ARABINOGALACTAN-PROTEINS FROM ECHINACEA PURPUREA: CHARACTERIZATION, LOCALIZATION AND IMMUNOMODULATING PROPERTIES

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Arabinogalactan-proteins (AGPs) are macromolecular glycoproteins belonging to the putative active compounds of Echinacea preparations (1). (β-D-Glc)₃yariv phenylglycoside specifically binds to most plant AGPs and has been used to isolate AGPs from pressed juice of the aerial parts of Echinacea purpurea L. Moench (Asteraceae). The carbohydrate moiety has been classified as type II arabinogalactan consisting of a backbone of 1,3,6-Galp and 1,3-Galp, with branched side chains composed of 1,3,6-Galp, 1,6-Galp,1,5-Araf, terminal Araf and terminal GlcAp. In the protein part, AGP from pressed juice showed an amino acid sequence rather untypical for AGPs with predominantly contiguous arrangement of three to four Hyp residues in blocks (2). For microscopic localization of AGPs in fresh plant tissue, a new method has been developed. Antibodies against Yariv’s reagent have been generated in rabbits and used for immunofluorescent labeling of plant tissue. Xylem tracheary elements showed very strong labeling of the cell wall, especially at the inner side of the wall and in the area of pit canals. Preparations of pressed juice from Echinacea purpurea are used as herbal medicinal products with immunomodulating properties. In vitro, AGP from the pressed juice of herbal material showed complement stimulating activities (3) as well as binding to human leukocytes (4).


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UBIQUINOL IS ANTIHYPOXANT AND CELL ENERGIZER OF THE NEW GENERATION

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Coenzyme Q (CoQ) is low molecular component of mitochondrial electron transport chains that functions as molecular shuttle between some enzymatical complexes: NADH-CoQ-reductase (complex I); succinate-CoQ-reductase (complex II); ubiquinol (CoQH₂)-cytochrome C-reductase (complex III) that with complex IV (cytochrome C-oxidase) realize transformation of carbohydrates, fats and proteins molecular energy into rich energy compounds ATP. CoQ functions in form of quinone redox-cycle (Q-cycle) where oxidized form of CoQ (ox CoQ) via intermediate free radical and anion forms is transformed by enzymatically into its active reduce form — ubiquinol (CoQH₂). Mitochondrial Q-cycle functions so effectively that stimulates transmembrane proton transfer and ATP synthesis twofold more intensively than simple one stage redox process. But redox processes in system (ox) CoQ-CoQH₂ take place not only in mitochondrion but in another membrane structures — lysosomes, Golgi and plasma membranes and serum LDL. In lysosomes Q-cycle takes part in proton transfer in pH-dependent activation of lysosomal pro-
teases for the degradation of worked off cell proteins. Another site of (ox) CoQ-CoQH₂ action is endosomal pynocytoses that regulates transport of Fe²⁺ by transferrin into cell cytoplasm. In plasma membranes system (ox) CoQ-CoQH₂ activates of Na⁺/H⁺ antiportal proton transfer that with ATP-dependent ion transport determine intracellular homeostasis. In LDL CoQ (in CoQH₂ form) defends cholesterol and another lipid components from peroxidation. Q-Cycle determines antioxidant-prooxidant functions of CoQ but CoQH₂ only is single stable antioxidant form of CoQ. Moreover it is single enzymatically regenerated endogenic lipid antioxidant. From point of view of CoQH₂ formation three enzymatic systems are important: a) NADH-CoQ-oxidoreductace; b) NADH-cytochrome b₅-reductase; c) NADH/NADPH-oxidoreductase (DT-diaphorase). But DT-diaphorase only reduces at once (ox) CoQ in to CoQH₂ by two-electron transport. Another two enzymes reduce (ox) CoQ via one-electron transfer to semiquinone-radical CoQ that is generated by interaction of CoQH₂ with lipid radicals. Besides of right radical scavenging action Co-
CATALYTIC SYNTHESIS OF COENZYME Q REDUCE FORM AND ITS WATER SOLUBLE MOLECULAR COMPLEXES WITH β-CYCLODEXTRIN

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As known usable now in practical medicine substance of CoQ (oxidized form) is characterized by very low bioavailability (absorption in intestine is about 8–9%) that do not permit to reach of therapeutic concentration in blood. Moreover active form of CoQ is reduced CoQ — ubiquinol (CoQH2). But formation of CoQH2 in mitochondrion is decreased by numerous mitochondrial diseases (diabetes, Alzgeimer’s, Parkinson’s etc.) and with aging. Therefore application of CoQH2 is more reasonable. We have developed the new method of CoQH2 synthesis that is based on catalytic reduction of CoQ with biogenic transition metal ions Mn2+ (redox catalysis) in regenerated ascorbic acid active form. Yield of CoQH2 is equal 95–100%. Duration of synthesis from 10 to 2 minutes that depend from ascorbic acid and Mn2+ concentration. We demonstrated that reduction of CoQ in aprotic solvents is realized via triple molecular complex ascorbic acid-Mn2+-CoQ (λmax = 358 nm), where Mn2+ play role of electron transfer link between reductive agent and CoQ. Acceleration of reaction take place not only in aprotic solvents but in another solvents. Quantitatively catalytic reduction of CoQ is reached at 25°C in 60–80 times more quickly than at 60°C without catalysis. Because Mn2+ may stimulate back reaction we have developed method of Mn2+ elimination from system and that stabilize and defense of CoQH2 from oxidation. On the base of this product we have synthesized water soluble molecular complexes CoQH2 with β-cyclodextrin that in ten times more stable than free CoQH2. Size of this aggregate supramolecular complex is about 200–700 nm (by Coulter’s method of corner light scattering). New method of effective accelerate synthesis of ubiquinol (CoQH2) and stabilization of water soluble formulation of molecular complexes “CoQH2 — cyclodextrins” was developed.