



## Is cord blood worth saving for public or private banking?

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Cord blood (CB) contains hematopoietic stem cells that can both reproduce themselves and turn into mature blood cells. Everyone agrees that CB cells can be lifesaving in patients with various malignant or non-malignant hematologic diseases, immune deficiencies and genetic diseases. Besides being a source of cells for hematopoietic stem cell transplantation (HSCT), CBs have been much used as a source of stem cells for research and for developing cell therapies [1, 2]. As a result CB that was once discarded after delivery is now often stored, and more than 30,000 patients worldwide have received banked CB for HSCT. Public CB banks were established in the 1990s, and over 600,000 units of CB are now stored in them; in addition private profit-driven CB banks have stored CB worldwide [3]. Although these various CB banking projects have saved the lives of many patients with refractory diseases, the use of banked CBs has become controversial, particularly in the case of private CB banks.

Although over 30% of banked CBs have been used for HSCT in Japan, in most other countries only 3-4% of banked public CBs have been utilized, and the figure in Korea is 1.3% to the end of 2013. While recognizing the need to increase the rate of use of public CBs, most people agree with banking donated CBs. In Korea, several steps have been taken to increase the use of banked public CBs. First, an inspection system for quality control of CBs and CB banks has been established under the "Cord Blood Manage-

ment and Research" Act, and entrusted to volunteers and transplant physicians. Second, governmental insurance coverage to reduce the cost of CB products promises to decrease the financial burden of patients from 4,000-6,000USD to 100-200USD. Third, a clinical guidebook is to be introduced shortly to help transplant physicians access CB transplantation. We anticipate that these efforts will encourage donation as well as the use of CB.

So far, most CBs stored in public and private CB banks have been used for HSCT. However, from the private CB banks' point of view, there are too few documented cases of children receiving their own banked CB for HSCT, because physicians are reluctant to use autologous CB. The reasons are the following; 1) The graft-versus-leukemia effect in which the donor's immune system acts against residual recipient malignant cells cannot occur in autologous HSCT, 2) Pre-leukemic and leukemic cells may be present in the stored CB of children who later develop childhood leukemia, 3) The stem cells present in autologous CB carry the same genetic information as the recipient and so cannot be used to treat genetic diseases. Estimates of the proportion of autologous CB transplants performed range widely. The advertising produced by some private CB bank puts the proportion at 1 in 27, but the American Academy of Pediatrics suggests that it is more like 1 in 200,000. In Korea, just a few CBs among the roughly 300,000 units in private banks were released for autologous HSCT up to the end of 2014 [4].

Many private banks suggest in their advertisements that stem cells present in autologous CB could be used in the near future in replacement stem cell therapy for various kinds of severe disease. However, the future role of autologous stem cells in novel treatments is very unclear, and stem cells from autologous CB are being used in only a few early-stage research studies at present. However, the field of basic and clinical stem cell research is progressing rapidly. In addition to the use of manipulated stem cells,

mononuclear cells from autologous CB have been used recently without any ex vivo manipulation in clinical trials aimed at regenerating damaged tissues, particularly to reverse neurologic deterioration in children with cerebral palsy [5]. Although the clinical feasibility and efficacy of autologous infusion of CB mononuclear cells for improving neurologic functions remain to be proven, potential benefits can be anticipated. Furthermore, storing CBs would be justified if encouraging data using CB mononuclear cells were obtained in this field of regenerative medicine, even if CB is not viewed as a future source for developing cell therapies.

While the odds that privately banked CBs will ever be used may currently be small, the costs are not. Prices vary, but most of private banks may charge up to 1,500-2,000 USD for the initial processing and storage for 10-15 years, and after that charge an annual storage fee of roughly 100 USD in Korea. Some people feel that the potential benefits are too few to justify the costs and that it is not a worthwhile investment. However, some doctors who have high hopes for advances in stem-cell therapy advise patients to consider private CB banking. I personally would like to believe that using mononuclear cells from CB, or manipulated stem cells, will be central to the field of regenerative medicine in the near future. Therefore, I advise people around me to bank CB privately as a biological insurance for future cell therapy if they can afford it, and are convinced that it might save or improve a child's life or the life of another family member; however I make absolutely clear that private CB banking is not needed for HSCT.

Deciding to use a private CB bank is a personal choice. The key is for individuals to be given the relevant medical information by their doctors as well as by CB bank associates so that they can make rational decisions. Whatever they do, they should not let themselves be pushed into a choice. I think it's fine if a parent makes an informed decision to do this. But I do not like parents doing it because they are made to feel guilty or ashamed by misleading advertising. No one should make parents feel irresponsible or reckless if they do not choose to bank their children's CB privately. If they research the possible benefits and are comfortable with the cost, then they should do it.

In conclusion, it is worthwhile storing CB in public or private CB banks. Donation to public CB banks should be preferentially promoted and publicized. Some people who understand the potential benefits of CB in the field of regenerative medicine may decide, if they can afford it, to use a private CB bank, but theirs must be an informed decision. They also should understand that stem cell therapy with CB, at least at present, is not a form of alchemy that can regenerate any damaged tissue, although many researchers believe it will become so in future.

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### Authors' Disclosures of Potential Conflicts of Interest

No potential conflicts of interest relevant to this article were reported.

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