Allyl disulfide as donor and cyanide as acceptor of sulfane sulfur in the mouse tissues

Małgorzata Iciek¹, Anna Bilska¹, Lucyna Książek², Zbigniew Srebro², Lidia Włodek¹

¹Institute of Medical Biochemistry, ²Institute of Biology, Faculty of Medicine, Medical College, Jagiellonian University, Kopernika 7, PL-31-034 Kraków, Poland

Correspondence: Lidia Włodek, e-mail: mtwlodek@cyf-kr.edu.pl

Abstract:
Cytoplasm of mammalian glial cells was reported to contain Gomori-positive cytoplasmic granulation (GPCG), whose biological role is unknown. The present study attempted to discover conditions facilitating GPCG formation and to elucidate their relationship with sulfane sulfur metabolism. To address these problems, we investigated in vivo the effect of both allyl disulfide (DADS), occurring in garlic (sulfane sulfur donor) and cyanide (sulfane sulfur acceptor) on number of GPCG-containing glial cells in the mouse brain. In parallel, sulfane sulfur level and activity of rhodanese and 3-mercaptopropionate sulffurtransferase (MpST) were determined in the mouse brain and liver. Cyanide caused a drop in GPCG number in the brain, while activity of sulfurtransferases and sulfane sulfur level remained unchanged. Slight but significant cyanide-induced rise in MpST activity was observed only in the liver, which indicates a possibility of enhancement of its detoxification in reaction with mercaptopropionate in this organ. DADS, a sulfur donor, increased GPCG number in the brain, whereas activity of sulfurtransferases and sulfane sulfur level did not change. However, in the liver, DADS elevated both sulfurtransferase activity and sulfane sulfur level.

These observations suggest that DADS can constitute a source of sulfane sulfur for the liver, thereby activating anaerobic sulfur metabolism and sulfane sulfur transfer. Consequently, this leads to the increase in sulfane sulfur level in plasma, in which it is transported in the form of albumin hydropersulfides and can be used for cyanide detoxification or stored in glial cells as GPCG. Therefore, it is not excluded that GPCG observed in the brain of mice and other mammals can be a source and a store of sulfane sulfur in mammals.

Key words:
alloyl disulfide, cyanide, Gomori-positive cytoplasmic granulation in glial cells of mammalian brain