Tissue-specific Conditional Gene Targeting

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In post-genomic era, one of the principal issues in biomedical research is to understand gene function. During the last two decades, numerous laboratory mice have been generated through gene targeting technology. The functional in vivo data against target gene has been efficiently provided through conventional knockout and transgenic experiments. However, these experiments frequently revealed serious limitations, such as embryonic lethality, adaptive gene expression and compensation. To overcome this limitations, new mouse models based on the conditional gene targeting technology have been introduced and are becoming increasingly popular. The main strategy of conditional gene targeting is to turn off gene function and precisely control gene expression in a spatiotemporal manner. In general, two major components are required to achieve conditional gene targeting. The one is inducer or transactivator, which restricts the extent of gene targeting in a tissue- and time-dependent manner. The other component is responder containing gene of interest. Cross combination of these two components result in a tissue- and time- specific conditional gene targeting. Recently we generated a series of conditional knockout mice for the study of molecular mechanisms underlying tooth development. From the phenotype of mutant mice, we could find the progress of biological mechanisms, which could not accessed by conventional knockout. To date, conditional gene targeting is the most powerful tools to manipulate the genes in vivo. Conditional gene targeted animal model is useful to provide more information about the molecular mechanisms underlying the physiologic and pathological processes as well as development. [This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MEST) (No. R01-2007-000-20005-0 and 2007-313-E00487)].