WORLD HEALTH ORGANIZATION

GENOME RESEARCH CAN SAVE MILLIONS IN DEVELOPING WORLD

WHO Report Calls for Genetic Medicine Benefits for All

Genetic research has the potential to lead to major medical advances within the coming years against such killer diseases as malaria, tuberculosis and HIV/AIDS, potentially saving millions of lives, especially in the developing world, the World Health Organization (WHO) says in a major new Report on the impact of genomics.

The WHO Report, entitled **Genomics and World Health**, also makes a major contribution to the debate on the ethics of genome research, covering a wide array of themes, from using DNA tests to select the sex of children to the need to ensure that poor countries are not left out of the coming medical advances.

The report strongly endorses the recommendation of the Commission on Macroeconomics and Health to create of a Global Health Research Fund, a new central organization for research and development with an initial US$ 1.5 billion, which would be available through peer-reviewed application, to every country. It argues that a second US$ 1.5 billion should be made available to institutions which are working on new vaccine and drug development for HIV/AIDS, tuberculosis and malaria.

"Genome research, if we handle it correctly, can change the world for all health care," says Dr Gro Harlem Brundtland, WHO Director-General. "In particular, it has the potential to allow developing countries to leap frog decades of medical development and bring their citizens greatly improved care and modern methods in the much more immediate future,"

A team of 14 internationally prominent doctors, medical researchers and ethicists in both developed and developing countries, coordinated by Dr Tikki Pang, WHO Director, Research Policy & Cooperation, developed the 241-page **Genomics and World Health** Report over a 12 month period.

The Report was issued on behalf of WHO's Advisory Committee on Health Research (ACHR), the organization's highest level scientific advisory body. Based on a wide-ranging consultative process, the Report details the latest advances in genome research, explains how this research could result in medical advances against many diseases, including those pandemic in poor countries, warns about potential risks of such research and makes recommendations on how the fruits of this research can be brought to the developing world.

"This is the first ever Report to put genomic research in a global perspective," says Sir David Weatherall, lead writer of the Report, professor at Oxford University's Weatherall Institute of Molecular Medicine and a pioneering researcher in molecular genetics, hematology, pathology and clinical medicine. "The Report anticipates how the global community could use genetics to attack the unfinished agenda of infectious diseases such as malaria, TB and HIV/AIDS that are still killing so many in the developing world, and eventually the diseases that are crippling the health care systems of all countries, like heart disease, diabetes and cancer."

In recent years, scientists have succeeded in sequencing the entire human genome, which contains between 28,000 and 40,000 genes -- lengths of DNA that carry the information required for every biological function of all living creatures. Researchers are also mapping the genomes of some important pathogens, disease vectors and plants.

Such research involves large-scale creation and utilization of databases through a high level of automation, and therefore requires major capital investment. This has mostly limited research to the rich industrial nations, although Brazil, China, India and Cuba are notable exceptions. These achievements should allow other researchers to develop both preventative and treatment techniques that have pinpoint accuracy for a wide range of afflictions.

"Developing nations are in danger of being left out of the benefits of genomic research, like they were left behind in the computer revolution of the 1980s and 90s, resulting in the so-called 'digital divide'," Prof. Dan Brock of Brown University and another of the Report's writers.. "Genomics and related technologies should be used to *narrow* the existing unethical inequities in global health. The Report is an important first step towards this goal."

"The whole thrust of the Report is that we will not change medical practice overnight by this new technology," Dr. Weatherall says."However, the long-term possibilities are such that developing countries, as well as developed countries, must prepare themselves for this new technology and carefully explore its possibilities."

DNA research is underway on a number of projects that can improve health care in developing countries, with some projects already yielding results. Among the research mentioned in the report are:

- Creating a new designer mosquito that cannot carry the malaria parasite, one of the biggest killers in the developing world.
- Rapid identification of a class of anti-malarial drugs that have the potential to be effective against multi-drug–resistant parasites, as well as being inexpensive and stable. A combination of malaria parasite DNA sequencing, bioinformatics (use of computer technology to store, analyze and interpret biological data-), and data mining (searching for comparative genomic data) have been instrumental in the creation of these drugs.
- Two new types of vaccines derived from genetic research have been developed against tuberculosis, which is spreading in both developing and developed countries. Clinical trials of one of these vaccines has already started.
- The diagnosis of leishmaniasis and dengue fever, both pandemic in some Latin American countries, has already been improved by the use of polymerase chain reaction techniques – one of the basic techniques in DNA research.
- Cuba has developed a meningitis B vaccine at the Carlos J. Finlay Institute, attesting to the potential of biotechnology in developing countries.
- Clinical trials have begun in Nairobi, Kenya and Oxford, UK, of a DNA-based AIDS vaccine candidate designed specifically for Africa.
- Scientists are using DNA technology to produce vaccines that can be incorporated into potatoes and other vegetables, and fruits, against hepatitis B, cholera, measles, and human papilloma virus (associated with cervical cancer, a common malignancy in women in sub-Saharan Africa), allowing the vaccines to be ingested as part of a meal.

- A candidate vaccine for *Plasmodium vivax*, the main type of malaria in India, has been identified by a recent collaborative effort between Indian researchers at the International Centre for Genetic Engineering and Biotechnology in New Delhi and the Malaria Vaccine Initiative.

- Pharmacogenetics may save lives and valuable health care resources in developing countries by identifying populations who will respond favorably to therapeutics; there is preliminary evidence for this in relation to certain anti-HIV drugs in West Africa.

"The importance of this WHO Report is to make clear that while most of the incentives to develop new drugs and vaccines are appealing to the markets in the industrialized world, there are enormous opportunities to apply knowledge of the genome to diseases of the poorest people as well, and that we all have a responsibility to help make those opportunities into realities," says Professor Barry R. Bloom, Dean of the Harvard University School of Public Health and a member of the Committee which prepared the WGO Report.

The Report carries the first ever global examination of the role that ethics should play in genetic research and genetic medicine.

The Report warns that the planned development of large-scale genetic databases offers a series of hazards and ethical issues which have not been previously encountered. It says that there is still considerable controversy about the desirability of establishing databases of this type and there are many ambiguities regarding access and control. Concerns are focused on the potential harm to individuals, groups and communities.

Another ethical problem deals with decisions families may make regarding children as a result of DNA research. "These concerns are based on the notion that in our attempts to help families or individuals with a genetic disease we may increase the number of deleterious genes in the human gene pool," the Report says. "Preventing parents who are carrying the same genetic defect from reproducing, and hence having affected children, will tend to interfere with the normal evolutionary mechanism for reducing the frequency of deleterious genes within a population."

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All WHO Press Releases, Fact Sheets and Features as well as other information on this subject can be obtained on Internet on the WHO home page http://www.who.int/

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DIABETES MELLITUS

Diabetes mellitus is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves.

There are two principle forms of diabetes:

- **Type 1 diabetes** (formerly known as insulin-dependent) in which the pancreas fails to produce the insulin which is essential for survival. This form develops most frequently in children and adolescents, but is being increasingly noted later in life.

- **Type 2 diabetes** (formerly named non-insulin-dependent) which results from the body's inability to respond properly to the action of insulin produced by the pancreas. Type 2 diabetes is much more common and accounts for around 90% of all diabetes cases worldwide. It occurs most frequently in adults, but is being noted increasingly in adolescents as well.

Certain genetic markers have been shown to increase the risk of developing Type 1 diabetes. Type 2 diabetes is strongly familial, but it is only recently that some genes have been consistently associated with increased risk for Type 2 diabetes in certain populations. Both types of diabetes are complex diseases caused by mutations in more than one gene, as well as by environmental factors.

Diabetes in pregnancy may give rise to several adverse outcomes, including congenital malformations, increased birth weight and an elevated risk of perinatal mortality. Strict metabolic control may reduce these risks to the level of those of non-diabetic expectant mothers.

Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) refer to levels of blood glucose concentration above the normal range, but below those which are diagnostic for diabetes. Subjects with IGT and/or IFG are at substantially higher risk of developing diabetes and cardiovascular disease than those with normal glucose tolerance.

The benefits of clinical intervention in subjects with moderate glucose intolerance is a topic of much current interest.

Symptoms: The symptoms of diabetes may be pronounced, subdued, or even absent.

- In Type 1 diabetes, the classic symptoms are excessive secretion of urine (polyuria), thirst (polydipsia), weight loss and tiredness.

- These symptoms may be less marked in Type 2 diabetes. In this form, it can also happen that no early symptoms appear and the disease is only diagnosed several years after its onset, when complications are already present.

Prevalence:

- Recently compiled data show that approximately 150 million people have diabetes

mellitus worldwide, and that this number may well double by the year 2025. Much of this increase will occur in developing countries and will be due to population growth, ageing, unhealthy diets, obesity and sedentary lifestyles.

- By 2025, while most people with diabetes in developed countries will be aged 65 years or more, in developing countries most will be in the 45-64 year age bracket and affected in their most productive years.

Diagnosis:

- WHO has published recommendations on diagnostic values for blood glucose concentration. The diagnostic level of fasting blood glucose concentration was last modified in 1999.

Treatment:

- The mainstay of non-pharmacological diabetes treatment is diet and physical activity.

- About 40% of diabetes sufferers require oral agents for satisfactory blood glucose control, and some 40% need insulin injections. This hormone was isolated by Frederic Banting and Charles Best in 1921 in Canada. It revolutionized the treatment of diabetes and prevention of its complications, transforming Type 1 diabetes from a fatal disease to one in which long-term survival became achievable.

- People with Type 1 diabetes are usually totally dependent on insulin injections for survival. Such people require daily administration of insulin. The majority of people suffering from diabetes have the Type 2 form. Although they do not depend on insulin for survival, about one third of sufferers needs insulin for reducing their blood glucose levels.

- Insulin is unavailable and unaffordable in many poor countries, despite being listed by WHO as an essential drug. Access to insulin by those who require it is a subject of special concern to international health agencies and national health authorities.

Complications associated with Diabetes Mellitus:

- **Diabetic retinopathy** is a leading cause of blindness and visual disability. Diabetes mellitus is associated with damage to the small blood vessels in the retina, resulting in loss of vision. Findings, consistent from study to study, make it possible to suggest that, after 15 years of diabetes, approximately 2% of people become blind, while about 10% develop severe visual handicap. Loss of vision due to certain types of glaucoma and cataract may also be more common in people with diabetes than in those without the disease.

  Good metabolic control can delay the onset and progression of diabetic retinopathy. Loss of vision and blindness in persons with diabetes can be prevented by early detection and treatment of vision-threatening retinopathy: regular eye examinations and timely intervention with laser treatment, or through surgery in cases of advanced retinopathy. There is evidence that, even in developed countries, a large proportion of those in need is not receiving such care due to lack of public and professional awareness, as well as an absence of treatment facilities. In developing countries, in many of which diabetes is now common, such care is inaccessible to the majority of the population.

- Diabetes is among the leading causes of **kidney failure,** but its frequency varies between populations and is also related to the severity and duration of the disease. Several measures to slow down the progress of renal damage have been identified. They include control of high blood glucose, control of high blood pressure, intervention with medication in the early stage of kidney damage, and restriction of dietary protein. Screening and early detection of diabetic kidney disease are an important means of prevention.

- **Heart disease** accounts for approximately 50% of all deaths among people with diabetes in industrialized countries. Risk factors for heart disease in people with diabetes include smoking, high blood pressure, high serum cholesterol and obesity. Diabetes negates the protection from heart disease which pre-menopausal women without diabetes experience. Recognition and management of these conditions may delay or prevent heart disease in people with diabetes.

- **Diabetic neuropathy** is probably the most common complication of diabetes. Studies suggest that up to 50% of people with diabetes are affected to some degree. Major risk factors of this condition are the level and duration of elevated blood glucose. Neuropathy can lead to sensory loss and damage to the limbs. It is also a major cause of impotence in diabetic men.

- **Diabetic foot disease**, due to changes in blood vessels and nerves, often leads to ulceration and subsequent limb amputation. It is one of the most costly complications of diabetes, especially in communities with inadequate footwear. It results from both vascular and neurological disease processes. Diabetes is the most common cause of non-traumatic amputation of the lower limb, which may be prevented by regular inspection and good care of the foot.

Prevention: Large, population-based studies in China, Finland and USA have recently demonstrated the feasibility of preventing, or delaying, the onset of diabetes in overweight subjects with mild glucose intolerance (IGT). The studies suggest that even moderate reduction in weight and only half an hour of walking each day reduced the incidence of diabetes by more than one half.

Diabetes is a serious and costly disease which is becoming increasingly common, especially in developing countries and disadvantaged minorities. However, there are ways of preventing it and/or controlling its progress. Public and professional awareness of the risk factors for, and symptoms of diabetes are an important step towards its prevention and control.

For further information, please contact the Communications Office of the Director-General's Office, WHO Geneva, Tel (+41 22) 791 2222, Fax (+41 22) 791 4858; e-mail: inf@who.int. All WHO Press Releases, Fact Sheets and Features can be obtained on the Internet on the WHO home page <http://www.who.ch>

WHO TO HOLD URGENT EXPERT CONSULTATION ON ACRYLAMIDE IN FOOD AFTER FINDINGS OF SWEDISH NATIONAL FOOD ADMINISTRATION

Following the announcement on 24 April, by the Swedish National Food Administration (NFA) that acrylamide, a known carcinogen in animal tests, has been found in elevated levels in starch-containing foods cooked at high temperatures, such as potato products and bread, the World Health Organization (WHO) has announced today that it will organize an expert consultation as soon as possible to determine the full extent of the public health risk from acrylamide in food. Previous concerns about acrylamide were a result of known human exposure through drinking water and in certain occupations. The Swedish announcement is the first report of the presence of elevated levels of acrylamide in food.

WHO officials have stressed that, although many pieces of information about acrylamide and its effects in animals do exist, a full picture of the levels in food and effects on humans does not, and therefore WHO will be looking to fill in relevant gaps in knowledge.

In 1994, the International Agency for Research on Cancer of WHO evaluated acrylamide as "probably carcinogenic to humans" (Group 2A). This evaluation was based on sufficient evidence of carcinogenicity in experimental animals and extensive supplementary evidence that acrylamide has a chemically reactive mode of action as a toxicant, causing DNA adducts, gene mutations and chromosome abnormalities in animal cells and haemoglobin adducts (a biomarker of exposure) in both exposed animals and exposed humans. The few epidemiologic studies of acrylamide that were available at that time were inadequate to establish that occupational exposures to acrylamide had increased cancer risks in exposed workers.

In announcing the discovery of high levels of acrylamide in food by research teams at Stockholm University and the Swedish National Food Administration (NFA), the NFA said that: "Present knowledge does not allow for a balanced analysis of risks and benefits of staple foods containing acrylamide. The Swedish NFA can currently only issue general advice regarding the risk management of acrylamide to the food industry and consumers... More knowledge is needed before the dietary advice issued by the NFA can be changed." The level of acrylamide produced during food preparation was reported in the Swedish studies to increase with the temperature at which the food is cooked.

WHO emphasized that several questions still need to be resolved before more definitive advice can be given. For example, is acrylamide taken up from food as readily as it is from water? If it is, what is the risk that this uptake will lead to harmful effects in humans?

The WHO informal expert consultation, planned to take place before the end of June, will look at these questions. Other topics that the consultation will consider are epidemiological data, levels in food in other countries, processing conditions that either increase or reduce those levels, and development of appropriate guidance to reduce exposure to acrylamide.

None of the results announced 24 April in Sweden would cause WHO to change its basic dietary advice. WHO recommends eating more fruits and vegetables and less fat-containing foods.

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NEW FORMULA FOR ORAL REHYDRATION SALTS WILL SAVE MILLIONS OF LIVES

Number of deaths and severity of illness will be reduced

Geneva and New York - The new formula Oral Rehydration Salts (ORS), released by the World Health Organization (WHO) today, will save millions of lives and reduce the severity of illness of those suffering from acute diarrhea. ORS is a sodium and glucose solution that is widely used to treat children with acute diarrhea, a serious killer of children under five worldwide. The new formula ORS will reduce the severity of diarrhea and vomiting, the number of hospitalizations, the need for costly intravenous (IV) fluid treatment and the length of illness.

The use of ORS is responsible for saving the lives of millions of children worldwide. This inexpensive and readily available intervention reduces death and suffering from dehydration caused by diarrhea. Since WHO adopted ORS in 1978 as its primary tool to fight diarrhea, the mortality rate for children suffering from acute diarrhea has fallen from 5 million to 1.3 million deaths annually.

The new improved formula is the result of extensive research sponsored by WHO's Department of Child and Adolescent Health and Development. The latest study was conducted in five developing countries among children from one month to two years old with acute diarrhea and dehydration.

The study's findings suggest that using the low-sodium, low-glucose ORS formulation reduces the need for intravenous fluids by 33 percent. The effect of this reduction could result in fewer children requiring hospitalization, fewer secondary infections, a diminished need to handle blood with its potentially dangerous consequences, and lower health care costs.

"Oral Rehydration Therapy is one of the great public health success stories of our time," according to Dr Gro Harlem Brundtland, Director-General of WHO. "Reducing childhood deaths from diarrhea by half in ten years is a notable success but, despite this progress, diarrhea remains a major cause of death. This week at the UN General Assembly Special Session on Children governments will endorse a new goal to reduce deaths from diarrhea by a further 50 percent by 2010."

Oral Rehydration Therapy was first researched in the 1940s but it was twenty years later before the idea was developed by research institutions in Bangladesh and India for the management of severe cholera. Then conventional wisdom said only health professionals could mix and administer the solution and that its use was limited to hospitals. The use of ORS during the 1971 war between India and Pakistan provided convincing evidence that ORS could be given by non-medical personnel, volunteers and family members.

The war provoked a public health emergency in the unsanitary, overcrowded and primitive border camps set up to house those fleeing the violence. The camps quickly became breeding grounds for diseases, especially cholera. With cholera spreading rapidly and death rates rising, the head of a medical centre in one of the camps instructed his staff to

distribute ORS that was stored in steel drums around the camp. The distribution, like the solution, was simple but effective. The ORS solution administered by family members and others dramatically reduced the death rates from diarrhea.

In the refugee camps where ORS was being used the death rate was only 3 percent compared to between 20 and 30 percent in those camps using only intravenous fluid therapy. But, still the medical community held out - sceptical that such a devastating problem could have such a simple solution.

The dramatic improvement in home management of diarrhea through ORS use took place between 1990 and 1995, saving about 1 million children annually. In 1990, oral rehydration salts were used in approximately one-third of diarrhea cases, and by mid-decade the average was 85 per cent among 33 reporting countries that account for almost half of the world's under-five population.

"To reach the 2010 goal we need to expand the use of ORS dramatically. To do this the role of parents, volunteer care givers and health workers is going to be vital. Having access to packets of oral rehydration salts when you need them is also very important to scaling-up. Ideally, all families should have packets of ORS in the home ready to be mixed as soon as it is needed. Using ORS packets should become routine at the first signs of diarrhea to avoid the risk of parents waiting too long before rehydrating the child. If we can achieve this, the 2010 goals should be well within our reach," says Dr Tomris Turmen, Executive Director, Family and Community Health at WHO .

Use of the new formula ORS will begin later this year in India.

For more information, contact Chris Powell, Information Officer, Family and Community Health, WHO, Geneva. Tel. (+41 22) 791 2888; mobile (+41) 79 217 3425; E-mail: powellc@who.int. All WHO Press Releases, Fact Sheets and Features as well as other information on this subject can be obtained on Internet on the WHO home page http://www.who.int/

POLLUTION-RELATED DISEASES KILL MILLIONS OF CHILDREN A YEAR

Alarming Numbers Part of New UN Report Released for Child Conference

NEW YORK, 9 May 2002 -- Every day 5,500 children die from diseases caused by consuming water and food polluted with bacteria, according to a new study released by three United Nations agencies.

This alarming figure, from *Children in the New Millennium: Environmental Impact on Health,* shows that children the world over are the greatest victims of environmental degradation, despite the great strides made over the past ten years in improving both children's well-being and the environment. The diseases largely influenced by this degradation, most notably diarrhoea and acute respiratory infections, are two of the leading causes of child mortality.

"We have made great strides over the last decade. Children are healthier today. There is more access to clean water. But these disturbing figures show we have barely started to address some of the main problems," said Carol Bellamy, the Executive Director of UNICEF. "Far too many children are dying from diseases that can be prevented through access to clean water and sanitation."

The 140 page report, jointly produced by UNICEF, the UN Environment Programme and the World Health Organization (WHO), is being released as part of the May 8-10 UN General Assembly Special Session on Children. This landmark conference, attended by more than 60 heads of state or government and 170 national delegations, aims to place children back at the top of the world's agenda and foster more investment in essential social services for them. One of its main goals is to increase household access to hygienic sanitation facilities and affordable and safe drinking water.

40 Per cent of Environmentally-Related Disease Burden in Children Under 5

According to WHO, almost one-third of the global disease burden can be attributed to environmental risk factors. Over 40 per cent of this burden falls on children under five years of age, who account for only 10 per cent of the world's population. A major contributing factor to these diseases is malnutrition, which affects around 150 million and undermines their immune systems.

Malnutrition and diarrhoea form a vicious cycle. The organisms that cause diarrhoea harm the walls of a children's guts, which prevents them digesting and absorbing their food adequately, causing even greater malnutrition -- and vulnerability to disease.

"People are most vulnerable in their youngest years. This means that children must be at the centre of our response to unhealthy environments." said WHO Director-General Dr Gro Harlem Brundtland.

The report also identifies other major environmental problems directly affecting children, such as high levels of toxic chemicals and the degradation and depletion of natural resources. Lead in the environment -- much of it from leaded gasoline -- causes permanent neurological and developmental disorders in children. Millions of children work in agriculture, putting them at high risk of pesticide poisoning. Children are also disproportionately vulnerable to global environmental problems, such as the impact of climate change, the depletion of the ozone layer and the loss of the planet's biological diversity.

"I am convinced that we need to elevate children's environmental health issues on the international agenda, both through the General Assembly's Special Session on Children and then the World Summit on Sustainable Development," said Mr Klaus Töpfer, the Executive Director of the UN Environment Programme. "We should recognize that realising children's rights and managing environmental challenges are mutually reinforcing goals. We hope that the publication will inspire everyone who cares about children to take decisive action that will improve both their health and the environment."

Immediate Action Needed Across the Board

The report warns of low public awareness on children's special vulnerability to environmental health risks. Among the recommended actions, the report calls for increased national investment in early child care, including focusing on the immediate environments of children, like homes, schools, and communities. One notable success in many countries is the transition to unleaded fuel, which helps eliminate lead from the environment.

Through the report, the three UN agencies hope to raise the awareness of governments and non-government organizations on these problems during the UN Special Session itself, and at August's World Summit on Sustainable Development in Johannesburg, South Africa.

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Note to broadcasters: An 8 minute video news release with 22 minute b-roll is available including interviews with the three UN agency heads. Please contact:
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