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## Editorial Comment

# Cancer stem cells: Opportunities for novel diagnostics and drug discovery

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This special issue of the *European Journal of Cancer* focuses on the cancer stem cell and comprises a wide spectrum of excellent articles. Over the past five years, we have seen a steady rise in publication activity in this subject area (Fig. 1) and it seems appropriate to take stock of where we are in this rapidly emerging field. This is a topic of considerable interest to both clinical and experimental oncologists and the collection of review articles covers aspects of cancer stem cells ranging from clinical issues, such as new therapies, through to cell signalling and model systems (Fig. 2).

Translating biological information into novel mechanism-based therapeutics for cancer is a long, expensive and difficult road. A major barrier to the successful conversion of this knowledge is the biological complexity of the cancer process.<sup>1</sup> Whilst we now have extensive lists of genes and pathways implicated in the cancer process, our understanding of these events in the context of the cell biology of cancer is fragmentary. The discovery of cancer stem cells that fuel neoplastic growth is providing the cancer community with a vast spectrum of new diagnostic, prognostic and therapeutic possibilities (Fig. 3). Indeed, the range of tumour types demonstrating sub-populations of cells with stem-like properties is increasing (Fig. 4) and, interestingly, transcriptional profiling has recently identified a signature of genes

predicting therapy failure that also resembles a stem cell phenotype.<sup>2–8</sup>

We hope the appeal of this issue will go beyond those who are already informed in cancer stem cells and draw in vital opinion, technologies and knowledge from neighbouring research niches. In the next few years it will be interesting to see just how quickly we can translate the biology of cancer stem cells into something clinically useful.

## REFERENCES

1. Keith WN, Bilsland A, Hardie M, Evans TRJ. Cancer cell immortality – telomerase as a target for novel cancer gene therapies. *Nature Clin Pract Oncol* 2004;1(2):88–96.
2. Al-Hajj M, Clarke MF. Self-renewal and solid tumor stem cells. *Oncogene* 2004;23(43):7274–82.
3. Glinsky GV, Berezovska O, Glinskii AB. Microarray analysis identifies a death-from cancer signature predicting therapy failure in patients with multiple types of cancer. *J Clin Invest* 2005;115(6):1503–21.
4. Hirschmann-Jax C, Foster AE, Wulf GG, et al. A distinct ‘side population’ of cells with high drug efflux capacity in human tumor cells. *Proc Natl Acad Sci USA* 2004;101(39):14228–33.

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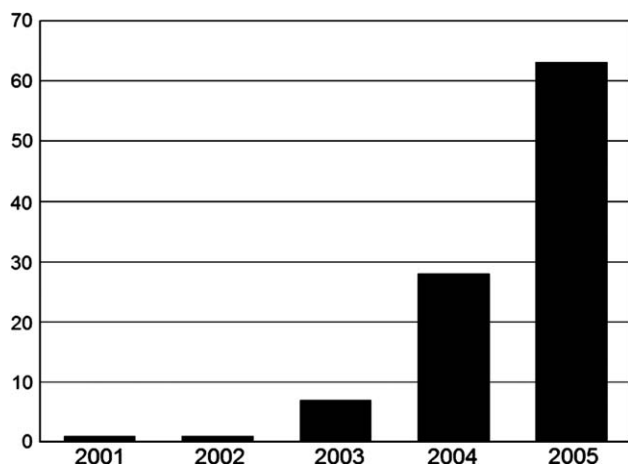


Fig. 1 – Publication activity in the subject area of cancer stem cells over the 5-year-period 2001–2005. As an indication of activity in the field, the phrase ‘cancer stem cells’ was used to search PubMed. The graph indicates the number of publications per year.

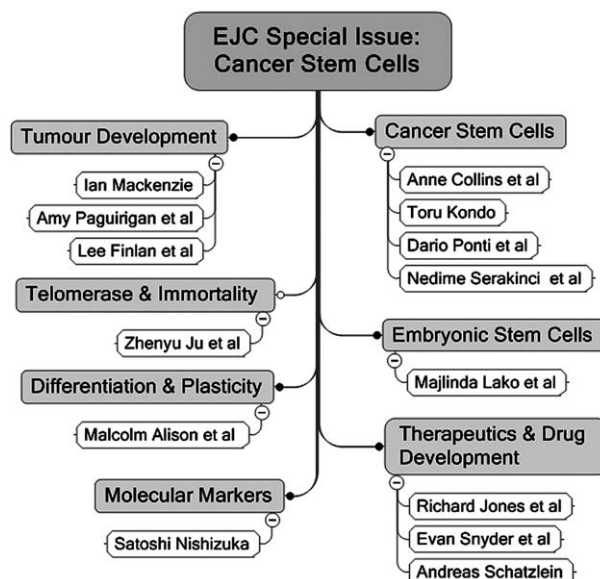


Fig. 2 – Converging themes in cancer stem cell research covered in this special issue of the *European Journal of Cancer*.

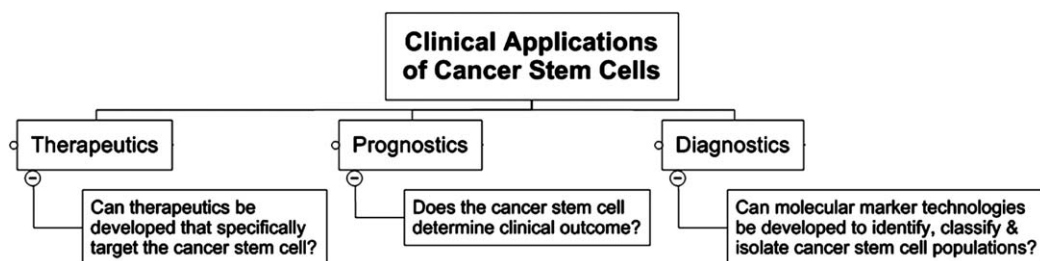


Fig. 3 – Clinical applications of cancer stem cells.

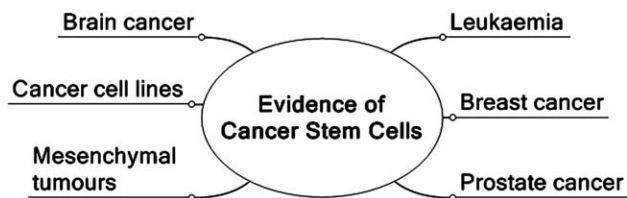


Fig. 4 – Examples of tumour types and cell lines showing evidence of cancer stem cells.

5. Jones RJ, Matsui WH, Smith BD. Cancer stem cells: are we missing the target? *J Natl Cancer Inst* 2004;96(8):583–5.
6. Keith WN. From stem cells to cancer: balancing immortality and neoplasia. *Oncogene* 2004;23(29):5095–8.
7. Serakinci N, Guldberg P, Burns J, et al. Adult human mesenchymal stem cell as a target for neoplastic transformation. *Oncogene* 2004;23(29):5092–4.
8. Singh SK, Clarke ID, Hide T, Dirks PB. Cancer stem cells in nervous system tumors. *Oncogene* 2004;23(43):7267–73.