

## EDITORIAL

# Quantification: the soft underbelly of molecular biology

*'Shall I compare you thee to a summer's day?' Or a housekeeping gene? [Shakespeare Sonnets 12]*

The activity of a particular gene at baseline or after stimulation is often determined by measuring tissue or cellular levels of the corresponding mRNA.

An immediate problem with this type of measurement of gene expression relates as to how the results should be standardised. If one wants to compare the amounts of a specific mRNA in two samples, it is mandatory to relate the results in one way or the other to some common standard, e.g. the number of cells analysed. Furthermore, it is important to control the efficiency of extraction procedures, RNA-stability, etc. These problems are shared between Northern analysis and PCR-based methods. For PCR methods it is also necessary to control the efficiency of the reversed transcriptase reaction.

Efforts to circumvent the above-mentioned problems have usually been based on the analyses of "housekeeping" genes, i.e. genes of which the expression is assumed not to vary between different tissue samples or in response to various types of stimuli, or with the state of differentiation, etc. The expression of the target gene is then reported in relation to that of the housekeeping gene.

In previous studies of gene expression in the skin several housekeeping genes have been used, the most popular being glyceraldehyde-3-phosphate dehydrogenase, cyclophilin, and  $\beta$ -actin (1–3). More rarely, the expression of a target gene has been related to the expression of certain components of the ribosomal unit, e.g. 18sRNA and 36B4 (4).

Many studies of psoriatic skin have used one of the above-mentioned housekeeping genes without finding any clear evidence for a difference between involved and uninvolved skin. This has been taken as a proof that housekeeping genes represent a constant contribution to the otherwise variable mRNA expression in human skin. However, in this issue two papers (pp. 2–3 and 4–9) using two different methods report independently that the expression of certain housekeeping genes is different in lesional and uninvolved epidermis. Also, the expression of housekeeping genes seems to be affected by various treatments. This shows the importance of choosing proper "standards" for the analysis of target gene expression.

Unfortunately, the expression of ribosomal RNA in psoriasis was not studied in any of these reports. It is still possible therefore that the expression of ribosomal RNA is a better denominator for target gene expression than the mRNA expression of a housekeeping gene. However, it is possible that this also may not be a solution, as it has previously been reported that the expression of some ribosomal protein mRNA also varies; an increased expression has been found in colorectal tumours and cervical cancer (5, 6).

These two papers suggest that we need to pay more attention to RNA quantification. The best way to standardise obtained results has yet to be determined.

## REFERENCES

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