

References

1. Finck, B.N. PGC-1 coactivators: Inducible regulators of energymetabolism in health and disease / B.N. Finck, D.P. Kelly // J. Clin. Invest. – 2006. – Vol. 116. – P. 615–622.
2. Reducedmitochondrial density and increased IRS-1 serine phosphorylation in muscle of insulin-resistant offspring of type 2 diabetic parents / K. Morino [et al.] // J. Clin. Invest. – 2005. – Vol. 115. – P. 3587–3593.
3. Shulman, Impaired mitochondrial activity in the insulin-resistant offspring of patients with type 2 diabetes / K.F. Petersen [et al.] // NEJM – 2004. – Vol. 350. – P. 664–671.
4. Kelley, D.E. Dysfunction of mitochondria in human skeletal muscle in type 2 diabetes / D.E. Kelley, J. He, E.V. Menshikova, V.B. Ritov // Diabetes – Vol. 51. – P. 2944–2950.
5. Deficiency of subsarcolemmal mitochondria in obesity and type 2 diabetes / V.B. Ritov [et al.] // Diabetes. – 2005. – Vol. 54. – P. 8–14.
6. Cardiac mitochondrial damage and biogenesis in a chronic model of type I diabetes / X. Shen [et al.] // Am. J. Physiol. Endocrinol. Metab. – 2004. – Vol. 287. – P. E896–E905.
7. Kuo, T.H. Defective oxidative metabolism of heart mitochondria from genetically diabetic mice / T.H. Kuo, K.H. Moore, F. Giacomelli, J. Wiener // Diabetes – 1983. – Vol. 32. – P. 781–787.
8. Reduced mitochondrial oxidative capacity and increased mitochondrial uncoupling impair myocardial energetics in obesity / S. Boudina , S. Sena, B.T. O'Neill, P. Tathireddy, M.E. Young, E.D. Abel, // Circulation – 2005. – Vol 112 – P 2686–2695.
9. Lipid-induced insulin resistance: unravelling the mechanism / Samuel VT, Petersen KF & Shulman GI // Lancet – 2010. – Vol. 375. – P 2267–2277.

DEVELOPMENT OF MITOCHONDRIA DYSFUNCTION DURING DIABETES

Mohammed Mustafa Luay Mohammed

Mitochondria are the center of fatty acid and glucose metabolism and thus they are highly likely to be impacted by metabolism associated with diabetes.so it is important to give an overview about the possible mechanisms by which impairments in mitochondrial oxidative metabolism (i.e. mitochondrial dysfunction) could affect insulin sensitivity.

**THE DYNAMICS OF TOTAL COLLAGEN AND ITS TYPE CONTENT
IN DAMAGED AREA OF GUINEA PIG SKIN UNDER BURNS WITH
DIFFERENT ORIGIN**

Polikarpova H.V.

*Kharkiv National Medical University, 61022, Nauky ave., 4, Kharkiv, Ukraine,
H.polikarpova@yahoo.com*

Burn is very frequent type of trauma, occurring at home and in industry. Burn lesions are belonged to injury characterized by a high degree of severity. Scalds are divided to thermal, chemical, radial according to the etiology. So far, however, there is no work, which would be carried out a comparative study of the features of reactions to these kinds of burns. That's why, the study of regulatory mechanisms of such damage repair is very important.

Collagen is the main part of the dermis (75% of the dry weight of the skin) and is the main structural component of connective and scar tissue. During the progression of wound healing the granulation tissue is converted from high vascularized tissue rich in cellular elements to avascular and acellular collagen matrix. Despite the numerous literary data the dynamics of collagen synthesis and comparative characteristic of this process under different types of burns are not understood well still.

The aim of research is the investigation of total collagen and its type content in damaged area dynamics and the comparison of these under thermal, chemical and radial burn.

Materials and methods. The study was carried out on 147 white four-month male guinea pigs, weighing 470 - 600 g, which were kept under standard vivarium conditions. Working with animals was performed according to the requirements of the "European Convention for the Protection of vertebrate animals used for experimental and other scientific purposes" and "General principles of animal experimentation," approved the first National Congress on Bioethics (20.09.2001, Kyiv, Ukraine), Law Ukraine "on protection of animals from cruelty» (№ 3447-IV of 21.02.2006).

Four groups of animals are formed: control, with thermal burn, with chemical burn and with radial burn. Thermal burn is caused by contact using hot metal stamp in previously shaved thigh area of 3 cm² ($S = 3 \text{ cm}^2$, $t = 250^\circ\text{C}$, exposure 2 min) under mild ether anesthesia. The chemical burn is caused by the application of the 20% hydrochloric acid solution on the pre-shaved thigh area of 3 cm² ($S = 3 \text{ cm}^2$, exposition 2 min) under mild ether anesthesia. Radial burn is caused by radiation exposure X-rays in the pre-shaved thigh area of 3 cm² in the exposition dose of 60 Gr in installing URS-50 (TYR - 60, 50 kV, 10 mA, 0.6 m filter Al dose 36,74 Gr / min exposure area 1 cm²) under mild ether anesthesia. The study of total collagen content was carried out by histochemical method. Determination of collagen types was performed by using monoclonal antibodies with fluorescent mark (Wallas, Austria). The investigation of all above indexes were carried out in dynamics: after 1 hour, 1 and 3, 5, 7 and 10 days after all investigated injuries and in the case of X-ray action after 21 and 35 days also.

Results. The minimal value of total collagen and collagen I, III, V and VI types in the affected skin area under thermal and chemical burns was observed at one hour after exposure during the formation of blisters, ulcers, necrosis, maximal activity of lipid peroxidation and maximal level of proinflammatory cytokines. Further, under reducing of the inflammatory response, activation of antioxidant system, neutralizing free radicals and lipid peroxidation normalization, a gradual increase of collagen is observed. At the seventh day for thermal burn and at the fifth day for the chemical the total collagen and all its studied type level in the skin was approached to the reference level corresponding to the stage of full wound cleaning from decay products and start

filling the defect by granulation. For a long period after radial exposure a gradual decline of total collagen and collagen I, III, V and VI types in the affected skin area was observed, a minimal value of all studied parameters was found only at the twenty-first day after irradiation corresponding period of desquamation, scab formation, scald sealing and ulcer formation and increase of lipid peroxidation products in several times compared with the control.

It should be noted that the twenty-first day after chemical or thermal action the defects are fully covered by epithelia, so far the process of their healing is completed. At the thirty-fifth day after the radial burn the levels of total and all studied collagen types are slightly increased, but all indexes were significantly lower than at the fifth day in after chemical and at the seventh day after the thermal injury.

Conclusion The dynamics of collagen content in the damaged skin area under thermal and chemical burns is consistent with the normal stages of tissue repair. So its sharp decline at the early stages during the activation of the inflammatory response and the prevalence of destructive changes contributes the its synthesis increase in response to increased levels of anti-inflammatory cytokines and activation of the pituitary-adrenal system, which means the ending of inflammatory and beginning of proliferative phase. A completely different picture is observed under radial burn: the gradual reduction of collagen in the early stages is observed, the minimal value of this index is found only at the twenty-first day after radial exposure, indicating a growth of destructive changes, lack of proliferative phase and violations of regulatory mechanisms of tissue repair.

ДИНАМИКА СОДЕРЖАНИЯ ОБЩЕГО КОЛЛАГЕНА И ЕГО ТИПОВ В
ПОРАЖЕННОМ УЧАСТКЕ КОЖИ МОРСКИХ СВИНОК ПРИ ОЖОГАХ КОЖИ
РАЗЛИЧНОЙ ПРИРОДЫ

Поликарпова А.В.

Было проведено сравнительное исследование динамики содержания общего коллагена, а также I, III, V и VI его типов в пораженном участке кожи морских свинок при термическом, химическом и радиационном ожогах. Результаты исследования показали, что минимальное содержание как общего коллагена, так и I, III, V и VI его типов при термическом и химическом ожогах кожи наблюдается через час после воздействия. В дальнейшем выявляется постепенное увеличение содержания всех исследованных типов коллагена, которое к 10 суткам достоверно отличается от контрольного, что свидетельствует о нормальном течении раневого процесса. Совершенно другая картина наблюдается при радиационном ожоге: постепенное уменьшение содержания общего коллагена и всех исследуемых его типов на ранних стадиях, минимальная величина этих показателей обнаруживается только на 21 сутки после лучевого воздействия, что указывает на рост деструктивных изменений, отсутствие пролиферативной фазы и нарушение регуляторных механизмов репарации тканей.