

The Claims:

1. A method of monitoring the status of a transplanted organ in the transplant recipients, comprising of: (i) collection of biological sample from a subject who has received an organ transplant from a donor; (ii) identification of the marker sequences from the transplant donor, wherein one or more nucleic acids that are derived from the donor are identified based on a predetermined profile of markers; and (iii) identification of said one or more marker sequences by analysing the circulating cell free nucleic acids from the transplant recipients by digital droplet polymerase chain reaction (DDPCR); (iv) arriving at a ratio of the donor derived marker sequences to the recipient-derived marker sequences expressed in terms of percent; (v) assessment of the organ status of the transplant recipients on comparison of the calculated percent with the cut off value; wherein the selection of predetermined markers are from SNPs of genes having a role in tissue rejection, necrosis, and in differentiation of two unrelated individuals and with a Minor Allele Frequency (MAF) in the range between 0.40 to 0.48.
2. The method according to claim 1, wherein the markers are selected from one or more SNP markers from the candidate SNP as in Table 1.
3. The method according to claim 1, wherein the markers are selected with high MAF value of $MAF > 40$ or $MAF > 0.4000$.
4. The method according to claim 1, wherein the markers are selected from the entire human chromosome including the X and Y.
5. The method according to claim 1, wherein candidate SNPs obtained ranged between 2 and 9 with a minimum of 3 SNPs per patient and wherein average of the 3 SNPs determined is measured as absolute copy numbers (copies/ μ l) and expressed as percentage of donor-derived ccfDNA markers to the recipient derived markers.
6. The method according to claim 1, wherein the cut off value for monitoring the status of the transplanted organ of the transplant recipient varies with the transplant type and is the range of 0.1 % to 15%.

7. The method according to claim 1, wherein the marker sequence is a polymorphic genomic marker and is selected from one or more single nucleotide polymorphisms (SNP's), restriction fragment length polymorphisms (RFLP's), short tandem repeats (STRs), variable number tandem repeats (VNTR's), hypervariable regions, minisatellites, microsatellites, dinucleotide repeats, trinucleotide repeats, tetranucleotide repeats, simple sequence repeats, or insertion or deletion polymorphisms.
8. A method of monitoring the status of a transplanted organ in the transplant recipients, comprising of: (i) collection of biological sample from a subject who has received an organ transplant from a donor; (ii) quantification of the total circulating cell free DNA in healthy subjects and post transplantation patients; (iii) arriving at a normalised value of the total circulating cell free DNA in healthy subjects and post transplantation patients; (iv) assessment of the organ status of the transplant recipients by comparing the normalised threshold value of total circulating cell free nucleic acids.
9. The method according to claim 8, wherein the normalized threshold value of the total circulating cell free nucleic acids in a healthy subject is $< 7.7 \text{ ng}/\mu\text{l}$ and $< 9.63 \text{ ng}/\mu\text{l}$ in clinically stable and healthy post-transplantation patients.
10. The method according to claim 9, wherein the normalized threshold value of the total circulating cell free DNA in transplant recipients if greater than $9.63 \text{ ng}/\mu\text{l}$, the recipient is considered as in organ rejection state; and wherein the value of the circulating cell free DNA in the transplant recipient is less than or equal to $9.63 \text{ ng}/\mu\text{l}$, the recipient organ status is considered as healthy.
11. The method according to claims 1 and 8, wherein the biological sample is selected from whole blood, plasma, serum or urine.
12. The method according to claims 1 and 8, wherein the transplant is selected from an organ transplant or a skin / tissue transplant.

13. The method according to claims 1 and 8, wherein the organ transplant is selected from one of kidney transplant, heart transplant, liver transplant, pancreas transplant, lungs transplant, intestine transplant, bone marrow or thymus transplant or a combination of more than one organ transplant.
- 5 14. The method according to claims 1 and 8, wherein the monitoring of the transplant organ status of the transplant recipients comprises of until the rejection outcome.
- 10 15. The method according to claims 1 and 8, wherein the frequency of monitoring of the transplant organ status of the transplant recipients is function of time determined based on the transplant organ and the ratio of cut off values over time.