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Human specific energy-expense type alleles in the obesity genes, *ADRB2*, *ADRB3* and *PPARG* occurred during primate evolution

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Abstract

In the human-obesity genes, two types were found. One was the real obesity gene which might be necessary to stock energy in non-human primates (NHP) such as Gly16, Glu27 of adrenergic receptor beta2 (*ADRB2*), Arg64 of beta3 (*ADRB3*) and Pro12 in peroxisome proliferator-activated receptor γ (*PPARG*). Another was the gene whose substitution to thrifty type occurred only in the human lineage, such as -112C of UCP1. In the first type of genes, all NHPs (30 chimpanzees, 8 gorillas, 15 orangutans, 108 macaques) had thrifty type alleles. So these thrifty type genes may be necessary for NHPs to endure food shortage seasons. In the second type, although all NHPs had energy-expense type (-112A of UCP1), ADRBs could regulate UCP1 activity at upper stage of the signal transduction.

Why only human could get the energy-expense alleles in the first type gene? Ancient human around 1.9 MYA, *Homo erectus*, left tropical rainforest for savanna, foraged plants and animals under strong solar radiation. Their body temperature was controlled by increased evaporation of sweat and reduction of body hairs to help water evaporation. At night, however, cold in the glacial period stimulated the adrenergic nervous system and increased thermogenesis through the newly appeared energy-expense alleles of the *ADRBs* to help the protection of entrails by higher body temperature. The increased total energy expense might have been supplemented by hunting large animals. After these energy-expense alleles spread among them, they migrated out of Africa. Then, we can see the energy-expense alleles in the world in high frequency.

Biography

Akiko Takenaka has completed her Dr.Sc. at the age of 27 years from Tokyo Institute of Technology. She was an assistant at Showa University School of Medicine, a research fellow of Primate Research Institute, Kyoto University and then a Professor of Nagoya Bunri University. She is an honorary Professor of Nagoya Bunri University and a senior researcher of Biomedical Institute, NPO Primate Agora. She has published more than 33 papers in reputed journals.