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## Safe use of biotechnology: prudent paranoia

Modern biotechnology is a wide range of techniques which involve the use and manipulation of living organisms and which can be commercially exploited.

Many people mistakenly assume that biotechnology means 'genetic engineering.' Actually, it is much more than that. Biotechnology is a very general term and refers to a variety of techniques involving living organisms as a means of production. Some of the most common techniques are tissue or cell culture, cloning and fermentation methods; cell fusion; embryo transfer; and recombinant DNA technology (genetic engineering).

Biotechnology is not new in Zimbabwe. It dates back centuries when people inadvertently came across the usefulness of one-celled organisms such as yeast, for beer brewing, and bacteria for making milk sour. This simple biochemistry and microbiology has recently led to radical changes in the field of biotechnology.

### THE QUESTION OF 'SAFETY'

The Convention on Biological Diversity Agenda 21 contains a chapter (16), entitled, 'Environmentally Sound Management of Biotechnology'. In the document are recommendations that some billions of dollars of the United Nations budget be committed to biotechnology. This will increase food yield to feed the hungry, improve human health, control population, purify water, clean up the environment and reforest wasteland. At the same time, the hazards as well as the positive impacts of new technology are consistently glossed over by the verbal ploys.

These include the supposed continuity between conventional biotechnology like wine-making, and the 'modern' biotechnology; that years of experience demonstrated modern biotechnology to be safe; substituting the less emotive term 'genetic modification' for 'genetic engineering'. There have already been serious indications of what can happen

when safety is ignored. 'Unexpected' toxins and allergens have been associated with genetically engineered foods.

The first case was in 1989, when trace contaminants in the amino-acid tryptophan, produced by the Japanese biotech company using a newly genetically engineered microorganism, was implicated in an outbreak of a mysterious illness, which led to 37 deaths and more than 1,500 affected. More recently, a soybean genetically engineered with a Brazilian nut gene was found to be allergenic to people sensitive to Brazilian nut, while a strain of yeast, engineered to ferment faster, was found to accumulate a metabolite at mutagenic levels.

Ecological hazards of biotechnology have been demonstrated in field trials with transgenic crops. In one herbicide resistance in transgenic potato and oilseed rape spread to weedy relatives within a single growing season, creating herbicide-resistant superweeds. In another genetically engineered soil bacterium, thought to be quite harmless, turned out to inhibit the growth of wheat seedlings drastically.

There is need therefore, in Zimbabwe, to be concerned and cautious about health hazards, ecological impacts, as well as the socio-economic implications of biotechnology. Zimbabwe, together with the support of other developing countries, at least in the SADC region, needs to aggressively promote a legally binding International Biosafety Protocol for the handling and transfer of genetically engineered organisms.

In addition, the 1972 Biological Weapons Convention should be enforced to outlaw research, development and possession of biological weapons for offensive use. There should be a Biotechnology Public Safety and Environment Protection Act. The proposed Environment Management Bill for Zimbabwe is somewhat inadequate and voluntary guidelines are not enough because they exclude liabilities and compensation, and socio-economic impacts.

## ENSURING SAFE USAGE

Biotechnology presents formidable challenges in public policy formation. The technology is complex and requires the establishment of institutions and human capacity development to promote its safe use. Biotechnology has the potential to touch every aspect of life.

Without proper coordination and a rational planning process, society runs the risk of over-regulation, sacrificing the possible benefits of the technology or under-regulation, allowing misuse and possible disaster.

As a matter of public policy which is formulated with laws, regulations and, administrative policy:

- Biotechnology should always be regarded as a tool, not an aim in itself. This means that other possibilities to reach a certain aim should be surveyed, the various risks compared and the biotechnological method ruled out if another turns out to be more efficacious.
- The release of genetically engineered or otherwise genetically altered or manipulated organisms, especially micro-organisms, into the environment should be regarded as a serious measure and be carried out only after diverse impact assessments.
- Reproductive technologies in humans should be subject to a broad public debate, ethical discussion and possible regulation or restriction. Relevant regulatory bodies should closely monitor the use of the technology to avoid abuse, in particular, discriminatory and racist applications.
- Biotechnological diagnostic methods for human, particularly gene diagnostics, should be monitored to avoid abuse, discrimination, and racist application.
- The conservation, utilisation and improvement of genetic resource and genetic diversity must not be hindered or endangered by biotechnological innovation.

Concrete regulations should be formulated in specific areas of biotechnology regarding products and technology. There should be guiding principles concerning the products themselves and their distribution or release, their specific risks, research, product tests and trials, safety of production plants, safe disposal or treatment of biogenetic waste, workers' safety, effects on people, animals, plants and the whole environment in the following areas:

### Pharmaceutical products

These include medicines, vaccines and products used for diagnostic purposes. The World Health Organisation (WHO) Code on Pharmaceutical Products moving in the International Commerce should serve as a minimum guideline in this area. All pharmaceuticals produced by biotechnological methods should be so labelled.

### Pesticides and agrochemicals

These include any substances used in agriculture, be they chemicals produced by biotechnological methods, biological substances or even living organisms. Apart

from the general stipulations, an adapted version of the International Code of Conduct on the Distribution and Use of Pesticides adopted by FAO 1985, including the clause on Prior Informed Consent should serve as a minimum guideline in this area.

### Food

This includes raw products and processed foods, additives, flavours, fragrances, colours and spices. In the area of milk products, the International Code of Marketing of Breastmilk Substitutes, adopted by the World Health Assembly in 1981, can serve as a guideline with respect to children. For other foods, particular consideration should be given to:

- Labelling and full disclosure of food ingredients and production method, possible risks and shelf life.
- Adequate testing for possible contamination.
- Effects on culture, in particular food culture, and tradition and socio-economic structures.
- Risks of products produced by the help of gene technology.
- Security of production workers.
- Possible environmental factors.

### ROLE OF SIRDC

Zimbabwe has a biotechnology institute housed within the Scientific and Industrial Research Centre (SIRDC), a government of Zimbabwe-sponsored organisation. This is important, given that all of the earliest biotechnology companies in the world were founded by university professors.

The initial research was undertaken in university laboratories, and even when the companies secured laboratory space some of the professors did not resign their university positions. Rather, professors chose to remain as faculty members and work for their commercial companies. Not surprisingly, commercial biotechnology has its roots in academia.

However, SIRDC should not be seen to go into cooperative research with international biotech companies before proper regulations governing biotechnology are put into place. Several transnational companies are keen to launch joint ventures with a view to developing aggressive research strategies while at the same time looking for safe testing havens for their products.

The biotechnological research or projects carried out at SIRDC should, therefore, keep the benefit of the people as its ultimate aim in mind. Any projects or research should employ some of the guidelines outlined earlier. Other guidelines should include:

- biotechnological research or projects imported from another country shall not be carried out if banned in the country;
- a person or company who proposes to carry out biotechnological research or projects, especially when public money is involved, should prove that the aim is to benefit

the majority of the people, and that the research or project set-up will not harm the people or the environment in the vicinity;

- researchers must abide by laboratory and experimentation safety regulations to be worked out on the basis of international recommendations; and
- the socio-economic impact on poor, small farmers and small business should be given special consideration, including the study of possible replacement of products, the production or marketing of which is important for people's economic survival; the affordability of an agricultural innovation for small farmers; the risk of losing competitiveness if they cannot afford it; the risk of losing jobs due to the innovation.

## BIOTECHNOLOGY DANGERS

Scientists in Zimbabwe must not divorce themselves from the social consequences of their research. There will be accidents. There may not be a 'biotech Chernobyl' ... but we might not know if there was.

Unlike the chain reaction in a nuclear power plant-where the elements are contained and controlled the release of genetically-manipulated organisms could launch a chain reaction which we can neither understand nor control. This chain reaction will not be in the laboratory but in the environment.

The chances of a genetically-modified organism 'taking over' are slim. The world will probably never wake up to a report that green slime has crossed the Limpopo and is now moving to the Zambezi. We should not look for a biotech Chernobyl or Bhopal. It is more likely that they will spread slowly, perhaps undetected.

The media will focus on the potential for slave species and brain-transfers but even these theoretical choices will have a minor impact on the great majority of humanity. The real choice is not between Einstein and Frankenstein but between research to combat diseases in plants and people, for example, and research on the same disease for biological warfare.

Society should not look at biotechnology as an escape from the economic and environmental crisis that engulfs us. Unfortunately, politicians desperate for solutions are uncritically embracing a science they do not even comprehend.

But never before has science offered products so capable of fundamentally altering the human equation. There is need for caution and constructive criticism.

Despite our own expressed concerns, perhaps too much media attention has been focused on the question of regulation and safety.

By contrast, there has been almost no media comment on the actual structure of the industry and the control techniques.

The greatest threat in the new biosciences is that life will become the monopoly property of a few giant companies.

"You are going to see food products that we cannot even conceive of today. You are going to see important breakthroughs in the relationship between food and disease, in which food becomes an important element in disease prevention. Biotechnology will enable us to design food to almost any specifications we want." –  
**R. Gordon McGovern, President, Campbell Soup**

The whole gene revolution is on the verge of becoming private property. In fact, what is now emerging throughout the corporate sector in the US, Europe and Japan is a new, unprecedented institution of economic and political power. The multi-faceted, transnational 'life sciences' conglomerate – a huge company that will use genes to fashion life-necessity products just as earlier corporate powers used land, minerals or oil.

Of all technologies, this life-derived technology must remain in the hands of the people. There is need to control access to Zimbabwe genetic resources by successfully implementing the 1992 Convention on Biological Diversity. Scientists should not be allowed to look for the truth by tearing life apart.

## CONCLUSION

Life is an intimate web of relations that evolves in its own right, interfacing and integrating its myriad diverse elements. The complexity and interdependence of all forms of life have the consequence that the process of evolution cannot be controlled, though it can be influenced.

It involves an unpredictable creative unfolding that calls for sensitive participation from all players, particularly from the youngest, most recent, arrivals, human beings.

Life must not be treated as a commodity that can be owned, in whole or in part, by anyone, including those who wish to manipulate it in order to design new life forms for human convenience and profit. There should be no patents on organisms or their parts.

We must also recognise the potential dangers of biotechnology to health and biodiversity, and the ethical problems it poses for our responsibilities to life. There is need for a comprehensive public enquiry into the legitimate and safe uses of biotechnology.

This enquiry should take into account of the precautionary principle as a criterion of sensitive participation in living processes. Species should be respected for their intrinsic natures and valued for their unique qualities, on which the whole intricate network of life depends.

The different ways of knowing and the equivalent value of the knowledge gained within our tradition, in our culture, are valid.

These add substantially to the set of alternative technologies that can be used for the sustainable use of natural resources that will allow us to preserve the diversity of species and to pass the precious gift of life in all its beauty and creativity to our children and their children.

## Glossary of terms

**Amino acid:** A building block of proteins.

**Biological warfare:** the use of weapons of biological or biotechnological origin.

**Biotechnology:** development of products by exploiting biological processes or substances. Production may be carried out by using intact original or modified organisms, such as yeasts and bacteria, or by using active cell components, such as enzymes from organisms.

**Diagnostics:** agents used as a help to diagnose diseases or

disorders, i.e. identify a disease or disorder and distinguish one from another.

**DNA (Deoxyribonucleic acid):** the molecule that carries the genetic information for almost all organisms.

**Gene:** a segment of DNA carrying, due to its base sequence, very specific information.

**Genome:** the entirety of genetic material of a cell.

**Transgenic organism:** a genetically manipulated organism containing in its genome one or more inserted genes of another species.

### Sources for Further Information

SIRDC  
Scientific and Industrial Research  
& Development Centre  
Biotechnology Research  
15 Alpes Road  
Hatcliffe  
HARARE  
Zimbabwe  
Tel: (263-4) 860320-33  
Fax: (263-4) 860350/51  
Email: bti@sirdc.icon.co.zw

COMMUTECH  
57 Suffolk Road  
Avondale  
HARARE  
Zimbabwe  
Tel: (263-4) 303160  
Fax: (263-4) 303160  
Email: tactdtms@harare.iafrica.com

Ministry of Mines, Environment  
and Tourism  
14th Floor  
Karigamombe Centre  
53 Samora Machel Avenue  
P. Bag 7753 Causeway  
HARARE  
Zimbabwe  
Tel: (263-4) 757881/5  
Fax: (263-4) 757877

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#### For further information contact:

The Director, SARDC-IMERCSA, P.O. Box 5690, Harare, Zimbabwe, Tel: (263-4) 720814  
Fax: (263-4) 737301, Email: cep@imercsa.sardc.net