**The FcRn Protein: From Mother to Fetus**

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**Abstract**

Fc Receptor Neonatal or FcRn is a protein in mammals by which immunity is passed from mother to fetus before birth. FcRn binds to Immunoglobulin G (IgG) and transports IgG across the placenta. FcRn is regulated by pH and is involved in the transport of IgG through transport vesicles. FcRn is also important in its control of the catabolism of IgG. It prevents degradation of IgG, substantially increasing the half-life of IgG. Since FcRn has the ability to increase the half-life of a protein, FcRn is a possible therapeutic agent in treating some diseases.

**Immunoglobulin: IgG**

Of all the antibodies found circulating in the body, IgG is the most common. IgG has the ability to cross the walls of blood vessels, enter tissue fluids, and protect the body from bacteria, viruses and toxins in the body. An Immunoglobulin consists of four polypeptide chains, two heavy chains and two light chains, which together form a “Y” like shape. The variable regions on an antibody allow it to bind to an antigen to help destroy or inactivate the antigen.

**Mechanics of FcRn**

- IgGs, which float in the blood stream, are important to mother and additionally, the fetus to help it develop an immune response. IgGs must be transported across the placenta since mother and fetus do not have interconnecting blood vessels.
- IgGs are taken across the placenta by vesicles.
- A portion of the cell membrane folds inward to create a vesicle. The pH of the vesicles is 6.0, lower than that of the blood and would induce the degradation of IgG.
- FcRn binds to the Fc region of IgG to stabilize IgG. Once transferred, the FcRn is no longer needed and disassociates in the higher pH of the fetal blood stream.

**FcRn**

FcRn is an important protein in the transfer of immunity to the fetus from the mother. IgG molecules are not stable in low pH environments and by binding to FcRn, the IgG molecules are more stable while being transferred to the fetus.

**Therapeutic Uses of FcRn**

The FcRn is very important in its ability to increase antibody stability. FcRn may be able to help in the treatment of diseases, such as lupus, in which the Fc region of an IgG molecule is bound to a therapeutic protein. By fusing the Fc domain to the protein, FcRn now has the ability to bind to the therapeutic protein, thus increasing the stability or half-life of the protein. IgG can last 22-23 days in humans. This may be able to be applied to any disease that is treated with a protein product.

**Lupus**

Lupus is an autoimmune disease. The function of a normal immune system is to distinguish foreign invaders in the body from self cells. When something goes wrong in the system, it may begin to produce antibodies which attack the body’s cells. This is considered an autoimmune disorder. Antibodies to DNA (anti-DNA antibodies) are a common feature of lupus. Patients receive injections of proteins that inhibit the production of these anti-DNA antibodies, thus stopping the DNA from being attacked. By binding these injected proteins to the Fc region of IgG, FcRn has the ability to stabilize the injected proteins, decreasing the frequency with which the patient must be injected.

**Conclusion**

FcRn is a naturally occurring protein in the body. It is important in transferring immunity from the mother to fetus. It also is important in its ability to increase the half-life of a protein. This feature allows it to be used as a potential therapeutic protein in diseases such as Lupus.

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