



Introduction

Biotechnology in the High third imperium (circa 1100) has been slow to advance due to the explosive expansion of material technology and physics. Many world governments place stringent controls on biological and medical advances to overcome real dangers as well as to prevent the large social changes which come with a new philosophy of life that biotech brings.

Material science deals with the inanimate world we are abstractly related to, while biotechnology is us, our bodies and our minds. What would happen when people realize that we are just a machine, as easily manipulable and programmable as any computer or robot. Biotech items are presented here in a series of catalogues, each dealing with one kind of technology which could be available by a biotech company or subsidiary. As biotechnology is essentially the technology of information, in the genetic code, corporate secrecy and patent laws have allowed a few companies to dominate the industry, while several small rip-off companies (called clone-biotechs) exist in their shadow. The majority of imperial worlds are biotech level 11-12. In regions where a few brave world governments have allowed biotechnological advances, tech levels go as high as 14. Service is not available for these high tech levels on most worlds, and are illegal on some worlds, so possessing biotech level 13+ items is somewhat problematic. The immortality issue often rages on many worlds (much like abortion rages on earth today), while the technology is easily available, many worlds have ruled it illegal and immoral. Some worlds simply make the technology unavailable, others forbid immortals from immigrating, embarking, or even entering orbit. In 1100, approximately 100 million citizens have become immortal, mostly on the few worlds which permit it.

The Genetics Catalogue

One of the major advances in biotechnology is the ability to manipulate our own genetic code. Biotech labs from tech level 9 can only transform single cells such as zygotes (which form new children) or in cell replacement therapy. Such procedures are expensive (3x basic cost) and invasive (critical failure= serious injury and infection). Tech level 10-11 labs can use gene therapy to retrofit genes into adult humans, but only single genes can be transformed. At tech level 12, labs can transform whole gene families, which allow complex traits.

There are considerable drawbacks to having extensive genetic modification however. The first is called the "genetic load". As new genes are acquired in an existing system, there is an increase in the total DNA which has to be supported by each cell, and new functions which will require additional energy. The cost needed to maintain and express these genes, and usually results in increased food uptake. The percentage genetic load acts to increase the amount of food needed to support the individual by a like percentage. This is not usually a problem in big cities, but does remain a threat for soldiers and explorers alike. Past 500% genetic load, there the probability that the genes begin to interfere with each other, and further modifications are impossible (called expression fading). For each modification past 500% the probability of successful expression is $100 - (\text{current load} - 500) / 10$ percent. At low tech levels, there is also the probability of aberrant expression, resulting in monstrosities (up to the gm, but basically normal development going haywire, physical and mental deformities). This probability is $15 - \text{tech level} \times 10\%$ for each 100% genetic overload.

In addition to genetic load, there is the probability that the new gene interferes with the delicate balance of oncogenes, which gives rise to cancer. The risk of cancer is decreased by half for every tech level the lab is above the technology. The sum of all cancer risk probabilities is rolled each year, and a failed roll results in a cancer (60% are benign and easily removed, 40% are malignant and fatal if untreated). Fortunately cancer is fully treatable by genetic therapy, but the

treatment is 50% likely to remove an added gene or gene complex. This treatment first becomes available in a tech level 10 lab and the probability of genetic loss is reduced by 10-tech level*5% in more advanced labs. Of course critical failure in a cancer treatment may result in monstrosities (described above) in addition to not removing the cancer.

Restrictions are placed on genes and transformed persons (called tra'ps). These impact whether the treatment is available, or possession of the trait is legal. Lightly restricted genes are available on most worlds, but a permit or licence is required to obtain the gene for personal use. Moderately restricted genes are unavailable on most worlds, tra'ps are free to visit most worlds but need special permission to immigrate. Those harboring severely restricted genes need special permission to even set foot on most planets. Extremely restricted genes are illegal to possess on most planets, and several planets instantly detain and give maximum penalties (including death) to those found possessing said genes, or even with a copy of the genetic code in a computer file.

One Gene- One product

These are the simplest of treatments, available almost anywhere. The basic cost of treatment is reduced by half for each tech level the lab is above the treatment, up to a maximum of 3 halvings.

Gene Name: High Hemoglobin

Major function: Allows patient to hold breath 20min

Tech level:9 Drawbacks:1%genetic load

Restrictions: none (athletic events: light) Basic Cost:10000cr

Description-

This gene increases hemoglobin content of blood by 10 times, increasing the metabolic rate by 100%, and allowing the patient to go for 20 minutes without oxygen. This has the same effect of increasing constitution by +1.

Gene Name: Poison resistance I

Major function: Confers resistance to a type I poison

Tech level: 9 Drawbacks: 1% genetic load

Restrictions: none Basic Cost: 10000cr

Description-

This represents a family of genes, all of which confer resistance to a specific type of poison. Poison type I includes anything from toxic metal ions, small biochemical which target protein receptors, and simple nerve gasses. It deals with the toxin by creating a protein which binds to it, and removes it from the body. This reduces toxic effects of poisons by 50-100% in most cases, but can be overpowered by massive poison consumption. A new gene must be purchased for every specific toxin resisted. The genetic load is low, but can easily build up if several toxin resistances are sought.

Gene Name: Poison resistance II

Major function: Confers resistance to organic poisons (type II)

Tech level: 9 Drawbacks: 1% genetic load

Restrictions: none Basic Cost: 20,000cr

Description-

Similar to type I, but this gene family codes for enzymes which break down toxic organic compounds into non-harmful byproducts. It operates with more efficiency than type I (95-100% effective), but is useless against inorganic poisons.

Gene Name: Poison resistance III

Major function: Confers resistance to poisons

Tech level: 10 Drawbacks: 5% genetic load, 1% cancer risk

Restrictions: light Basic Cost: 20,000cr

Description-

This type of poison resistance is 100% effective and cannot be overpowered as it provides an alternative pathway to the target of the poison. Only certain types of poisons can be avoided by this way, among them are cyanide (which is a natural gene, and is allowed on most worlds), neurotoxins, and metabolic toxins (such as proteinase inhibitors or phytolectins). Many of the modern toxins are designed to be defeated by this type of gene however (but the genetic code is of course a state secret).

Gene Name: Disease resistance

Major function: Confers total immunity to a specific disease

Tech level:10* Drawbacks: 2% genetic load

Restrictions: light Basic Cost: 10000cr

Description-

These genes are usually specifically designed to vaccinate citizens/ soldiers against a specific disease. *However, every tech level brings a new host of tailor made diseases which defeat the resistance packages of earlier tech levels. A disease- disease resistance arms race is usually maintained between warring factions, with plenty of intrigue as spies vie for samples of each others diseases and resistance packages.

Gene Name: Olfactory Analysis

Major function: Detection of specific chemicals

Tech level:10 Drawbacks 1% genetic load

Restrictions: none Basic cost: 10000cr

Description-

Each of these genes allows the patient to recognize a specific chemical scent. Gene packages of 20 common chemicals is available and only gives 10% genetic load (50000cr). Such packages include Adventure (various animal and plant smells), Soldier (various toxic gasses and human device smells), Technician (set of smells specific to one line of work), and Doctor (disease

associated smells). These packages improve associated tasks by +1.

Gene Name: Infra-red/ Ultra-violet vision

Major function: Allows patient to see into these light spectra

Tech level: 10 Drawbacks: 1% genetic load

Restrictions: light Basic Cost: 10000cr

Description-

A simple gene which codes for a new type of opsin (the protein which detects light), and extends the frequency with which light can be detected. The light frequency can either be down shifted (to see into the infrared) or upshifted (into the ultraviolet), but not both. This allows limited night vision (infra-red) or twilight vision (ultraviolet), and is quite handy with the correct frequency of flashlight. Also allows patient to see the true colors of many flowers (which are often in infrared or ultraviolet).

Gene Name: Radiation hardening

Major function: Traps free radicals, lowers cancer risk 1%

Tech level: 9 Drawbacks: 2% genetic load

Restrictions: none Basic Cost: 15000cr

Description-

This simple gene swallows up the free radicals which come from pollution, radiation, or some kinds of weak carcinogens. This sharply reduces acute radiation damage (by 50%), and lowers cancer risk in long term low level exposures. There is no compensation for actual chromosomal damage, so it is not 100% effective at blocking the direct effects of radiation (divide the RAD value of each exposure by 2 to determine effective damage).

Gene Complexes

These are only available in tech level 12 labs or above. Two or more genes are required for the final effect, all of which are included in the basic cost.

Gene Complex Name: Fast autoregeneration group

Major function: Rapid cell proliferation heals wound more quickly

Tech level:12 Drawbacks: 100% genetic load, 10% cancer

Restrictions: moderate Basic Cost: 50000cr

Description-

This gene complex increases rates of cellular replacement, and quickly regenerates damage to an organ or limb. For game purposes, healing occurs at twice the normal rate (halving healing time), as long as wounds are uninfected. The rapid cell proliferation is dangerous, and poses a serious cancer risk at lower tech levels.

Gene Complex Name: Organ Abscission

Major function: Safely disconnects dysfunctional organs
Tech level:12 Drawbacks: 50% genetic load, 3% cancer
Restrictions: severe Basic Cost: 20000cr

Description-

Often outlawed by interstellar convention, this gene complex allows the user (at tech level 12 genes are commercial enough that tra'ps are no longer called patients) to detach damaged and painful limbs and organs. This is quite useful in a city or in a field hospital where a new limb or organ can simply be re-installed. This only applies to the lesser organs (digestive, reproductive) and limbs (arms, legs), and not to the circulatory or nervous system. In game terms hits to the arms, legs, and abdomen will never cause death, serious or critically wounded parts will simply detach themselves. There are no deleterious effects of shock, trauma, or bloodloss, the user remains conscious and fully functional (minus the use of that organ). Although 2 combat rounds are needed to fully remove the organ, there is no knockdown or disabled period. NB: Fatal hits (2 x critical) to the abdomen will cause both legs to sever as well.

Gene Complex Name: Slow regeneration

Major function: Allows slow replacement of lost tissue, organs
Tech level:13 Drawbacks: 20% genetic load, 1% cancer
Restrictions: moderate Basic Cost: 25000cr

Description-

This gene complex allows users to regenerate lost organs. In the wilderness, this usually just applies to small defects (scars, lost fingers, toes, etc), but a whole hand could have been regenerated in one reported case. Under hospital supervision (tl8+), almost any organ will naturally regenerate, except the brain and spinal cord. The gene complex requires a 100% increase in metabolism or 18hrs sleep during regeneration.

Gene Complex Name: Hardened Epidermis

Major function: Prevents damage from Vacuum and tainted atmosphere
Tech level:12 Drawbacks:20% genetic load, 2% cancer risk
Restrictions: moderate Basic Cost: 15000cr

Description-

Early versions of this trait are physically disfiguring (hardened scaly skin), but give AV:1. Modern versions are reputed to be as smooth and comfortable as real skin (according to the advertizing), they do not have armor value though. Both types make the skin impermeable to most tainted atmospheres, and do not allow capillary damage to occur when exposed to vacuum (you have to keep your eyes closed though, they become bloodshot otherwise).

Gene Complex Name: Perfect strength

Major function: Maximizes muscle load and bone hardness (+3 Str)
Tech level:12 Drawbacks: 100% genetic load, 3% cancer
Restrictions: moderate (athletic events: severe) Basic Cost: 20000cr

Description-

Outlawed in most athletic competitions, perfect strength gives the maximum amount of muscle and bone hardness for the users frame. This generally results in a +3 strength increase, but is of little benefit for those already at or near maximum anyway. Essentially used to convert couch potatoes into weekend warriors.

Gene Complex Name: True Omnivore diet

Major function: Allows wide range of food consumption

Tech level:12 Drawbacks: 5% genetic load, 1% cancer

Restrictions: light Basic Cost: 20000cr

Description-

Although users often get sick (10% per day, -1str, -1con) due to a delicate and complicated digestive system, they can eat almost any complex biomolecule. It is possible to digest grass, wood, fuel oil, rubber, and paint. This is often used by long range explorers who often have to live off the land.

Gene Complex Name: Low metabolism

Major function: Decreases metabolic activity by 50%

Tech level:13 Drawbacks: increases sleep to 12hrs per day, 1% cancer

Restrictions: light Basic Cost: 20000cr

Description-

An unusual selection of genes causes the user to sleep more frequently, and spend little energy. This trait conflicts with any energetic gene complex (perfect strength for example), and is usually used by explorers who have to make due with less food. The energy requirement is now half of the original level. Obesity is common among low metabolics who remain in civilization too long.

Gene Complex Name: Simple digestion

Major function: Decreases genetic load by -100%

Tech level:13 Drawbacks: 2% cancer risk, restricted diet

Restrictions: severe Basic Cost: 40000cr

Description-

Usually only given to soldiers, this trait removes most of the digestive organs (stomach, liver, pancreas, intestines, etc) and replaces them with a much simplified system in order to make room for 3 cubic feet of internal cybergenetic devices or new organs. When installed, the genes for the lost organs are also removed, greatly reducing genetic load. To survive however, the user needs to drink a specialized diet of nutrient solution (sugar, vitamins, fats, etc) and cannot digest solid food.

Gene Complex Name: Direct metabolic powering (DMP)

Major function: Replaces digestive system with fusion power device
Tech level: 14 Drawbacks: 4% cancer risk, 4% genetic load
Restrictions: extreme Basic Cost: 50000cr + power source (1Kw minimum)

Description-

Still highly experimental, and only included because the extensive use of this gene complex in two world armies. This trait replaces the entire digestive system and most of the cardiovascular system (heart, lungs), saving 5 cubic feet.. A new metabolite is generated in an organ designed to run on electricity. Current is converted into ion gradients, and which then charge the metabolite. The charged metabolite is released into the bloodstream and used by the bodies cells. There is no need for oxygen or food. There is no excretory system either as the bodies building blocks (carbon, nitrogen, etc) are simply recycled. Theoretically a DMP user can live as long as electricity is available (average user=1KW, 100W in sleep mode).

Gene Complex Name: Alternative Limb design

Major function: Allows change of major body limbs
Tech level:14 Drawbacks: 10% cancer risk, 80% genetic load
Restrictions: severe - extreme Basic Cost: 30-40000cr

Description-

A variety of limb designs are available, the simplest include flipper feet (for water worlds), and four spider legs (increases agility +2, increases ground speed, and is damn handy inside a starship engine room). 4 arms takes some extensive upper body reworking (+5% cancer risk, +10% genetic load), but increases agility +1, as does Wings (+10% cancer risk, +50% genetic load +500% metabolism when flying).

Gene Complex Name: Alternative Eyes

Major function: Allows vision into infrared and ultraviolet, enhanced
Tech level:14 Drawbacks: 1% cancer risk, 1% genetic load
Restrictions: moderate Basic Cost: 20000cr

Description-

These eyes look different than normal ones, as they amplify light, and see into both the upper and lower spectra. This allows perfect vision in twilight and near dark environment. Another alternative model doesn't have infrared or ultraviolet, but gives the user long range vision (triples normal range), and allows the user to see details as small as 5mm up to a 500m range.

Gene Complex Name: Electrical sensing

Major function: A new organ which detects electromagnetic fields
Tech level: 14 Drawbacks:2% cancer risk, 5% genetic load
Restrictions: moderate Basic Cost: 30000cr

Description-

Allows user limited detection of electromagnetic activity, and decoding of frequency modulated

(FM) and amplitude modulated (AM) signals. These signals are fed into the audio and visual cortex, and are processed so that the user can control the apparent volume of the signal. A limited direction finder is also present, but the user will have to run around a lot to triangulate and calculate distances to emission sources. In this version the user cannot broadcast, but a transceiver version is available as a cybergenetic option (+5000cr), and requires batteries to transmit.

Gene Complex Name: Immortality

Major function: Blocks normal aging

Tech level: 12 Drawbacks: 10% cancer risk, 1% genetic load

Restrictions: Extreme Basic Cost: 100,000cr

Description-

This gene complex can be set, and later reset (through additional gene therapy) to lock the user into any age he/she wishes. That user will continue to live at that age until genetic damage (via radiation or cancer) interferes with genetic clock. The age can be reset after the cancer or radiation damage has been eliminated. In a tech level 14 lab, the age is resettable at the will of the user. In all cases it takes several years to reach the desired age, as the body only adjusts slowly.

Gene Complex Name: Redundant Organ

Major function: reduces fatality of chest wounds

Tech level:13 Drawbacks:2% cancer risk, 50% genetic load

Restrictions: moderate Basic Cost: 40000cr

Description-

In games with realistic wound rules, hits to the chest and head can be instantly fatal. This gene family creates a set of backup organs (spare heart, spleen, etc) which take over when the normal organ is damaged. The gene complex also disconnects the damaged organ, reducing bloodloss damage. The user will need surgery to remove the disconnected organ in 1-4 days or it begins to decay, and will probably want new organs regenerated as the backup organs are only 50% efficient (-2con, -1str).

Gene Complex Name: Improved immunity

Major function: Increases natural immune response by 100%, -2% cancer risk

Tech level:12 Drawbacks:100% genetic load

Restrictions: light Basic Cost:140000cr

Description-

This gene package adds a few new players to the bodies natural immune response. It lowers the chance of catching a disease by 50%, and adds +5 to constitution in terms of disease recovery and secondary infection. It has a severe genetic load, and can cost 100% additional metabolism (or 18hours sleep) during recovery.

Gene packages

These are often sales features of large corporations, and consist of a group of genes tested to work well together. They don't guarantee success if you already have genetic modifications. Often military will take only "clean" recruits so they can give them soldier gene packages.

Adventurer Package:

Improved Immunity, Multiple toxin I resistance (10 of users choice), Fast autoregeneration, Hardened epidermis, Omnivore Diet, Low metabolism, Infravision, Olfactory analysis. Total Load (TL12): 185% Total Cancer Risk: 10% Cost:300Kcr

Soldier Package A:

Current military Disease/toxin resistance set I- III, Hardened epidermis, Organ abscission, Simple digestive system, high hemoglobin.

Total Load (TL12): 100% Total Cancer Risk: 5% Cost:150Kcr

Soldier Package B:

As package A, but with Direct metabolic power and a tl15 10KW fusion power plant (abdominal) with a 20 year lifespan. Includes a outlet in right palm which can power Dei weapons and cybergenic devices.

Total Load (TL12): 100% Total Cancer risk: 9% Cost: 300Kcr