

- Taken as nose spray
- Not all cells take it up
- Problems encountered:
 - Cells have short natural life span so only lasts a short period before needing replacement
 - Unpleasant side effects due to virus
 - To be used as effective treatment, allele needs to get into many cells throughout the respiratory system, including the ones that divide to form surface cells

Treating genetic diseases with gene therapy

- Insert normal allele into vector
- Liposomes as vectors
 - In aerosol/inhaler
 - Fuses with host cell
- Viruses as vectors
 - Virus vector harmless
 - Short term effect so repeat treatments needed
 - Side effects

Advantages of gene therapy

- Treats cause, not just symptoms
- No physiotherapy/antibiotics - less time consuming/easier

...and disadvantages:

- Effects only last a few days
- Low uptake by target cells
- Only targets specific cells (eg lung)
- Side effects eg from virus

Social and ethical considerations for gene testing/therapy:

- Embryo can be chosen if it doesn't have an allele for a genetic disease/if it has correct tissue type for a sick sibling - transfer
- Embryo can't be genetically modified (germ cell therapy)/have an allele added
- Foetus can be tested in utero for genetic disease by amniocentesis or chorionic villus sampling

Use of PCR/DNA testing in forensic medicine/criminal investigations

- PCR used in forensic science to amplify DNA samples from smallest tissue samples left at scene of a crime
 - Use gel electrophoresis to analyse DNA

Preview from Notesale.co.uk
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- Golden Rice™
- Vit A found in aleurone layer of rice seeds
- White rice does not contain beta-carotene
- Genes coding for Vit A extracted
- From bacteria (*P. ananatis*)
- And daffodils/maize
- Inserted into plasmids - plasmids used as vector
- Promoters added
- Plasmids put into *Agrobacterium tumefaciens*
- *A. tumefaciens* mixed with rice embryos
- Some embryos take up bacteria and Vit A gene
- Grow into adult plants
- Produce seeds with Vit A/beta carotene in endosperm

GM SALMON

- Added growth hormone regulating gene so fish can grow all year round
- Reach adult size in 16-18 months instead of 3 years
- Salmon grow much larger

INSECT/HERBICIDE RESISTANT CROPS

- Increases yield
- Reduces damage to leaves by insects, increasing efficiency of plant (increased rate of photosynthesis)
- Herbicide resistance allows entire fields to be sprayed with herbicide after the crop has germinated, killing any weeds that would otherwise compete with the crop for space/light/water/nutrients

Detrimental environmental effects of herbicide resistant oilseed rape:

- GM rape may itself be a weed/invasive
- Pollen transfer to wild relatives
- Resistant gene transfer to non-GM crops/wild relatives
- Resulting hybrid invasive
- Intensive use of herbicide selects for herbicide resistant weeds
- And reduces biodiversity

...and economic:

- Problem with competition between crops and herbicide-resistant weeds
- Contamination of organic crops/accidental mixing of GM and non-GM crops and financial consequences of this eg compensation
- High cost of GM seeds/plants - poor farmers can't afford them
- Cost of herbicide