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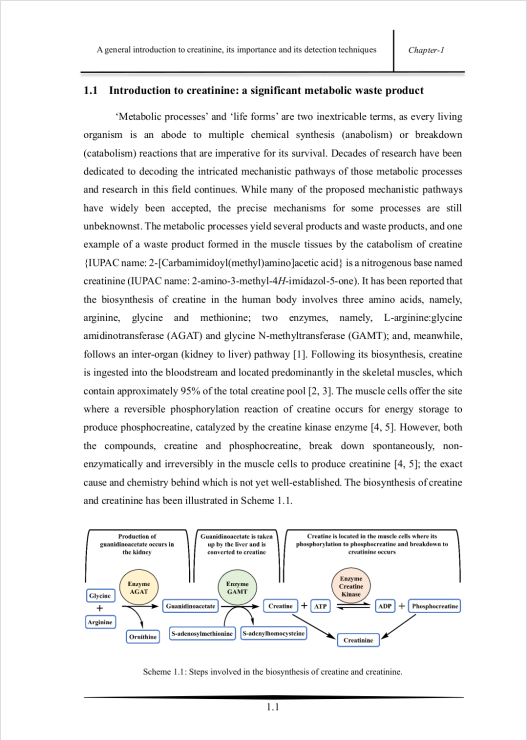

A general introduction to creatinine, its importance and its detection techniques | *Chapter-1*

1.1 Introduction to creatinine: a significant metabolic waste product

'Metabolic processes' and 'life forms' are two inextricable terms, as every living organism is an abode to multiple chemical synthesis (anabolism) or breakdown (catabolism) reactions that are imperative for its survival. Decades of research have been dedicated to decoding the intricated mechanistic pathways of those metabolic processes and research in this field continues. While many of the proposed mechanistic pathways have widely been accepted, the precise mechanisms for some processes are still unbeknownst. The metabolic processes yield several products and waste products, and one example of a waste product formed in the muscle tissues by the catabolism of creatine {IUPAC name: 2-[Carbamimidoyl(methyl)amino]acetic acid} is a nitrogenous base named creatinine (IUPAC name: 2-amino-3-methyl-4*H*-imidazol-5-one). It has been reported that the biosynthesis of creatine in the human body involves three amino acids, namely, arginine, glycine and methionine; two enzymes, namely, L-arginine:glycine amidinotransferase (AGAT) and glycine N-methyltransferase (GAMT); and, meanwhile, follows an inter-organ (kidney to liver) pathway [1]. Following its biosynthesis, creatine is ingested into the bloodstream and located predominantly in the skeletal muscles, which contain approximately 95% of the total creatine pool [2, 3]. The muscle cells offer the site where a reversible phosphorylation reaction of creatine occurs for energy storage to produce phosphocreatine, catalyzed by the creatine kinase enzyme [4, 5]. However, both the compounds, creatine and phosphocreatine, break down spontaneously, non-enzymatically and irreversibly in the muscle cells to produce creatinine [4, 5]; the exact cause and chemistry behind which is not yet well-established. The biosynthesis of creatine and creatinine has been illustrated in Scheme 1.1.

Scheme 1.1: Steps involved in the biosynthesis of creatine and creatinine.

1.1

Study of the Electrochemical Behaviour of Creatinine towards selected transition Metal ions and Electro-active materials for sensor application

by Nayab Hussain

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