junctions. The tight junctions are composed of transmembrane proteins (occludins, claudins, junctional adhesion molecules) connected to junctional plaque proteins (*i.e.* ZO-1). The transmembrane proteins of the adherens junctions are the cadherins linked through catenins (alpha, beta, gamma) to the cytoskeleton.

The blood-brain barrier is involved in a large variety of pathological processes. Little is known about the effects of nicotine exposure on BBB function. We investigated the changes affecting the tight and adherens junction proteins by cigarette smoke components, especially nicotine and polyaromatic hydrocarbons (PAHs). 24h treatment of cerebral endothelial cells with relatively high concentration nicotine led to a decrease in occludin, cadherin and ZO-1 expression. Similar but less pronounced effects were observed after 24 h treatment with phenanthrene. Results of the immunofluorescent analysis confirmed western blot data. We also performed two dimensional electrophoresis in order to explore the cellular proteins responsive to nicotine and PAHs in brain endothelial cells. We observed different responses of the cells to both nicotine and phenanthrene treatment resulting in altered expression of shock induced proteins, metabolic enzymes, signaling molecules. This confirms the cerebral endothelium as being a target to cigarette smoke components (Hutamekalin et al. 2008).

From clinical point of view, because of the relative impermeability of the barrier many drugs are unable to reach the CNS in therapeutically relevant concentration, making the BBB one of the major impediments in the treatment of CNS disorders. A number of strategies have been developed to circumvent this problem. One of the successfully used methods to deliver drugs – especially antitumoral agents – to the CNS is the osmotic opening of the BBB using mannitol. This causes a rapid opening (within minutes) of the BBB which is reversible.

We investigated the effect of mannitol treatment on brain endothelial cells and found that mannitol induced a rapid, concentration dependent, and reversible tyrosine phosphorylation of a broad range of proteins between 50 and 190 kDa. One of the targets of tyrosine phosphorylation turned out to be the adherens junction protein beta-catenin and this phosphorylation was Src-kinase dependent (Farkas et al. 2005).

Beside beta-catenin and Src kinase, we aimed to find new signaling pathways activated by hypertonicity in cerebral endothelial cells and identified the receptor tyrosine kinase Axl to become tyrosine phosphorylated in response to hyperosmotic mannitol. Besides activation, Axl was also cleaved in response to osmotic stress. Specific knockdown of Axl increased the rate of apoptosis in hyperosmotic mannitol-treated cells; therefore, we assume that activation of Axl may be a protective mechanism against hypertonicity-induced apoptosis. Our results identify Axl as an important element of osmotic stress-induced signalling. (Wilhelm et al. 2008).

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Investigation of the maturation of NiFe hydrogenases in *Thiocapsa roseopersicina*

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Our model organism, *Thiocapsa roseopersicina* BBS is an anaerobic, phototrophic purple sulfur bacterium. There are at least two membrane-bound (HynSL and HupSL) and one soluble (HoxEFUYH) [NiFe] hydrogenases in the cells. A typical [NiFe] hydrogenase is composed of a large and a small subunit. The large subunit harbors a specific NiFe catalytic metallocenter associated with CO and CN ligands (Volbeda et al. 1995.) The maturation of these complex enzymes require numerous accessory proteins. Most of these auxiliary genes were found using transposon mutagenesis, one of them was the *hupK* gene. (Maróti et al. 2003.) The product of this gene, the HupK protein is present only in organisms containing at least one membrane-bound [NiFe] hydrogenase enzyme.

The role of HupK is not known yet. In order to investigate the role of this protein, *ΔhupK* mutant strains were created, then the hydrogenase activities of the wild type and the mutant strains were compared. The results clearly showed that HupK protein is important for the formation of the functionally active membrane-bound hydrogenases, but not for the biosynthesis of the soluble enzyme. (Maróti et al. 2003.)

More detailed information can be obtained from biochemical experiments. Special expression vector was used to produce active, tagged HupK protein in homologous host. The tagged HupK protein was purified under mild conditions to retain all protein-protein interactions and the copurified proteins were analyzed by mass spectrometry. From cells grown under standard conditions, only one protein partner, namely the GroEL chaperonin could be fished out. The specific role of GroEL in the hydrogenase maturation is not likely, therefore alternative growth conditions were used to find the specific partners. Nickel starvation of the cells is supposed to result in the accumulation of the intermediates of the posttranslational process. Therefore, the tagged HupK protein was purified from such cells, however only one co-purifying band was observed: the PuhA protein, which is the H subunit of the photosynthetic reaction centre.

Metal content determination of the purified HupK protein from homologous host was performed. The HupK protein was shown to contain nickel atom in 1:2 molar ratio, and no Fe atom was detected in the sample. In order to determine, which amino acids assist in binding the nickel atom, the sequences of the HupK and the large subunits of the hydrogenases were compared. Conserved regions could be recognized at the N- and C-termini, while the middle part of the proteins was variable. The alignment uncovered two conserved cysteine residues as candidates for coordination of the metal. One of them is in the R-X-F-X-X-C motif at the amino terminus, other one is in the D-P-C-X-X-F motif at the carboxyl terminus. In order to examine the putative role of these residues, site-directed mutagenesis were performed and the effects of the mutations were monitored via the hydrogenase activties of the membrane-associated hydrogenases. A mutant carrying alanine instead of Cys378 had only 65% activity of the wild-type strain. However, the replacement of the Cys54 by alanine led to a considerable reduction in the hydrogenase activity (to 25% of the wild type level). Ni content investigation of the Cys54Ala mutant HupK protein revealed that it contains the same amount of Ni atom like the wild-type protein.

The R-X-C-X-X-C and the D-P-C-X-X-C sequences in the large subunits of NiFe hydrogenases have been shown to be essential for their activity and the cysteine residues have been proposed to form a coordination sphere surrounding the NiFe center (Przybyla et al. 1992, Volbeda et al.,1995.). In the HupK protein, phenylalanines subtitute the first and the last cysteins. In order to confer the motifs of the hydrogenas large subunit on HupK, the two phenylalanines were replaced by cysteines. The effect of these mutations on the biosynthesis of the membrane-bound hydrogenase is being investigated.

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Anthropological Analysis of the Medieval Cemetery of 'Szeged-Vár'

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The environs of Szeged was a populated area from the primitive age; archeological finds prove there were Roman inhabitants at the time of Roman Empire, and later habitation during the great migrations of Huns, Gepids and Avars. This area was important because this is where Maros runs into the Tisza River, the Maros River being an excellent and cheap transport possibility of salt from Transylvania.

The first mention of the Medieval town is from 1246. As a result of the Turkish occupation of Hungary limited data is available, making the archeological excavation of Szeged-Vár very important.

The Medieval cemetery of Szeged-Vár was used from the Hungarian conquest to 1543, and from 1686 until 1713. The excavations have been going on since 1999, and by now approximately 700 graves have been excavated, along with some objects and crypts.

In this study, we have researched 425 graves excavated between 1999 and 2004. The basis of the anthropological analysis was the determination of sex and age of death, inclusion metric data, and paleopathological and taxonomical analysis. To determine these data, we have used common anthropological methods. Paleopathological and taxonomical examinations have been carried out using macromorphological methods, though in certain cases radiographical analysis was also applied.

After the determination of sex and age, we could establish that in this population the sex ratio was 50%-50%; the percentage of infants (INF1, INF2, JUV) was 49%, and elderly (SEN) 7%.

By means of the measurements of humerus, radius, ulna, tibia and femur we determined the height of people. The average of the height of adult males was 170 cm, adult females 160 cm; the highest was 181 cm both among males and females, the minimum height was 157.5 cm among males and 147.7 cm among females.

In accordance with general medieval health, many of the skeletons showed different forms of paleopathological lesions: periostitis, osteomyelitis, arthritis; minor developmental anomalies: sacralisation, lumbarisation, spina bifida, dislocation of the hip; traumas: fractures of humerus, radius, ulna, ribs or clavicle. There also were infectious bony lesions due to TB and syphilis. We found some metabolic disturbances of bone: osteoporosis; and circulatory and hematologic disorders as well: cribra orbitalia and cribra cranii.

The taxonomical analysis could yield some very interesting information because there is no such data available for this town. There are some finds in the area of a 'Kun' population (for example in Kiskundorozsma), and we suppose there was a Mongolid population in Szeged after the Hungarian conquest. For taxonomical analysis we have to research anatomical variations like sutura metopica, os Wormiana, torus palatinus, torus mandibulae and maxillae, fossa canina and several dental variations.

This presentation is for the preliminary results only.

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