Describing the effectiveness of immunosuppression drugs and apheresis in the treatment of transplant patients.

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Abstract
When any foreign object is found in the human body antibodies are generated that mark it for removal by the immune system. In most cases these are natural and healthy responses; however, when considering organ transplants the immune response to the implanted organ must be kept to a minimum to avoid host rejection. To reduce the host's immune response to the implant, clinicians are able to manipulate the antibody dynamics through drug therapy, to minimise the antibody synthesis (immunosuppression), and by the removal of antibodies directly from the patients' blood, a process known as apheresis. In this paper models are presented that describe the in vivo kinetics of three immune complexes which are routinely measured pre- and post-operatively in implant patients, namely IgA, IgG and IgM. These models are then used to analyse the effective clearance rates of different apheresis methods (plasmapheresis, plasma absorption or plasma exchange) and to quantify the impact immune-suppression drugs have on the underlying antibody synthesis. It is hoped that the simplicity of the mathematical models, and associated implementation, will allow the translation of knowledge gained of the process dynamics to positively impact future patient diagnosis and treatment.


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