SUMMERY

The gene is biological unit of the inheritance which consist of DNA sequence (Deoxyribonucleic acid) that contains the code for production of the protein. More specifically each gene comprises all the details instructions that determined the precise composition of a specific protein that perform most life functions and even make up the majority of cellular structures as well as regulatory instructions that determine when this specific protein.

In theory, gene therapy can be defined as the transfer of a gene or genetic material (DNA or RNA)into a cell with therapeutic intent .Ideally ,actual substitution of a defective gene with a therapeutic gene would be the most desirable method for returning target cells to a normal genotype and phenotype.

There are two forms of gene therapy one of which is called somatic gene therapy and the other form of gene therapy is called germline gene therapy. Somatic gene therapy involves the manipulations of gene expression in the cells so as to be corrective for the patient , but this correction is not inherited by the next generation .This is type of gene therapy that is currently being investigated at the institue for Human Gene Therapy , as well as at other laboratories around the world . The other form of gene therapy is called germline gene therapy, this involves the genetic modifications of germ cells that will pass the selected chance on to the next generation, but it is limited to animal model systems because of significant technical and ethical challenges.

Applications of gene therapy not only include rare inherited diseases but extend to common acquired disorders, including tumors (predominantly

malignant melanoma) and haematological disorders, cardiovascular disease, and the acquired immunodeficiency syndrome.

Delivery of gene therapy is delivered by three methods, chemical, physical and biological. Chemical methods for gene transfer usually involve the generation of some kind of complex with purified DNA, and the application of this complex to cells in culture or, less frequently, in vivo.

DNA vectors can be introduced into cells via a variety of physical methods. Conceptually the most obvious of such methods, direct injection, requires sophisticated techniques for injection on a micro-scale.

Biological methods is the viral vectors .Viruses is obligate intra cellular parasites . They tend to be very efficient at transfecting their own DNA into the host cells. By replacing genes that are needed for the replication phase of their life cycle (the non essential genes) with foreign genes of interest.

Haematopoietic cells are important potential targets for gene therapy because of their ready accessibility and the potential to treat congenital disorders, such as haemoglobinopathies, immunodeficiencies and metabolic storage disorders.

The possible treatment against hemophilia is ex vivo modification. In this process, cells of the patient are extracted and and reinfused after its modification. In vivo modification is a mostly a theoretical practice, but is one that is widely being investigated because of its notional simplicity.

A recent report is the concept of sever combined immunodeficiecies (SCID) as a favorable model disease for early gene therapy studies and

represent the first demonstration of a significant clinical benefit from gene therapy

Gene therapy of chronic granulomatous disease is done by using cytokine-mobilized peripheral blood $CD34^+$ cells have either been completed or are ongoing. Retrovirally transduced autologous peripheral blood $CD34^+$ cells were reinfused into patients .

Gene therapy for HIV seeks to restore and or boost normal immune function using a variety of both protein and RNA effector molecules to inhibit viral replication. These techniques can be conducted ex vivo or in vivo

There are five different gene transfer approaches have been used in cancer patients: Firstly the enhance the immune response to tumour antigens. Secondly transduce tumours in vivo with the tumour suppressor genes. Thirdly Transfer a suicide gene. Fourthly use conditionally replication competent viruses to infect and destroy tumour cells but leave normal cells unharmed. Fifthly To express drug resistance genes in bone marrow cells to protect them from augmented chemotherapy

CF is the pulmonary disease that has received the most interest as a target for gene therapy

α_1-Antitrypsin (AAT) deficiency is another prevalent lung disease resulting from a single gene mutation. Like CF, AAT deficiency has as a potential target the airway, although more distal gene delivery may be beneficial in AAT deficiency. Whereas both CF and AAT are associated with concomitant liver disease, the prevalence of severe liver failure is much higher in AAT deficiency. In addition AAT is a secreted product that need not be expressed in lung epithelium. Therefore, gene delivery and

correction directed toward hepatocytes has received attention in AAT deficiency.

Acquired lung diseases may also be candidates for gene therapy. For instance, primary pulmonary hypertension may be amenable to gene therapy, even though < 15% of cases are familial. Lung cancer is another likely candidate for gene therapy.

Many diseases affecting the cardiovascular system such as ischaemia, thrombosis, hypertention and atherosclerosis are amenable to gene therapy protocols. Indeed, success has been achieved experimentally.

Gene therapy is associated with many risks to the patient, to the patient's future offspring, and to the general population. Toxicities to the patient may be caused either by the gene therapy vector or by its encoded gene product and possible contributing factors include an inflammatory reaction to the virus particles.