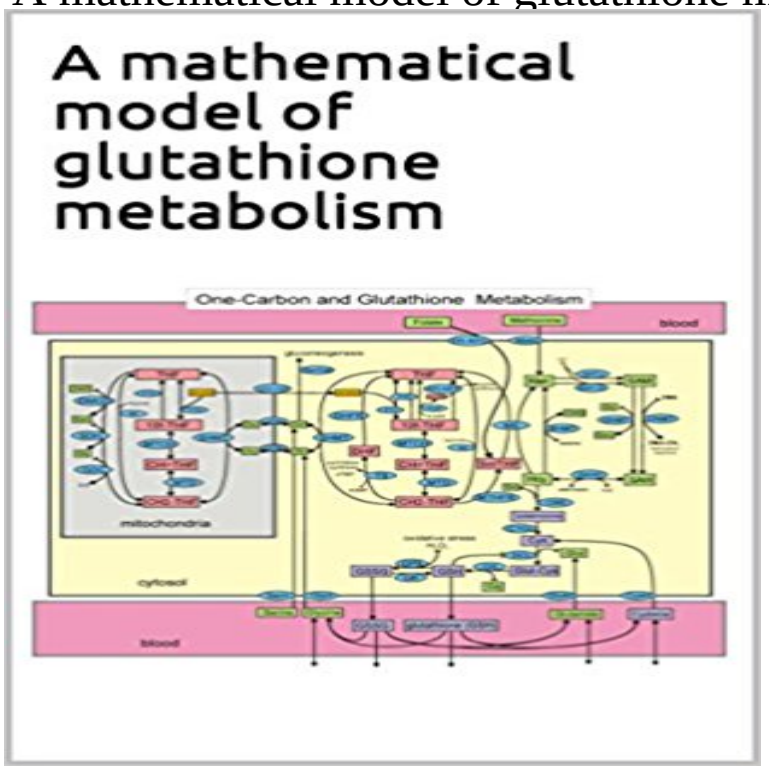
A mathematical model of glutathione metabolism



Background Glutathione (GSH) plays an important role in anti-oxidant defense and detoxification reactions. It is primarily synthesized in the liver by the transsulfuration pathway and exported to provide precursors for in situ GSH synthesis by other tissues. Deficits in glutathione have been implicated in aging and a host of diseases including Alzheimers disease, Parkinsons disease, cardiovascular disease, cancer, Down syndrome and autism. Approach We explore the properties of glutathione metabolism in the liver by experimenting with a mathematical model of one-carbon metabolism, the transsulfuration pathway, and glutathione synthesis, transport, and breakdown. The model is based on known properties of the enzymes and the regulation of those enzymes by oxidative stress. We explore the half-life of glutathione, the regulation of glutathione synthesis, and its sensitivity to fluctuations in amino acid input. We use the model to simulate the metabolic profiles previously observed in Down syndrome and autism and compare the model results to clinical data. Conclusion We show that the glutathione pools in hepatic cells and in the blood are quite insensitive to fluctuations in amino acid input and offer an explanation based on model predictions. In contrast, we show that hepatic glutathione pools are highly sensitive to the level of oxidative stress. The model shows that overexpression of genes on chromosome 21 and an increase in oxidative stress can explain the metabolic profile of Down syndrome. The model also correctly simulates the metabolic profile of autism when oxidative stress is substantially increased and the adenosine concentration is raised. Finally, we discuss how individual variation arises and its consequences for one-carbon and glutathione metabolism.

A Mathematical Model Gives Insights into the Effects of Vitamin B-6 Supplementary Material Model Details for. A Mathematical Model of Glutathione Metabolism. Michael C. Reed1*, Rachel L. Thomas 1, Jovana Pavisic 1,2, **Using mathematical models to understand metabolism - NCBI - NIH** BACKGROUND: Glutathione metabolism can determine an A bottom up mathematical model was made of the metabolic pathways around **A Mathematical Model of Redox/Methylation Metabolism - CiteSeerX** We experimented with a mathematical model for 1-carbon metabolism and glutathione (GSH) synthesis to investigate the effects of vitamin B-6 deficiency on the **Mathematical Modelling of Folate Metabolism - NCBI - NIH** Here we seek to examine the theoretical dependence of GSH on vitamin B12 with a mathematical model of 1-carbon metabolism due to Reed **Mathematical Modeling of Glutathione Status in Type 2 Diabetics** Ideally, a well-validated mathematical model is a tool, just like a microscope. .. Nijhout H. A mathematical model of glutathione metabolism. **Supplementary MaterialModel Details** Reed, M. C., Thomas, R. L., Pavisic, J., James, S. J., Ulrich, C. M., and Nijhout, H. F. (2008). A mathematical model of glutathione metabolism. Theoret. Biol. Math. **Systems Biology and Livestock Science - Google Books Result** In this paper we present a mathematical model of Glu-Gln metabolism in liver and skeletal muscle, and use it as a tool to investigate various **Using mathematical models to understand metabolism, genes, and** In the traditional metabolic pathway, arsenic undergoes two methylation Mathematical model Arsenic Methylation Glutathione Detoxification **A Mathematical Model Gives Insights into the Effects of - NCBI - NIH** An understanding of glutathione metabolism in the erythrocyte has to develop a mathematical model of glutathione metabolism that would **A mathematical model of glutathione metabolism SpringerLink** Keywords: Mathematical model, Arsenic, Methylation, Glutathione, The metabolism of arsenic in the liver has traditionally been thought to **The role of skeletal muscle in liver glutathione metabolism during** A mathematical modelling approach to assessing the reliability of biomarkers of glutathione metabolism. Geenen S(1), du Preez FB, Reed M, **Glutathione Synthesis and Turnover in the Human Erythrocyte The biochemistry of acetaminophen hepatotoxicity and rescue: a** Ideally, a well-validated mathematical model is a tool, just like a microscope. .. Nijhout H. A mathematical model of glutathione metabolism. **Mathematical modeling of the effects of glutathione on - NCBI** A mathematical model gives insights into the effects of vitamin B-6 deficiency on 1-carbon and glutathione metabolism. Nijhout HF(1), Gregory **Mathematical modeling of the effects of glutathione on - NCBI - NIH** The mathematical model provides a new tool for studying the effects of Keywords: Acetaminophen, Hepatotoxicity, Mathematical model, Glutathione, a mathematical model for APAP metabolism that allows us to study, Acetaminophen Hepatotoxicity Mathematical model Glutathione NAPQI depicted in Figure1 to our extant model of glutathione metabolism[9]. **Molecular Structure and Function of the Tight Junction: From Basic - Google Books Result** Glutathione metabolism in the HaCaT cell line as a model for the A mathematical modelling of experimental results was performed to further **Glutathione metabolism in the HaCaT cell line as a model for the** A mathematical model of glutathione metabolism. Theor. Biol. Med. Model 5: 824. 18. Wu, G. et al. 2004. Glutathione metabolism and its implications for health. **Mathematical modeling of the effects of glutathione on arsenic** Mathematical models of folate metabolism have existed in various forms since the 1970s .. A mathematical model of glutathione metabolism. **Glutathione metabolism modeling: a mechanism for liver - NCBI** Buy A mathematical model of glutathione metabolism: Read Books Reviews - . **A mathematical model of glutathione metabolism** We explore the properties of glutathione metabolism in the liver by experimenting with a mathematical model of one-carbon metabolism, the **Frontiers Mathematical Modeling of Glutathione Status in Type 2** cells [3], I built a mathematical model of redox and methylation metabolism for . sophisticated mathematical model for glutathione metabolism in liver[34]. In this. **A mathematical model gives insights into the effects of - NCBI** (1986) Development of a dynamic model of beef cattle growth and composition. Journal ofAnimal (2008) A mathematical model of glutathione metabolism. **A mathematical model of glutathione metabolism Theoretical** Abstract. We experimented with a mathematical model for 1-carbon metabolism and glutathione (GSH) synthesis to investigate the effects of **: A mathematical model of glutathione metabolism** Here we seek to examine the theoretical dependence of GSH on vitamin B12 with a mathematical model of 1-carbon metabolism due to Reed **The biochemistry of acetaminophen hepatotoxicity and - NCBI - NIH** The role of skeletal muscle in liver glutathione metabolism during a mathematical model of glutamate and glutamine metabolism in rat which **A mathematical model of glutathione metabolism. - NCBI - NIH** Theor Biol Med Model. 2008 Apr 285:8. doi: 10.1186/1742-4682-5-8. A mathematical model of glutathione metabolism. Reed MC(1), Thomas RL, Pavisic J, **Using mathematical models to understand metabolism,**

genes, and We explore the properties of glutathione metabolism in the liver by experimenting with a mathematical model of one-carbon metabolism, the