ABAT, which stands for 4-aminobutyrate aminotransferase, is an enzyme that plays a critical role in the metabolism of gamma-aminobutyric acid (GABA), an important neurotransmitter in the central nervous system. ABAT is also known by other names, such as GABA transaminase or GABA aminotransferase.

Here's a brief overview of ABAT and its functions:

GABA Metabolism: ABAT is primarily involved in the catabolism (breakdown) of GABA. GABA is a neurotransmitter that inhibits the activity of neurons in the brain and spinal cord. It is essential for maintaining the balance of excitation and inhibition in the nervous system. After GABA has performed its signaling function at synapses, it needs to be metabolized to prevent its excessive accumulation.

Transamination: ABAT catalyzes a chemical reaction called transamination, where it transfers an amino group from GABA to alpha-ketoglutarate. This results in the formation of succinic semialdehyde and glutamate. The succinic semialdehyde can further undergo metabolic processes, ultimately contributing to the citric acid cycle (Krebs cycle) and energy production.

Tissue Distribution: ABAT is found in various tissues throughout the body, but it is especially abundant in the brain, where GABA metabolism is particularly important for regulating neuronal activity.

Role in GABA Homeostasis: By participating in the breakdown of GABA, ABAT helps maintain the appropriate levels of GABA in the brain and prevents excessive inhibitory signaling. Dysregulation of GABA levels and its metabolism can lead to neurological disorders and imbalances in brain function.

Clinical Significance: Alterations in ABAT activity or mutations in the ABAT gene can lead to GABA metabolism disorders, such as succinic semialdehyde dehydrogenase deficiency (SSADH), a rare inherited metabolic disorder. SSADH deficiency can result in an accumulation of GABA and its metabolic byproducts, leading to various neurological and developmental issues.

Understanding the role of ABAT and the GABA metabolic pathway is essential for unraveling the mechanisms behind certain neurological and metabolic disorders and for the development of potential therapeutic interventions. Additionally, studying ABAT and GABA metabolism is crucial in the field of neuroscience, as GABA is a key neurotransmitter involved in the regulation of neuronal excitability and the maintenance of overall brain function.

Li et al. compared the gene expression levels in the four different medulloblastoma groups (MB-WNT, MB-SHH, MB-G3, and MB-G4), with a focus on genes associated with mitochondria. They used several tools including Salmon, Tximeta, DESeq2, BiomaRt, STRING, Ggplot2, EnhancedVolcano, Venny 2.1, and Metscape.

A total of 668 genes were differentially expressed and the most abundant genes were associated with the cell division pathway followed by modulation of chemical synaptic transmission. We also identified several genes (ABAT, SOX9, ALDH5A, FOXM1, ABL1, NHLH1, NEUROD1 and NEUROD2) known to play vital role in medulloblastoma. Comparative expression analysis revealed OXPHOS complex-associated proteins of mitochondria. The most significantly expressed genes in the MB-SHH and MB-G4 groups were AHCYL1 and SFXN5 while PAICS was significantly upregulated in the MB-WNT group. Notably, MB-G3 contained the most downregulated genes from the OXPHOS complexes, except COX6B2 which was strongly upregulated. They show the importance of mitochondria and compare their role in the four different medulloblastoma groups [1)].

1)
Li Q, Jia Y, Tang B, Yang H, Yang Q, Luo X, Pan Y. Mitochondrial subtype MB-G3 contains potential novel biomarkers and therapeutic targets associated with prognosis of medulloblastoma. Biomarkers. 2023 Oct 27:1-16. doi: 10.1080/1354750X.2023.2276670. Epub ahead of print. PMID: 37886818.