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Gene expression and functions specific to acidic cancer nests

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Solid cancer nests are often acidified, which induces cytosolic acidification. Many metabolic processes may decline as cytosol is acidified and alternative processes are argued to work in acidic cancer nests to compensate the decrease in activities of the processes functioning at alkaline pH. We investigated the expression of 24,000 genes in cancer cells at pH 7.5 and 6.6 and found approximately 700 genes whose expression increased under acidic conditions, while expression of approximately 850 genes decreased at acidic pH. We found a protein named CTIB whose level was the same at pH 7.4 and 6.3, but it was essential for cell proliferation only at pH 6.3. Our result and reports by other groups suggest that mammalian cells have genes whose functions are required under acidic conditions but their expression is not affected by acidosis. Our study with specimens from cancer patients showed that different acidosis-dependent genes were expressed in different cancers. The analyses of acidosis-dependent genes specific to each cancer may be useful for diagnosis of carcinogenesis and cancer progression, because cancer nests are acidified with the cancer progression. The anti-cancer drugs whose target molecules function at acidic pH may show a clinical superiority because such drugs are less effective on cells in normal alkaline tissues, such as the body immune systems.

Biography

Hiroshi Kobayashi received his PhD in Biochemistry from University of Tokyo in 1974. After his Post-doctoral training at Colorado University Medical Center, he started to study adaptation strategies of microorganisms to acidic environments at Chiba University in 1978. His research is focused on mammalian cell functions under acidic conditions from 1996 at Graduate School of Pharmaceutical Sciences, Chiba University. He retired in March 2012 and is a Professor Emeritus at Chiba University after his retirement. He works as an Associate Editor of International Immunopharmacology published by Elsevier B.V. from 2014.

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