

生物科学 推薦入試 小論文 〔問題〕用紙	受験番号	氏 名
受験番号と氏名を全ての用紙に記入すること。 試験終了時に全ての用紙を回収します。		

北里大学理学部生物科学科 2025年度公募制推薦入試 小論文課題

[問題] 以下の英文を読んで、下の問1~3に日本語で答えなさい。

Postmortem brains from Alzheimer's disease patients show the characteristic extracellular amyloid plaques. These plaques were shown to be composed largely of beta-amyloid peptides. ⁽¹⁾The tau protein is also associated with Alzheimer's disease. When neuronal tau becomes hyperphosphorylated, its conformation changes. The deformed tau proteins, which form neurofibrillary tangles in hippocampus brain neurons, may be a more immediate cause of the neuronal dysfunction associated with Alzheimer's disease than beta-amyloid peptides.

There is no cure yet for Alzheimer's disease, although ⁽²⁾treatments with cholinesterase inhibitors seem to slow its advancement. For example, the drug Aricept inhibits acetylcholine breakdown by acetylcholinesterase, thereby enhancing cholinergic neurotransmission, which may in turn prolong the brain's neural function. Sadly too, there is yet no treatment to restore lost memories or the significant cognitive decline associated with Alzheimer's disease. Perhaps more promising in this respect is a recent development. Proteins or peptides associated with Alzheimer's disease have been detected in the blood and serum. Beta-amyloid peptides and/or tau-protein fragments that escape into the blood stream can be detected six to eight (or more) years before Alzheimer's symptoms appear. A neurofilament light chain that is seen in a familial form of Alzheimer's disease (among other neuropathies) is detectable sixteen years before the symptoms! The ability to detect ⁽³⁾these marker proteins and Alzheimer's-associated peptides so far in advance of symptoms raises hopes for early monitoring of at-risk individuals and for new therapies for Alzheimer's disease.

[出典] Bergtrom, Gerald, "Basic Cell and Molecular Biology 5e: What We Know and How We Find Out" (2022). Cell and Molecular Biology 5e: What We Know and How We Found Out - All Versions. 14. https://dc.uwm.edu/biosci_facbooks_bergtrom/14/ より改変

[注] postmortem 死後の; Alzheimer's disease アルツハイマー病; amyloid plaque アミロイド斑; beta-amyloid peptide ベータアミロイドペプチド; neuronal 神経細胞の; tau protein タウタンパク質; hyperphosphorylated 過剰リン酸化された; conformation 立体構造; deform 変形する; neurofibrillary tangle 神経原線維変化; hippocampus 海馬; immediate cause 直接の原因; neuronal dysfunction 神経機能障害; cholinesterase inhibitors コリンエステラーゼ阻害薬; Aricept アリセプト; breakdown 分解; acetylcholinesterase アセチルコリンエステラーゼ; cholinergic neurotransmission コリン作動性神経伝達; cognitive decline 認知機能の低下; serum 血清; neurofilament light chain 神経フィラメント軽鎖; neuropathies 神経障害; marker proteins マーカータンパク質; at-risk individuals 危険性のある個人; therapies 治療法

問1 下線部(1)の tau protein がどのようにアルツハイマー病に関わっていると考えられているのかを本文に即して説明しなさい。(150字以内)

問2 下線部(2)の具体例を本文に即して説明しなさい。(100字以内)

問3 下線部(3)が本文中で具体的に何を指すのかを答えなさい。(50字以内)

また、それらがどのようにアルツハイマー病の治療に役立つのかを説明しなさい。(250字以内)