

Bioethics in Reusing of Biomedical Waste in Regenerative Dentistry

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Stem cell-based therapies are the most promising breakthrough in almost all the fields of medicine. Despite stem cells are widely investigated, scientific community is still debating if stemness is a peculiar ability of a specific cytotype or if any differentiated cell may adopt stem-cell-like properties, according to an organ's needs [1].

Resident stem cells undergo to changes in chromatin structure depending from stimulus-responsive transcriptional programs [2] highlighting how stem cells can be induced during both embryonic development and adult tissue regeneration in several different tissues, regardless of their biological niche.

Biological wastes are usually considered as matter to be discharged, but in the last years, especially after the Nobel Prize in Physiology or Medicine to Randy Schekman, the interest toward the re-use of wasted tissues has become a hot topic in biomedical research [3].

Several scientific studies have focused on dental-derived stem cells as reliable and promising source of Mesenchymal Stem Cells (MSCs): specifically, dental pulp stem cells (DPSCs) and exfoliated deciduous teeth-derived stem cells (SHED) have been largely characterized and are believed to represent a safe and highly promising source of SCs for tissue engineering [4]. As both DPSCs and SHED are easily obtainable from deciduous teeth and from teeth extracted because of orthodontic reasons in pediatric patients, it is important to understand the limits and the advantages deriving from harvesting such teeth by dentists.

Fatally, the biomedical research on stem cells has widely divided the scientific community on bioethical themes. Pope John Paul II reported in an editorial: "I have always encouraged research on stem cells derived from adult tissues, or from tissues of waste; so as to preserve the fetus and the embryo ". And more recently, Pope Benedict XVI also asserted that "Those who advocate research on embryonic stem cells, commit the error of denying the inalienable right to the life of human people". Research on stem cells and "the reuse of biological waste" are undoubtedly the keywords

that are most requested by international research programs. Recently, a research line carried out on dental tissues has concretely reported the biological waste regenerative potential. In fact, it was discovered in the inner wall of inflammatory cysts, resulting from the necrosis of the dental pulp, a new line of mesenchymal stem cells, named: "Human Periapical Cyst-Mesenchymal Stem Cells" (hPCy-MSCs) [5,6]. The studies on such novel MSCs have been further carried out, demonstrating that hPCy-MSCs have stemness skills similar to other promising stem cells [7]: hPCy-MSCs have been even differentiated, for the first time ever, into dopaminergic neuromelanin-producing neurons, just the same neurons lost in Parkinson's disease; this study has created, right from biological wastes, an innovative disease-like cell-model, an exceptionally promising tool for neurological replacing therapies [8,9].

Reusing of waste in virtuous producing cycle is a hot topic in several fields [10]. The recent research lines and the consolidated bioethical principles on biological wastes have certified the safety of the reusing of biological tissues in clinical therapies and in cell banking for future regenerative applications. Teeth extractions in pediatric patients are frequent and validly justified in routine protocols: the reusing of discharged tissues is always an option to be carefully evaluated, as it may represent a strategic choice for several treatments in regenerative medicine, according to bioethics and human rights.

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