

Housekeeping Genes Encyclopedia Article

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Housekeeping Genes

Housekeeping genes are responsible for **cell** maintenance and activity, and their products are therefore essential for general cell physiology. Housekeeping genes are so denominated because they encode proteins required for common and essential functional and structural purposes in most cell types, independent of their particular histology (i.e., tissue-specific cell characteristics).

Scientists research the identification of genes involved with cell function maintenance (housekeeping genes), utilizing **DNA** chips, also known as bio chips or **gene** chips, a new bioinformatic technology for genetic screening. This technology allowed researchers to measure **gene expression** levels of about 7,100 genes in seven different human adult tissues and four different fetal tissues. Researchers found that adult tissues share a set of 700 gene products, whereas fetal tissues share a set of 591 transcripts (i.e., gene products). They also found that 242 of the transcripts of the adult tissues were detected at the same level of expression in all the seven tissues. Furthermore, scientists detected 339 gene products that were present at the same level in all four fetal tissues. These transcripts were therefore considered products of maintenance or housekeeping genes.

Many studies of normal cellular physiology, as well as of pre-malignant transformed cells and **cancer** cells, measured levels of expression of housekeeping genes, and used them as non-variable control markers in expression studies of other non-housekeeping genes. Studies, like the one described above, are useful for establishing average levels of normal expression of housekeeping genes. The collected data will later constitute a reference in the detection of expression variations of other genes.

Not every housekeeping gene, however, can be used as a constant reference or control marker in expression studies. As an example, enzyme GAPDH expression has been widely used as a control marker for expression, being considered an invariable housekeeping gene. Nevertheless, a research group have recently analysed the expression of GAPDH in about one hundred samples of normal, dysplastic and tumour tissues through *in situ* (in place) hybridization experiments. They found that, in fact, the expression of GAPDH progressively increases in normal, dysplastic and **tumor** samples. Furthermore, evidence was gathered that GAPDH may constitute a marker of **cell proliferation** and a possible marker of cell undifferentiation in some normally high proliferative tissues. The conclusion is that this housekeeping gene in particular could not be used as a proper control for expression studies, being instead an appropriate marker for cell proliferation in various types of tissues.