topics and progress of work are reviewed by the ensuing presentations.

M. Bébarová, P. Matejovič, M. Pásek, M. Šimurdová, J. Šimurda (Department of Physiology, Faculty of Medicine, Masaryk University, Brno): **Effect of ajmaline on course of action potential and ionic membrane currents in rat ventricular myocytes.**

Ajmaline, a class Ia antiarrhythmic drug, has been used in clinical practice for over thirty years in the treatment of various types of both atrial and ventricular tachyarrhythmias. However, the data demonstrating the effect of ajmaline on electrophysiological properties of cardiac cell are fragmentary so far.

Experiments were performed at room temperature on enzymatically isolated rat ventricular myocytes using the whole cell patch clamp technique in the current clamp and the voltage clamp mode.

Ajmaline (30 μmol/l) induced a decrease of upstroke velocity $(dV/dt)_{max}$ of action potential (AP) (35.4 ± 5.2 $V.s^{-1}$ vs. 83.2 ± 18.3 $V.s^{-1}$ in control, $P<0.05$), a decline of the AP amplitude (77.5 ± 3.8 mV vs. 95.9 ± 6.1 mV in control, $P<0.01$) and an AP prolongation at the level of 50 % repolarization (31.9 ± 6.1 ms vs. 13.1 ± 1.0 ms in control, $P<0.05$). Ajmaline was effective in blocking the main components of ionic membrane current. According to the concentration of drug that caused 50%-block of current (IC_{50}), sensitivity declined in the subsequent order: the sodium current I_{Na} (27.8 ± 1.1 μmol/l) and the transient outward potassium current I_{to} (25.9 ± 2.9 μmol/l) – the potassium current measured at the end of 250 ms impulse $I_{K,end}$ that is mainly composed of the delayed rectifier current I_K (61.0 ± 1.1 μmol/l) – the L-type calcium current $I_{Ca\text{-}L}$ (70.8 ± 1.1 μmol/l). Ajmaline blocked also the potassium current sensitive to ATP $I_{K(ATP)}$ with IC_{50} = 13.3 ± 1.1 μmol/l. The Hill coefficient was not far from unity in all cases.

The observed blocking effects of ajmaline on ionic currents suggest the following interpretation of the changes of AP configuration: Besides the decrease of $(dV/dt)_{max}$, I_{Na} seems to be responsible for the decline of AP amplitude. The AP prolongation is probably related particularly to the block of I_{to}, the main repolarizing current in rat. This effect predominates over the opposite effect of $I_{Ca\text{-}L}$ inhibition, partly because of lower IC_{50}.

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M. Šimurdová, J. Šimurda (Department of Physiology, Faculty of Medicine, Masaryk University, Brno): **Potassium current sensitive to [ATP]$_i$. Inhibition by antiarrhythmics.**

K_{ATP}-channels are potassium channels in which activity is normally inhibited by physiological levels of intracellular ATP. They are activated during metabolic stress to promote cellular survival. They were first identified in cardiac myocytes (1) and subsequently in the cells of other tissues with various functions (secretions of hormones, excitability of muscle cells and neurons, protection against ischemia damage). The channels are heterooctamers composed of Kir6.2 subunits (forming pore with binding site for ATP molecule), and SUR2A, a regularly subunits (with binding site for Mg-ADP or Mg-GDP having high affinity for sulfonylurea derivatives). In addition, opening of K_{ATP} channels is controlled by complex interactions of many intracellular factors and signalling pathways.

In our experiments (2), (3), (4), the current I_{KATP} was induced by the uncoupler of oxidative phosphorylation 2,4 dinitrophenol in rabbit and rat isolated ventricular and/or atrial cardiomyocytes. Membrane current was measured in response to the imposed voltage ramp pulses in whole cell patch-clamp arrangement. The current recorded during the repolarizing phase of voltage ramp when the disturbing transient currents were inactivated was used for data analysis. The recorded current could be inhibited by glibenclamide, a specific inhibitor of I_{KATP}. Our aim was to investigate the effect of class 1 antiarrhythmics on this current. All the agents under study (propafenone, trimecaine, and ajmaline) inhibited reversibly I_{KATP} in a concentration-dependent manner. The blocking effect appeared to be significant at clinical concentrations (propafenone: IC_{50} = 1.26± 0.17 μmol/l and 4.94 ± 0.59 μmol/l in rabbit atrial and ventricular myocytes, respectively; ajmaline: IC_{50} = 13.3±1.1 μmol/l; trimecaine: IC_{50} ~ 100 μmol/l). It is concluded that partial inhibition of I_{KATP} by some antiarrhythmics might be one of the main reasons of the known risk in the pharmacological treatment of patients with ischemic heart disease.

J. Šimurda (Department of Physiology, Faculty of Medicine, Masaryk University, Brno): **Action potential and electrical charges transferred by components of ionic current across membrane in cardiac cell**.

The voltage clamp methods applied in cardiac cells led to identification of a variety of ionic current components. However, a quantitative evaluation of the share of individual components in configuration of action potential (AP) remains problematic so far. Using specific inhibitors, it is difficult to distinguish drug induced primary changes of AP from the secondary changes caused by all voltage dependent current components (1). Using a biophysical model, membrane voltage U_m during AP can be expressed by means of a sum of electrical charges Q_k transferred across membrane through components $I_{i,k}$ (k=1, ..., n) of the total ionic current I_i:

$$U_m = U_{m,r} + Q_{st} - \frac{1}{C_m}\sum_{k=1}^{n} Q_k, \quad where \quad Q_k = \int_0^t I_{i,k}\,dt,$$

$U_{m,r}$ is resting membrane voltage, Q_{st} stimulation charge, C_m membrane capacity, n number of components and t is time measured from the beginning of stimulation impulse (1).

In this study, a computer analysis of rat AP in charge representation was performed using a quantitative description of current components (2). The fraction of individual component during AP was expressed by the ratio $|Q_k| / \sum_l |Q_l|$.

The results of computations have shown that AP configuration in rat was largely formed by three current components: fast sodium current I_{Na}, transient outward current I_{to} and L-type calcium current I_{Ca}. The total portion of charge they carry through the membrane in the course of AP did not fall below 90 %. From other nine components included into computations, only the currents generated by electrogenic Na-Ca and Na-K exchangers and potassium currents I_{K1} and I_{Ks} contributed significantly to the remaining 10 % while the share of other components was negligible. The described procedure can be used in experiments provided AP voltage clamp technique is applied.

M. Nováková (Department of Physiology, Faculty of Medicine, Masaryk University, Brno): **Effects of sigma receptor ligands on membrane ionic currents of rat cardiomyocyte**.

Sigma receptors, first discovered in the central nervous system, have been later reported in various peripheral tissues including the heart muscle. They are involved in fine modulation of contractility. Sigma receptor ligand haloperidol is a psychotropic drug used in the treatment of various psychiatric disorders. Its severe cardiovascular side effects (mainly ventricular arrhythmias) have been repeatedly reported. The direct effect of this compound on membrane excitability has not been studied yet.

Experiments were performed on enzymatically isolated rat ventricular cardiomyocytes by whole cell patch clamp technique at room temperature. The effects on the sodium current I_{Na} and potassium currents, the transient outward current I_{to}, the current at the end of 250ms-impulse $I_{K,end}$ (that is mainly composed of the delayed rectifier current I_K) and the inward rectifier current I_{K1} were studied.

Haloperidol inhibited reversibly and in concentration-dependent manner amplitudes of all tested ionic currents with 39% inhibition of I_{Na}, 39% inhibition of I_{to} and 14% inhibition of $I_{K,end}$ in the presence of 1 μmol/l and 95% inhibition of I_{Na}, 80% inhibition of I_{to}, 37% inhibition of $I_{K,end}$ and 29 % inhibition of I_{K1} in the presence of 10 μmol/l haloperidol. Inhibition of I_{to} was voltage-independent, with a small (–1.4 mV; P<0.05) hyperpolarizing shift of the steady state inactivation curve. The apparent inactivation of I_{to} was accelerated in the presence of haloperidol ($\tau = 27.4 \pm 3.3$ ms in the absence and 6.9 ± 2.3 ms in the presence of 10 μmol/l haloperidol). Inhibition of both other tested potassium currents $I_{K,end}$ and I_{K1} did not depend on membrane voltage as well.

In conclusion, haloperidol causes reversible and concentration-dependent inhibition of sodium and potassium membrane currents in rat ventricular cardiomyocytes with the highest effectivity on I_{Na} and I_{to}. In potassium currents, the inhibition is voltage-independent. The acceleration of apparent I_{to} inactivation is a typical sign of interaction with I_{to}-channels in the open state. The negligible effect of haloperidol on the steady state inactivation curve of I_{to} implies no interaction with the channels in the inactivated state. More detailed study with lower haloperidol concentrations is necessary to explain frequent ventricular dysrythmias.

M. Pásek[1,3], G. Christé[2], J. Šimurda[3] ([1]Institute of Thermomechanics, Czech Academy of Science – branch Brno, Czech Republic, [2]INSERM E0219, DRDC/DVE, CENG F-32054, Grenoble, France, [3]Department of Physiology, Faculty of Medicine, Masaryk University, Brno, Czech Republic): **Quantitative analysis of ion concentration changes in transverse-axial tubular system of rat and guinea pig ventricular cardiomyocytes**.

Authors explored the extent of ion concentration changes in the transverse-axial tubular system (TATS) of rat and guinea pig ventricular cardiomyocytes by means of mathematical models. The geometrical characteristics of TATS [tubular density ($dens_t$), length (l_t) and diameter (d_t)], time constants of ion exchange between tubular and external space ($\tau_{Ca,}$ $\tau_{Na,}$ τ_K) and fractions of main ion transporters in tubular membrane ($f_{t,x}$) were determined to meet recently published data. Their values in rat model are: $dens_t$ = 0.3 tubules/μm^2, l_t = 4.5 μm, d_t = 0.3 μm, τ_{Ca} = 470 ms, τ_{Na} = τ_K = 150 ms, $f_{t,Na}$ = 56 %, $f_{t,Ca}$ = 87 %, $f_{t,Kto}$ = 56 %, $f_{t,Kss}$ = 76 %, $f_{t,K1}$ = 56 %, $f_{t,NaCa}$ = 81 % and $f_{t,NaK}$ = 59 %. In guinea pig model they are: $dens_t$ = 0.21 tubules/μm^2, l_t = 5.93 μm, d_t = 0.296 μm, τ_{Ca} = 240 ms, τ_{Na} = 220 ms, τ_K = 200 ms, $f_{t,Na}$ = 64 %, $f_{t,Ca}$ = 64 %, $f_{t,K}$ = 53 %, $f_{t,K1}$ = 80 %, $f_{t,NaCa}$ 70 % and $f_{t,NaK}$ 53 %.

The simulations revealed significant changes of tubular Ca^{2+} and K^+ concentrations at different stimulation rates in both the models. In the rat model, the transient depletion of tubular Ca^{2+} increased from 7.5 % to 13.7 % (related to external level) and the transient accumulation of tubular K^+ decreased from 4.3 % to 2.8 % with increase of stimulation rate from 1 Hz to 5 Hz. The guinea pig model, on the contrary, exhibited decrease of tubular Ca^{2+} depletion from 15.6 % to 7.1 % and increase of tubular K^+ accumulation from 2.5 % to 3.4 % in the same frequency-range. The relative changes of tubular Na^+ were negligible.

The results suggest that activity-dependent depletion of Ca^{2+} within the TATS lowers the intracellular Ca^{2+} load, intracellular Ca^{2+} transients and hence the inotropic status of ventricular myocytes. This effect is modulated differently by stimulation rate in the two models, suggesting species-related functional consequences of TATS.

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L. Zeman, P. Novák[1], L. Novák[1], P. Mareš (Department of Animal Nutrition, Faculty of Agronomy, Mendel University of Agriculture and Forestry, Brno, [1]Department of Nutrition, Dietetics, Zoohygiene and Plant Products, Veterinary and Pharmaceutical University, Brno): **The influence of the seasonal temperature and humidity changes in the stables climate on the growth of fattened pigs**.

Animals' thermoregulation mechanisms do depend on temperature-humidity parameters of stable climate. There are recommended intervals of stable temperature and humidity for each of pigs' categories. These optimal values of parameters should ensure maximal animal-efficiency, because in these conditions the energy requests of the environment against the animals, under the defined feed intake, are minimal. However, there are not the technological equipments in all stables, which are able to ensure these optimal conditions during all year. In the paper is evaluated the effect of stable temperature and humidity in all year seasons on pig performance in stable with common heating and ventilation equipment.

The experiment was made in experimental stable of University farm Žabčice. The final hybrids were fed by granulated feed mixture ad semi-libitum. The energy content was 13.02 MJ MEp/kg feed mixture. The feed intake was measured and pigs were weighted every two weeks. In stable was recorded temperature and humidity in the level of 1 m over floor by automatic recorder (COMET L3120) once in 30 minutes all day.

The common parameters as follows: averages of daily live body mass gain, daily feed intake, conversion of feed mixture per unit of live mass gain were used for performance evaluation of the pigs in all experiments. To evaluate the finishing effectiveness, authors have adapted the well-known formula of „European Production Efficiency Factor", into the form:

$$\mathbf{EPEF = mortality * weight\ gain * time\ of\ fattening^{-1} * feed\ conversion^{-1}}$$

The experiments were carried since 11. 12. 2002 until 27. 11. 2003 – it means they did include all year seasons.

Presented results have revealed that the heating and ventilation technology used in experimental stable is not able to adapt the stable microclimate within the recommended optimal condition. Authors observed that the decrease of the air temperature evoked the decrease in the gain of live body mass. In experimental stable, the microclimate was dependent on the outside weather. It is difficult to say if it will be profitable to use more powerful technology to improve performance of fattened pigs in our local climate conditions. However, the continuous rotation of the finishing pig batches during the year seasons deserves to take into account the impact of variable temperature-humidity conditions within the stable on the economical aspects of the rotating pigs fattening batches. The question remains open: how to reduce negative impacts of the stable climate on average daily body mass gain and feed intake. The first step in these common conditions is the recording of air temperature, dew point and air convection in pig stable and to explore this information in decision-making. Do we change the feed mixture composition or feed additives used, shall be better to improve the heating and ventilation technology? It is fact the animals react on environments condition according to biological and physiological rules. There is no reason to interpret the individual differences in the live body mass growth as a stochastic process. The individual differences in the growth of live body mass depend on the genome qualities and the results of their expression are linked to variation in the microclimate and the actual level of feeding conditions.

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L. Zeman, J. Vavrečka, P. Novák[1], L. Novák[1] (Department of Animal Nutrition, Faculty of Agronomy, Mendel University of Agriculture and Forestry, Brno, [1]Department of Nutrition, Dietetics, Zoohygiene and Plant Products, Veterinary and Pharmaceutical University, Brno): **Replacement of Soya by the field pea in the feed ration for fattened pigs during unfavourable stables climate conditions**.

In hot days of the summer, the ventilation system of stables for the fattening pigs is unable to maintain the internal climate within the recommended optimal values of the air temperature, air movement and relative humidity. The changed stables climate either warmer, either colder than is the desired optimum, influences the feed consumption of the fattened pigs and the value of their maintenance energy consumption. Such imbalances in the stables climate do reduce the optimal body mass increase

of the animals. As far as the animals are unable to use in the feed offered all high-quality proteins for accumulation in the growing mass of body proteins, the unused proteins convert into the lipids of the fat tissue. It seems reasonable in such cases to replace the Soya as a protein source by the field pea. This is the point of the presented experiment realized in the stable with current technology of ventilation and heating. In stable was recorded temperature and humidity in the level of 1 m over floor by automatic recorder (COMET L3120) once in 30 minutes all day.

The experiment was carried out in two series on four groups of four pigs with sex ratio 50:50. The animals were marked by ear label and were weighted every 14 days during the 70 days of the experiment, with accuracy ± 0.5kg. The pigs were fed by the regular granulated feed mixture ad-libitum before starting of the experiment. In the experimental feed-mixture was, as a source of protein, on the isoprotein basis, used 18 % peas of breed Zekon or Gotik and 9 % peas breed Zekon or Gotik. The experiments were carried since 10. 5. 2004 until 20. 7. 2004, when the average temperatures in the stable were 20–25°C that means the temperature was outside the range of optimal values. The average values measured in the 70–day experiment are given in the table and evaluated by the values of the „European Production Efficiency Factor" (EEF).

Experimental groups	Body mass kg	Gain in the experiment kg/70d	Consumption of feed kg/70 d	Feed conversion kg/kg	Feeding days	EEF relative units
Group A	30.3					
18% Zekon	92.6	63.1	140	2.247	70	40.1
Group B	30.2					
18% Gotik	91.7	61.7	132.0	2.146	70	41.1
Group C	30.6					
9% Zekon	93.6	63.0	142.9	2.268	70	39.7
Group D	29.4					
9% Gotik	90.4	61	131.7	2.159	70	40.4

The observed results are compatible with the data of Zeman et al. (2004) reached, in the same season of the year and identical pigs hybrid, fed with the classical diet (Testa) containing Soya as the source of proteins. The values of EEF in both experiments are not statistically significant. Replacement of Soya by the field pea in conditions when the heating and ventilation technology used is not able to maintain the stable climate within the recommended optimal condition seems to be plausible and correspond with the data of Gatel (1991), Jaikaren (1995) and Černý (1994).
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L. Novák (Department of Preventive and Social Paediatrics, Institute of Social Medicine and Public Health Care Administration, Faculty of Medicine, Masaryk University, Brno): **Modelling of growth in biology**.

Each mammalian body, the result of the genome expression, represents the system characterized by the mass (G, kg) and the length (D, cm) and is denominated as proteome. The body mass growth is a complex process determined by the biologic background (genome), the physiologic requirements (nutrition, regulation of physiology functions) and suitable biophysics' conditions between the body and the ambient environment (core temperature, temperature gradients and thermal insulations and cooling power of environment). Metabolizable energy taken in the food eaten is converted into the energy deposited in proteins, lipids and carbohydrates of cells, tissues and organs, further into the heat emitted to the environment. Expression of the genome into the proteome depends on the positive energy balance. The body mass growth or the growth of the body length does have the S-form shape curve. The course of the growth curve is satisfactory described by the logistic or exponential growth function see *Tab. I.*

	Phenotype parametre			Derivation parametre		Constant of integration
Phenotype	G0	GLi	dGmax			
Function				a	k	c
Logistic	Gt = GLi/(1+c.exp(-a.t))			4.dGmax/GLi	a/GLi	$(a-k.G_0)/(k.G_0)$
Derivative	dG/dt = a.G – k.G.G					
Function						C
Exponential	Gt = GLi.exp(-C.exp(- .t))			.ln(GLi)	e.dGmax/Gli	$\ln(GLi/G_0)$
Derivative	dG/dt = .G – .G.lnG					

Derivative of the growth function do represent the body mass increase, the growth's velocity that reaches the maximum in coincidence with the growths curve inflection point. The body mass value into the inflection point of the logistics is equal GLi/2 that of the exponentials equals GLi/e. The maximum body mass increase, of course, is conditioned by the capability of the particular individual to consume and digest the appropriate amount of metabolizable energy and by the favorable cooling power of the environment. The structure of the "self-regulating growth model" (*Novák, 1996, Acta Vet Brno, 65, 107*) has enabled to define the growth function by means of the three phenotypes parameters (G_0, GLi, dGmax). As shown in the Tab. I. the general relations between the phenotype parameters and the body mass increase (dG/dt) together with the growth curve values (Gt). Universality of this original methodology has been proved in experiment on Wistar rats (*Novák, Pípalová, 1996, Scripta Medica Brno, 69, 179*), on pigs (*Novák, Zeman, Novák P, Mareš, 2004, Acta Univ Agric Sivic Mendel Brun, LII/2, 53*) and give interesting results in evaluation of the body mass growth of children and teenagers (*Čuta et al, 2005, in press*).

In comparison with the classic methods for evaluation of body mass growth or posture, the presented "bioversion" expresses the mathematic growth functions by the three biologic comprehensive and direct measurable phenotypes values of body mass: G_0, GLi, dGmax or posture: D0, DLi, dDmax, often known as values of a breeding standard.

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L. Kukla (Department of Preventive and Social Paediatrics, Institute of Social Medicine and Public Health Care Administration, Faculty of Medicine, Masaryk University, Brno): **ELSPAC – European Longitudinal Study of Pregnancy and Childhood – as an example of longitudinal studies**.

ELSPAC is a prospective longitudinal study that is in progress in several European countries and follows selected study sets of children and their families from pregnancy of the mother, delivery, confinement and all periods of child development till at least 18 years of age. A brief information about the reasons leading to founding this project is presented along with project characteristics and its uniqueness (the interlacing between the prenatal period and the complex development of a child till 18 years of age; the international constitution of the project with common methodology and data compiling allow result comparations among participating countries; mother as well as father) in the study.

The project aims above all to find out whether there are factors and which (biological, psychological, social, environmental factors) that are connected to survival and health of a fetus, newborn, infant and child and to find out whether the same factors have similar influence in all participating countries. Areas subject to study are for example: health, growth, development, behaviour, biology, morbidity (with regard to newborn and infant), mortality (fetal, neonatal, postneonatal and so on), accidents, injuries, sensory disorders, speech disorders, pregnancy complications, and specific pregnancy terminations.

Studied areas stated above are analyzed in different periods of development in relation to these variables: physical environment, parent characteristics, social factors, psychological factors, psychosocial environment, health care, family situations, changes of environment in which child grows.

Study set in each country consists of all children born within the span of 1–1,5 years in one or more geographic areas. Altogether more than 40 000 children are followed throughout Europe. In the Czech Republic, the set includes all children born from March 1st 1991 until June 30th 1992 to mothers with permanent residence in Brno and in the district of Znojmo at the time of birth.

Research data are collected mainly by means of:

1. Questionnaires

a) in the families – for mother, father, about the child, for the child,

b) in the health care sector – delivery questionnaire, health status questionnaire in corresponding phases of investigation, hospitalization questionnaire,

c) teachers´ questionnaire.

2. Paediatric and anthropological examination of children (at our centre), psychological (in cooperation with FSS MU in Brno).

Acquired data are coded, keyed, computerized, controlled and cross-checked and elaborated for publishing. All data are strictly confidential and do not conveye to individuals or institutions. They are published so that neither individuals nor families could be identified.

So far these investigations have been performed: in the middle of pregnancy (prenatal phase), delivery, confinement, in the 6th month, in 18th month, in 3 years, 5 years, 7 years, 8 years, 11 years, 13 years and now we are preparing investigation at 15 years of age of followed children (pilot study now being evaluated).

Financial provision of the project must come from multiple sources (IGA grants, the Centre project, Intent of Scientific Research and so on).

Elaborated data have been published in form of books, numerous original and overview papers, lectures at national and international proceedings, posters and so on.

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M. Čuta, L. Novák, L. Kukla (Department of Preventive and Social Paediatrics, Institute of Social Medicine and Public Health Care Administration, Faculty of Medicine, Masaryk University, Brno):
An example of using a bioversion of growth functions in a longitudinal data analysis.

Growth is one of the basic characteristics of life. It can be described in many ways and many models have been devised to generalise and fit these descriptions. The new model being introduced is based on a logistic curve that fits on empiric data using three mathematically precisely and biologically defined coefficients. These coefficients defining the curve are the starting value of a growth parameter studied (at birth, or any other age we choose), genetical limit of this parameter and yearly (or monthly or daily) increments.

The aim of this paper is to show that validity of introduced growth model was tested successfully and that the model is capable of exact data description, predictions and comparations. Moreover, this model can compute growth dynamics of an individual rather than just statistically describing a study set somehow sampled and represented in a mean value. Energy intake necessary for sustaining growth recorded at any given point of a model curve can be calculated for each individual.

The logistic growth model was tested on a subset of individuals from the ELSPAC project (European Longitudinal Study of Pregnancy and Childhood). Validity was also tested on mean values of this study, of Brno longitudinal study by Marie Bouchalová and a transversal study by Pavel Bláha (1999).

We proved that this model is functional and reliable. It can be used not only in managing large quantities of longitudinal growth data, but also in data comparations and, most importantly, in analyzing growth dynamics of an individual with an output in energy balance and possibility of decoding various causes of fluctuations in individuals´ curves.

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