РЕЗЮМЕТА НА НАУЧНИТЕ ТРУДОВЕ
СЛЕД ЗАЩИТА НА ДОКТОРСКА ДИСЕРТАЦИЯ
на гл. ас. д-р Петя Влашева Хаджибожева-Георгиева

За участие в конкурс за заемане на академична длъжност **доцент** в област на висшето образование 4. Природни науки, математика и информатика, професионално направление 4.3. Биологически науки, по научна специалност „Физиология на животните и човека“, към катедра “Физиология, патофизиология и фармакология“, Медицински факултет, Тракийски Университет, гр.Стара Загора
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Angiotensin II and Vasopressin effects on motor activity of rat isolated tissue strips from urinary bladder and rectum

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The purpose of this study was to analyze and compare the force and time-parameters of Angiotensin II (Ang II) and Arginine-Vasopressin (AVP)-provoked contractions on muscle strips from rat urinary bladder and rectum in experiments in vitro. Mature Wistar rats, weighting 250–300g, were used. Longitudinal strips from urinary bladder and rectum were prepared and influenced by Ang II and AVP in a dose of 10^{-6} M. The recorded force-vs.-time curves were analyzed including calculation of amplitudes, area under the curve (AUC) of the smooth muscle contraction, as well as defining of different time-parameters. Ang II and AVP caused urinary bladder tonic contractions with similar amplitudes (1.74 ± 0.27 g and 1.55 ± 0.16 g, respectively) and different AUC. Marked difference was observed in the application of both peptides on strips from rectum. Ang II caused tonic reactions with amplitude of 4.60 ± 0.42 g, while AVP do not change significantly phasic contractions. The time-parameters analysis established an analogy in the developed response to Ang II of both organs.In urinary bladder, the action of Ang II derivatives and the interactions of the two peptides with the ion channels of the plasmalemma might be the reason for the observed differences in the contraction parameters.The similarity in the time-parameters of Ang II-mediated contractions of the bladder and the rectum indicates an analogical mechanism of the development of the contraction. The lack of a rectal tonic response when AVP was applied is probably due to different type of the receptors or modifications in the transductional signal pathway.

Key words: Angiotensin II, Vasopressin, rectum, urinary bladder, time-parameters

220

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EFFECTS OF SOME VASOACTIVE NEUROPEPTIDES ON MOTOR ACTIVITY OF SMOOTH MUSCLE ORGAN´S STRIPS FROM DIFFERENT AREAS OF GASTROINTESTINAL SYSTEM

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Abstract

ILIEVA, G., A. TOLEKOVA, R. KALFIN, P. HADZHIBOZHEVA and Ts. GEORGIEV, 2014. Effects of some vasoactive neuropeptides on motor activity of smooth muscle organ´s strips from different areas of gastrointestinal system. *Bulg. J. Agric. Sci.*, 20: 220-226

The aim of this study was to analyze in detail and to compare the effects of Angiotensin II (Ang II) and Arginine - vasopressin (AVP) on the contractile activity of smooth muscle strips from different rat gastrointestinal segments by application of time-parameter analysis. Longitudinal muscle strips from the rat stomach and intestine were used for in vitro recording of contraction, iduced by Ang II (10^{-6} M) and AVP (10^{-6} M). Amplitude, area under the curve (AUC) and time-parameters of the curves force-vs.-time of the contraction were determined. The colon and rectum responded to Ang II with more powerful contractions (3.43 ± 0.56 g and 4.74 ± 0.65 g, respectively). Jejunum and colon from one side and stomach, duodenum and rectum on other hand showed a similar pattern of contractions and relaxations. The response of the ileum was different. It was shown bilateral symmetry in the responses of the gastrointestinal tract. The differences in the responses of smooth muscle strips on Ang II in the various segments are probably due to unequal distribution of the density and opposite effects of AT_1 and AT_2-receptors, the presence of local RAS and activation of various transduction pathways. AVP induced tonic contractions of the preparations from the stomach. In the intestines, AVP was ineffective.

Key words: smooth muscle strips, organ baths, angiotensin II, vasopressin

Abbreviations: ACE – Angiotensin-converting enzyme; Ang II – Angiotensin II; AUC – Area under the curve; AVP – Arginine-vasopressin; DAG – Diacylglycerol; GIT – Gastro-intestinal tract; IP_3 – Inositol triphosphate; RAS – Renin-angiotensin system; SMC – Smooth muscle contractions

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Agricultural Academy

MODULATORY EFFECTS OF PEPTIDE GHRELIN ON URINARY BLADDER AND ITS ROLE IN DIABETES

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Abstract

HADZIBOZHEVA, P. V., M. I. LAZAROVA, A. N. TOLEKOVA and R. E. KALFIN, 2014. Modulatory effects of peptide ghrelin on urinary bladder and its role in diabetes. *Bulg. J. Agric. Sci.*, Supplement 1: 15–19

Plasma ghrelin levels manifest "biphasic changes" in diabetes mellitus. In order to investigate ghrelin effects and mechanisms of action in diabetes, firstly we should know how this peptide modulates urinary bladder muscles under normal conditions. We found no statistically significant changes in contractile activity after application of ghrelin alone as compared to the spontaneous activity. The effects of ghrelin were displayed when it was applied in combination with other peptides. For example, 30 min after ghrelin application, the administration of Ang II did not lead to the typical tonic contractions occurring when only Ang II was administrated. The amplitude of the Ang II stimulated contractions was reduced from 1.90 ± 0.20 g to 0.78 ± 0.09 g in the presence of ghrelin ($n = 21$, $P < 0.05$). Based on these results we can assume that the urinary bladder possesses receptors for ghrelin, which are different from those in the digestive tract, with respect to the kind of intracellular signalling mechanism to which they are coupled.

Key words: ghrelin, urinary bladder, contractile activity, smooth muscle, diabetes
Abbreviations: *Ang* II – angiotensin II; GOAT – O-n-octanoylation at serine 3 through the enzyme ghrelin O-acyltransferase; AVP – vasopressin; AUC – area under the curve

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ANGIOTENSIN II RECEPTOR BLOCKADE – IMPORTANCE FOR INTESTINAL SMOOTH MUSCLE TONE

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(*Submitted by Academician P. Vassileva on February 5, 2015*)

Abstract

The significance of AT_1 and AT_2 receptor subtypes for the development of Angiotensin II (Ang II)-induced contractions of different intestinal segments was investigated. Longitudinal strips from rat jejunum, ileum, colon and rectum were prepared and treated by Ang II in a dose of 1 μM. The specific effects on Ang II receptors were studied by pretreatment with the selective AT_1 antagonist Losartan (100 nM) or AT_2 receptor blocker PD 123319 (100 nM). The recorded force vs. time curves of smooth muscle contractions were explored by calculation of amplitudes, integral force, the power of the contraction, as well as time parameter analysis. The application of Losartan caused significant reduction of the amplitude of smooth muscle contraction of preparations from colon and rectum (2.53 ± 0.12 g and 2.79 ± 0.25 g, respectively) in comparison to those provoked with Ang II alone (3.43 ± 0.38 g and 4.74 ± 0.44 g). The blockade of AT_1 receptors completely neutralized Ang II-provoked jejunal activity. Pretreatment with PD 1233319 caused significant reduction of the amplitude of jejunal and rectal contractions (0.47 ± 0.08 g and 2.86 ± 0.33 g, respectively) and led to significantly higher amplitude of the ileal smooth muscle response (2.11 ± 0.16 g). The results indicate the predominant role of AT_1 receptors for the induction of smooth muscle contraction. The blockade of AT_2 receptors affects both phases of the smooth muscle contraction – AT_2 receptors are of importance for the development of the intestinal response to Ang II, especially for the initiation and maintenance of the rectal muscle contraction.

Key words: Angiotensin II, receptor antagonists, smooth muscle, isolated tissue, intestine

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Angiotensin II-induced motility of reservoir smooth muscle organs from ghrelin and melatonin-treated diabetic rats

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The purpose of the study was to assess the effect of short–term ghrelin (GHR) or melatonin (MLT) treatment on Angiotensin II (AngII)-provoked motility of stomach, rectum and urinary bladder of rats with streptozotocin (STZ)-induced diabetes. Mature Wistar rats were divided into 4 groups: control; STZ-treated: by a single STZ injection; MLT-treated: single STZ injection, followed by MLT treatment for 7 consecutive days; GHR-treated: single STZ injection, followed by GHR treatment for 7 consecutive days. The experiment lasted 42 days and in the end, preparations from the reservoir organs were prepared and influenced by AngII. The analysis of power and kinetic parameters of the obtained contractions was made by KORELIA Software.

STZ-induced diabetes affected differently AngII-provoked contractile activity of reservoir organs. In the MLT-treated group, powerful responses to Ang II of the stomach (1.91±0.07 g) and weak Ang II-induced contractions of urinary bladder preparations (1.12±0.11 g) in comparison to controls (1.14±0.13g and 1.74±0.22g, respectively) were observed. Administration of GHR almost completely recovered the normal force characteristics of urinary bladder contractions and accelerated the duration of stomach contractions. The responses to Ang II of rectal preparations from animals treated with GHR or MLT were not improved.

Although partial, there were registered favorable effects of short-term application of MLT or GHR in animals with STZ-induced diabetes. The beneficial effect on Ang II-induced stomach and urinary bladder motility was probably due to antioxidant and pro-kinetic properties of MLT or GHR on the smooth muscle.

Key words: Angiotensin II, Ghrelin, Melatonin, diabetes, smooth muscle

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Effect of N-[N'-(2-chloroethyl)-N'-nitrosocarbamoyl-glycine amide of 2,2,6,6-tetramethyl-4-aminopiperidine-1-oxyl (SLCNUgly) on Angiotensin II-mediated smooth muscle activity of organs in pelvic cavity

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Persistent hyperglycemia during diabetes mellitus impairs contractile responses of smooth muscles to pressor hormones like Angiotensin II (Ang II). The main etiological factor for this diabetic disturbance is the excessive formation of reactive oxygen radicals leading to oxidative stress and disrupted cell calcium signaling machinery. Therefore antioxidants have the potential to improve smooth muscle diabetic dysfunction.

The purpose of this study was to assess the effects of administration of SLCNUgly on the oxidative and glycemic status and on Ang II – induced motility of organs from the pelvic cavity of rats.

Mature female Wistar rats were divided into three groups: control group (intact animals); STZ-treated group (single injection of 60 mg/kg STZ); group, treated seven consecutive days after STZ injection with 10mg/kg SLCNUgly. In the end of experimental period, longitudinal strips from the urinary bladder, rectum and uterus were prepared and influenced by Ang II (1μmol). The obtained contraction curves were analyzed by calculation of force and time-parameters of the contractile process. The concentrations of ascorbate radicals, ROS production and lipid peroxidation (malondialdehyde) were evaluated in tissue homogenates from the liver, kidney and pancreas.

The seven-day administration of SLCNUgly improved significantly the glycemic status. It caused an additional reduction of Ang II-mediated response and greatly decreased the half relaxation phase of the myometrial response. Rectal preparations from SLCNUgly-treated diabetic rats responded to Ang II with reduced force parameters. The nitrosourea tends to normalize force and time-parameters of the urinary bladder. SLCNUgly has a small effect over amelioration of tissue oxidative damages.

Key words: Angiotensin II, SLCNUgly, smooth muscle contraction, oxidative stress, Streptozotocin

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Short-Term Administration of Melatonin or Ghrelin on Diabetic Rats: Effects on Angiotensin II and Vasopressin–Induced Uterine Contractility

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Summary

The aim of the present study was to investigate the effects of Angiotensin II (Ang II) and Arginin-Vasopressin (AVP) on contractility of non-pregnant uterus in diabetic Wistar rats and to explore whether one-week administration of Melatonin (MLT) or Ghrelin (GHR) will change the response of diabetic uterine muscle to AngII and AVP. Uterine horns, prepared by the method of isolated tissues were investigated as well as glycemic profile, blood pressure and body weight. The research of smooth muscle contractions was made by a new method of analysis, characterizing in detail the various phases of the myometrial activity. Differences in the development of the peptide-mediated smooth muscle contractions depending on the phase of the estrous cycle were observed. Experimental diabetes had a pronounced negative effect on force and time-parameters of AngII and AVP-stimulated uterine contractions. Administration of GHR or MLT had a beneficial effect on the glycemic status of diabetic rats and partially improved the response of uterine preparations to the peptides. The application of MLT increased both force and time-parameters of Ang II-and AVP-stimulated uterine contractions while treatment with GHR increased power characteristics and shortened contraction and relaxation of the smooth muscle process.

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https://doi.org/10.31925/farmacia.2019.6.20 **ORIGINAL ARTICLE**

VITAMIN D EFFECTS ON LIPID PROFILE AND URIC ACID LEVELS IN THE EXPERIMENTAL MODEL OF METABOLIC DISORDERS IN FRUCTOSE FED WISTAR RATS

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Abstract

A growing number of studies suggest that hyperuricemia and low vitamin D levels could contribute to the pathogenesis of metabolic disorders and the development of metabolic syndrome and *vice versa* - the development of metabolic disorders itself could lead to low vitamin D levels and high uric acid levels. The present study aims to investigate the role of vitamin D effects on uric acid levels and lipid profile in the experimental model of metabolic disorders in fructose fed male Wistar rats. In our study we confirmed the protective role of vitamin D and its effects in lowering the elevated uric acid levels. Vitamin D decreases glucose and uric acid concentrations and improves the cardiogenic lipid profile (cholesterol/HDL and LDL/HDL).

Rezumat

Un număr tot mai mare de studii sugerează că hiperuricemia și nivelurile scăzute de vitamina D pot contribui la patogeneza tulburărilor metabolice și la dezvoltarea sindromului metabolic și *vice-versa* - dezvoltarea tulburărilor metabolice în sine ar putea conduce la niveluri scăzute de vitamina D și niveluri ridicate de acid uric. Studiul de față își propune investigarea rolului efectelor vitaminei D asupra nivelurilor de acid uric și asupra profilului lipidic într-un model experimental al tulburărilor metabolice la șobolani Wistar. În prezentul studiu a fost confirmat rolul protector al vitaminei D și efectele acesteia în asupra valorilor crescute de acid uric. Vitamina D scade concentrațiile de glucoză și acid uric și îmbunătățește profilul lipidelor cardiogene (colesterol/HDL și LDL/HDL).

Keywords: vitamin D, uric acid, metabolic disorders

AIP Conference Proceedings

Mild Laboratory-Induced Metabolic Disorder in Rats. Effect on Erythrocyte Membrane According to a Dielectroscopic Study

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Abstract. This study concentrates on the effect of mild metabolic disorder (MMD) in fructose-fed rats on the submembrane skeleton MS of their erythrocytes relying on the relationship between membrane structure and its dielectric properties. The segmental flexibility of MS and its attachment to the lipid membrane of erythrocytes is expressed by the MS intrinsic dielectric polarization. The latter was assessed by the difference in dielectric properties of erythrocytes (complex impedance, Z*, and capacitance, C*) prior to and after the thermal denaturation of spectrin assuming the dielectric activity of denatured spectrin nil. The erythrocytes of control (n=4) and fructose-fed (n=5) rats were isolated, washed, suspended in isotonic 10 mM NaCl/mannit solution (hematocrit 0.45) and heated (1.5 °C/min). At the denaturation temperature of spectrin (49°C) the dielectric properties of erythrocyte suspension sustained threshold changes $\Delta Z^* = \Delta Zre + j\Delta Zim$ and $\Delta C^* = \Delta Cre - j\Delta Cim$. The frequency analysis of ΔZre, ΔZim, ΔCre and ΔCim indicated strongly increased contribution of spectrin to the dielectric properties of erythrocyte membrane. Thus, spectrin contribution to the static capacitance of erythrocyte membrane was 83 % greater and that to the dipole loss of erythrocyte membrane was 38 % greater in erythrocytes from MMD rats, compared to control RBCs. This finding is suggested to be due to the moderate increase in glucose level and related increase in phosphorylation of membrane proteins in MMD rats.

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Effect of oxidative stress on angiotensin II-induced smooth muscle contractile activity of urinary bladder from fructose fed rats

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The persistent hyperglycemia in the diabetes and metabolic syndrome causes a generation of reactive oxygen species (ROS) and can seriously violate the oxidative homeostasis. This could affect the oxidative sensitive signal transduction pathways, thus contributing to the pathogenesis of some later complications as is the smooth muscle dysfunction. The purpose of this study was to examine the effects of fructose intake on the oxidative homeostasis and on Angiotensin II (AngII) – induced motility of the urinary bladder. Mature Wistar rats were randomly divided into two groups (9 rats per group): control group (drinking tap water) and fructose-drinking group (15% fructose, dissolved in tap water). The duration of the experiment was 12 weeks. In the end of the experimental period, strips from urinary bladder were prepared and influenced by AngII. The curves of contractions were analyzed and the parameters of the contractile process were calculated. Detection of the oxidative status was performed by the evaluation of ascorbate radicals, ROS production and lipid peroxidation in tissue homogenates from liver, kidneys and blood. The plasma glucose and some parameters of lipid metabolism were registered. The developed metabolic disturbances decreased force parameters, changed the time profile characteristics, and reduced the speed of AngII-stimulated urinary bladder contraction. The oxidative imbalance was clearly demonstrated by the elevated levels of NO• and reactive oxygen radicals. Metabolic and oxidative disturbances as a result of fructose-fed diet modified the smooth muscle contractile activity and led to a smooth muscle dysfunction.

Keywords: Angiotensin II, fructose, oxidative imbalance, urinary bladder

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Original Article

Metabolic Disorders Induced by Fructose-drinking Water Affect Angiotensin II-mediated Intestinal Contractility in Male Wistar Rats

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Abstract

Introduction: The high-fructose diet in rats has been reported to cause metabolic disorders such as impaired fasting glucose levels, insulin resistance, dyslipidemia, and dysregulation of the renin-angiotensin system. This could lead to further complications, for instance, to the smooth muscle dysfunction.

Aim: The present study aimed at developing fructose-induced metabolic perturbations in rats and the investigation of their impact on angiotensin II-induced smooth muscle intestinal motility.

Materials and methods: Mature Wistar rats were randomly divided into two groups (9 rats per group): control group (drinking tap water) and fructose-drinking group (15% fructose, dissolved in tap water). At the end of the experimental period (11 weeks), the plasma levels of insulin, renin, angiotensin II and creatinine, as well as the lipid profile were assessed. Morphometric analysis and lipid index calculation were also performed. The contractile properties of ileum, colon and rectum were studied using stimulation with angiotensin II in the isolated tissue bath system.

Results: Our experiment showed that drinking 15% fructose solution induced dyslipidaemia accompanied by elevated lipid indexes as well as an increase in creatinine and renin plasma levels in the rats.

Conclusions: Fructose drinking and consequently the developed metabolic disorders modified the Ang II-induced intestinal activity causing a gradual alteration in the distal direction with the rectum being the most strongly affected organ.

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ORIGINAL ARTICLE

Analysis of angiotensin II-Induced rat urinary bladder contractions in the presence of angiotensin II receptors blockers

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ABSTRACT

Objective: An application of a specific analysis on recordings obtained from urinary bladder (UB) preparations influenced with Angiotensin II (AngII) and AngII receptor (ATR) blockers was performed.

Methods: UB preparations were divided as follows: group 1 stimulated with AngII only; group 2:PD123319 (ATR type-2 blocker)+AngII; group 3:Losartan (ATR type-1 blocker)+AngII. The averaged time and force parameters of the contractions were processed by a spline interpolation and graphic images of the different patterns of the contractile activity were obtained.

Results: The speed of AngII-induced UB contraction, when PD123319 was administered, was significantly higher than those, registered by the application of AngII alone and Losartan + AngII. The presence of Losartan markedly delayed the speed of the overall AngII-induced contraction.

Conclusion: The study indicates the contribution of both ATR subtypes for the development of AngII-induced UB contraction. Our results showed that probably ATR mediate a reciprocal dynamic response to AngII in the bladder.

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Angiotensin II receptors; smooth muscle contraction; urinary bladder

PHARMACIA

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Research Article

Therapeutic approach of glutathione/ glutathione peroxidase-4 axis modulation in the light of ferroptosis

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Abstract

In the 21st century beginning, the evidence of a new type of programmed cell death, different from apoptosis, began to accumulate. In 2012, the ferroptosis concept was officially introduced. It refers to a kind of cell death that is associated with iron accumulation in the cell, impaired redox potential, and ROS increment with concomitant lipid peroxidation. Ferroptosis plays an important role in the pathophysiology of several organ damages such as tumors, neurodegenerative, ischemia-reperfusion, inflammatory diseases, and others. In ferroptosis, the leading mechanism is the glutathione (GSH) depletion and inactivation of Glutathione peroxidase-4 (GPX4), which strongly shifts the oxidative balance in the cell, leading to the activation of certain signalling pathways to induce oxidative death. The article aims to focus attention on the modulation of the GSH/GPX axis as a key factor in the treatment of these diseases.

PHARMACIA

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Research Article

Appetite–regulating hormones in rats with fructose-induced metabolic changes

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Abstract

Objectives: The aim of this research is to examine the effects of fructose-drinking on the plasma levels of appetite-regulating hormones insulin, leptin and ghrelin in male and female rats.

Methods: Mature Wistar rats were divided as follows: two control groups - male (CM) and female (CF); two fructose-drinking groups - male (FDM) and female (FDF), received 15% fructose solution. The experiment lasted 11 weeks. At the end, insulin, leptin and ghrelin levels as well as lipid and glucose profile were assessed.

Results: Plasma concentrations of the examined hormones were elevated in fructose-drinking groups. However, in the FDM group only the leptin levels were significantly increased compared to the control. In the FDF group, all three appetite-regulating hormones showed the highest concentrations in comparison to the other groups.

Conclusion: Sex hormones may affect the appetite-regulation signals and could be a factor contributing to degree of metabolic changes caused by long-term fructose overconsumption.

Keywords

Appetite, Fructose, Ghrelin, Insulin, Leptin

pharmaceuticals

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Article

Vitamin E and Silymarin Reduce Oxidative Tissue Damage during Gentamycin-Induced Nephrotoxicity

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Abstract: Aminoglycoside antibiotics and gentamicin (GN), in particular, are still widely used in clinical practice. It is a well-known fact that GN causes nephrotoxicity, and redox disturbances are discussed as a factor in its side effects. Recently, a new type of cell oxidative death, named ferroptosis, was discovered; it is associated with iron accumulation in the cell, glutathione (GSH) depletion and inactivation of glutathione peroxidase-4 (GPX4), reactive oxygen species (ROS) increment with concomitant lipid peroxidation. In this regard, a possible connection between GN-induced renal damage, ferroptosis and the overall antioxidant status of the organism could be investigated. Moreover, due to its beneficial effects, GN is still one of the main choices as a therapeutic agent for several diseases, and the possible reduction of its side effects with the application of certain antioxidants will be of important clinical significance. The study was conducted with adult male white mice divided into several groups (n = 6). GN nephrotoxicity was induced by the administration of GN 100–200 mg/kg i.p. for 10 days. The control group received only saline. The other groups received either Vitamin E (400 mg/kg p.o.) or Silymarin (200 mg/kg p.o.) applied alone or together with GN for the same period. After the end of the study, the animals were sacrificed, and blood and tissue samples were taken for the assessment of biochemical parameters and antioxidant status, as well as routine and specific for GPX4 histochemistry examination. The experimental results indicate that GN-induced nephrotoxicity negatively modulates GPX4 activity and is associated with increased production of ROS and lipid peroxidation. The groups treated with antioxidants demonstrated preserved antioxidant status and better GPX4 activity. In conclusion, the inhibition of ROS production and especially the suppression of ferroptosis, could be of clinical potential and can be applied as a means of reducing the toxic effects of GN application.

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Chapter 8

PEPTIDERGIC REGULATION OF THE URINARY BLADDER FUNCTIONS

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ABSTRACT

The regulation of the urinary bladder activity is an interesting scientific research field. Many mediators and modulators of the vegetative nerve system or locally generated ones are involved in the adjustment of the bladder function. However, despite its high prevalence and cost to society urinary incontinence remains poorly studied and poorly understood, as does the normal peptidergic control and functioning of the urinary bladder. Periodic bladder ischemia during obstructed micturition has been suggested to result in the partial denervation of the detrusor smooth muscle, through ischemia and reperfusion injury to the neurons within the bladder wall.

This manuscript presents an overview on the peptidergic regulation of the urinary bladder functions and contractile activity by ghrelin, vasoactive intestinal peptide, angiotensins and vasopressin. Original results obtained by the authors regarding effects and mechanisms of ghrelin action on Angiotensin II and arginine-vasopressin mediated contractions of urinary bladder, as well as protection of detrusor nerves from experimental ischemia and reperfusion injury by vasoactive intestinal peptide are also discussed.

Chapter 6

The Effects of Some Neuropeptides on Motor Activity of Smooth Muscle Organs in Abdominal and Pelvic Cavities

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1. Introduction

1.1. Neuropeptides

Neuropeptides are intracellular peptides, composed of short chains of amino acids and found in brain tissue. They are often localized in axon terminals at synapses and are released as intercellular messengers that transmit information in the central nervous system, gastro-intestinal tract etc. Many are also hormones released by nonneuronal cells. Neuropeptides can be divided and grouped according their site of synthesis and secretion or their structural or functional characteristics. Currently recognized neuropeptides include all hypothalamic releasing hormones, pituitary hormones, gastro-intestinal and brain peptides, some circulating hormones, opioide peptides, neurohypophyseal hormones etc (Siegel, 2006). Some neuropeptides are secreted by the nerve terminals with conventional neurotransmitters. But which are the differences between the classical neurotransmitters and the neuropeptides? The precursors of neuropeptides have at least 90 amino acids residues - larger than the precursors of the neurotransmitters. The synthesis of neuropeptides is carried in the neuronal soma and then is transported to the axonal ends. The secretion of neuropeptides requires lower concentration of intracellular Ca^{2+} in comparison to transmitters. After secretion the neuropeptides or their precursors are reused in the synapse. The concentration of the neuropeptides in the tissue is very low and they interact with the receptors at lower concentrations than neurotransmitters. Neuropeptides appearance and secretion are very plastic (Siegel, 2006). For example in pathological conditions, the number of endocrine cells that secrete neuropeptides can not only increase but also appear unusual locations as a result of additional stimulation (Gulubova et al., 2012).