



Stem Cell Research in Africa: Legislation and Challenges

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Abstract

The emergence of stem cell research has undoubtedly brought a lot of hope to the medical field with the opportunities that regenerative medicine offers. Human embryonic stem cells can be manipulated to cure some of the most debilitating diseases of our times. The ability to transform somatic cells into pluripotent stem cells will ease the objections by some people towards the use of embryo derived stem cells. However, due to global differences of opinion on stem cell research, it is almost impossible to come up with standardised rules that will govern the research around the world. While there is rapid and continues progress in the field of stem cell research, Africa is lagging behind with respect to actively being involved in stem cell research, despite the fact that it stands to benefit greatly from the research. There are very few African countries that are actively involved in stem cell research. This review article examines the involvement of African countries in stem cell research. Some of the challenges that are affecting the progress of stem cell research in Africa are discussed. Because human embryonic stem cells are derived from human embryos, there are legislative frameworks that concern the rights of unborn embryos to life which have to be considered before undertaking research involving human derived embryos. This review discusses recommendations that can vigorously promote and expand stem cell research in Africa, especially in smaller and less scientifically active countries of the continent. In order to succeed in promoting stem cell research in Africa, there is a need to understand the ethical and moral issues that hinders the research. There is further need to enforce basic understanding of what stem cells are and how they function. Therefore, the general consensus is that to succeed in growing stem cell research in Africa, there is a need to first enhance education about stem cells among the ordinary people of the continent and to solicit funding that will help propel the research in Africa.

Keywords

Stem cell; Embryonic stem cells; Regenerative medicine

Introduction

Stem cell research in Africa

The World Health Organisation predicts that by the year 2030, non-communicable diseases will be ahead of maternal, perinatal and communicable diseases in causing human mortality [1]. However, Africa continues to struggle with controlling non-communicable diseases. Stem cell research offers possible solutions to the problem of non-communicable diseases. Investment in stem cell research will

also have economic benefits because these diseases have a significant impact in the economy of the continent by impacting negatively on industrial workforce.

In South Africa, human embryo derived stem cells are mainly being used for novel drug development and screening while adult stem cells have mainly been used in bone marrow transplants to treat diseases such as myeloma clinical studies for novel drug discovery and screening [2]. South Africa is ahead of other African countries where stem cell research is concerned. It is for this reason that people in Africa suffering from blood and cancer related disorders regularly visit the country to seek medical help. Even though there is a lot more to be done with respect to stem cell research in Africa, active research has been reported in some African institutions such as Netcare Femina Hospital in Pretoria South Africa, University of Pretoria and University Cape Town [3]. In Nigeria, there are stem cell research centres in Lagos and Abuja. Stem cell research has also been established at Cairo University Hospital and Nasser Institute in Egypt, University of Sousse in Tunisia and in countries such as Libya and Algeria. In Egypt, for example, a haematopoietic stem cell transplantation program has been running since 1989 [4]. Although this program started at a very small scale, it has since grown significantly with 1320 transplants performed in the first 18 years of its formation. Unfortunately though, stem cell tourism in some countries remain a great threat to the progress of stem cell research in Africa because of the administration of stem cell therapies that have not been legally approved on unsuspecting patients by unscrupulous medical practitioners [5]. In Morocco, the first haematology department was established in the early 1980s in Casablanca while in 2004, transplantations involving stem cells officially began in that country [6].

Africa is lagging behind other continents as far as clinical trials relating to the stem cells are concerned. Currently, only 2.5% of Mesenchymal stem cell clinical trials occur in Africa while more than 80% of these trials occur in Asia, Europe and North America [7]. There are very few clinical trials that are being conducted in Africa involving pluripotent stem cells. However, there is activity towards increasing the number of clinical trials concerning the potential of stem cells towards healing heart diseases [8]. These cells are however used mainly as experimental models *in vitro*, not for therapeutic applications.

Legislation on stem cell research in Africa

Stem cell research regulatory legislation exists in South Africa. However this legislation is not strictly implemented and this often results in it being abused by those medical scientists involved in stem cell tourism to satisfy their interests [5,8]. Legislation on the use and research of stem cells is provided by the National Health Act and Medicines Control Act in South Africa [2]. More specifically, the National Health Act is concerned with the use of embryo derived stem cells, induced pluripotent stem cells and adult stem cells from mature somatic tissues such as the bone marrow. Adult stem cells are specifically regulated by chapter eight of the National Health Act. The National Health Act 61 of 2003 of South Africa allows research and therapeutic treatment that uses stem cells only after consent with the donor has been established [9].

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In Egypt, the creation of stem cells by cloning that is not done for reproductive purposes is generally accepted as outlined in the recommendations of a workshop on the ethical implications of advanced regenerative therapies towards infertility [10]. Tunisia on the other hand holds a completely different legal view on the practice of stem cell research as it does not allow any experimental work to be performed on embryos because an embryo is regarded as having the potential to become a fully-fledged independent life. This is stated in Opinion No. 1 of the Tunisian Medical Ethics Committee of 1997 which also inhibits cloning for either therapeutic or reproductive purposes [10]. Moreover, in 2001, a law (No.01-93) was passed in Tunisia which inhibits research on embryonic stem cells where article no. 11 of this law states that embryos can only be used for reproductive purposes.

With the exception of Tunisia, most of the African Arab countries lack clear legislation on the control of stem cell research. As explained in the United Nations Education Report [11], these countries rely on a decree, called a Fatwa, to lead their research on contentious issues such as human embryonic stem cell research. Therefore, stem cell research in these countries is more reliant on the cultural and religious beliefs. All in all, it appears that the regulation of stem cell research in Africa is controlled by unclear laws that do not precisely give definitive guidelines on how research should or should not be conducted. This negatively impacts the growth of stem cell research in the continent and enables unethical practices in the field.

Challenges to stem cell research in Africa

In addition to legislative issues, there are other factors that hinder the progress of stem cell research. These issues are mainly related to religious beliefs and matters of morality surrounding the use of stem cells that have been harvested from human embryos. The fact that human embryonic stem cells are harvested from the destruction of 5-day old human embryos has been met with a lot of resistance especially from religious denominations [2]. In terms of credible research infrastructures, South Africa is more advanced than most African countries. However, lack of trained personnel to utilize these infrastructures is still a significant challenge as there is an inability to retain skilled personnel who move overseas for better financial gain [12]. In Nigeria, as is the case with many other developing African countries, many medical care specialists have migrated to Europe and other parts of the world [13]. One of the major setbacks that hold back the growth of stem cell research in developing countries is the lack of or insufficient supply of power for the operation of high pressure machines that are often used in stem cell laboratories and in medical facilities for clinical applications.

Cultural beliefs have a massive impact on the perception and use of stem cells in Africa. In some African cultures, there is some level of sacredness attached to the human body which may hinder research concerning the use of body parts. For example, some African tribes continue to bury the umbilical cord of a newly born child due to the belief that this will prevent any spiritual influence upon the child [9].

One of the greater challenges that face stem cell research is the understanding of the mechanism of stem cell differentiation. That is, how can scientists be so sure that stem cells will form whatever tissue or organ they are induced to form inside the body and not something else. How can this be guaranteed. When cells are transplanted, their growth may become too difficult to control and these cells then develop into tumour cells in the patient. In Tunisia, the use of human embryos

is ethically disapproved. Normally, if a fertilized egg is implanted into a uterus, it has the potential to develop into a genetically unique human being with genetic attributes. Similarly, some Muslims and Christians in Africa shun the use of embryo derived stem cells because they deem it unethical to cut short the right of an embryo to develop into a baby [14].

Recommendations and Conclusions

There is a lot of ambiguity in some of the legislation that governs stem cell research in Africa. This poses a problem of bogus undertakings such as stem cell tourism. This can also lead to the emergence of not so genuine scientists who are only it to make quick money. This they do at the expense of people's health. Therefore, there is a need for a more consistent and precise set of regulations that will guide stem cell research in the continent. Such legislation should also be up to par with world standards of stem cell research. For Africa to develop its stem cell research capabilities and be competitive with the rest of the world, it has to benchmark against the very best in the field. For example, as Scholefield et al., [2] mention, while some African countries have rules and regulations that allow the derivation and processing of stem cells, there are sometimes no guidelines on exactly how this derivation and processing should be done or how these derived cells should be applied clinically. This then leads to a lot of variations in the methods used to prepare the cells for therapy, something that ultimately leads to different levels of applicability of the cells in clinical therapy. These laws that govern stem cell research in Africa should also have clauses that protect innocent patients from being scammed by some of the medical professionals that use them in insincere stem cell operations for their own gain. This could deter other would be bogus stem cell scientists while at the same time boosting patient confidence in stem cell research in the continent.

It goes without saying that the migration of skilled personal is a major drawback on the progress of stem cell research in Africa. It is therefore incumbent upon the governments of the day, parastatals, NGOs and private company to provide financial incentives that will avoid this skilled labour migration. At the same time, there is a massive need for investment in educating people of Africa about the importance of stem cells and how they stand to benefit from it. It is common sense that for someone to invest their time in partaking in stem cell research they first need to fully understand what stem cells are and how they can be applied clinically.

Africa is one of the poorest continents in the world. Therefore, for its people to fully benefit from stem cell research, it should be affordable. Affordability could be provided by governments through the subsidisation of medical insurance. There should also be greater efforts towards making sure that stem cell therapy, like other medical procedures such as dentistry, is covered by various medical insurances [15].

Religious beliefs provide great resistance towards stem cell research in Africa. While there is no doubt that most of this resistance stems from the derivation of stem cells from human embryos, lack of education and pure ignorance could be other contributing factors. Therefore, education efforts should also be targeted towards the various religious denominations that are against stem cell research. This will allow members of these groups to at least have all the facts when making anti or pro stem cell research decisions. It is common in Africa that dissemination of information by word of mouth can lead to the distortion of the original message that was meant to be spread across. Therefore, proper public education by stem cell professionals

could avert misconceptions about stem cells and make the general public alert to the benefits of stem cell research. Education should be directed towards sensitizing the African people on how stem cells can help alleviate and ultimately afford cure to some of the diseases that affect them directly such as HIV/AIDS.

Finally, for stem cell therapy to be accepted as a viable therapeutic medical procedure in Africa, there is a need to allay people's fears about the safety of stem cell therapies. People need to be shown practical examples of the effectiveness of these therapies and how they too can benefit. After all, the best way to convince a sceptical person is to provide convincing evidence that stem does work. This could be through, for example, testimonies of those who have benefited from the therapy.

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