

## The Pill Cabinet of the Future

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**The Health Issue Miracle Cures** The next 10 years promise massive advances as a new generation of designer drugs and treatments turns killers like cancer into chronic complaints. Jeremy Laurance on a brave - and expensive - new world.

We are on the edge of a new era of drug discovery. Decades of research into the basic science of biological systems is starting to bear fruit. Within the next 10 years new drugs tailored to individuals that will be both safer and more effective are set to appear on the market.

New additions to the bathroom cabinet will include powerful statins to cut cholesterol, enzymes to promote digestive health and new classes of painkillers geared to personal pain receptors. Patients will have access to stem cells from which new tissue can be grown, DNA profiling setting out their risks of developing or passing on inherited disease and tests for predicting individual drug response. Gene therapy for certain childhood blood conditions such as Severe Combined Immunodeficiency Disorder has already proved effective, heralding a revolution in treatments for inherited disease.

In fertility treatment, scientists are working on making sperm and eggs from skin cells in a process known as haploidisation. If successful, it could bring hope to the one in six infertile couples who are unable to produce their own genetic offspring.

The new drug for breast cancer, Herceptin, is a harbinger of drug developments to come. It is one of a new class of cancer drugs that some experts claim will transform cancer from a killer disease to a chronic condition like diabetes. Herceptin is among the first of the new "personalised" medicines - only effective in the 20 per cent of breast cancer patients with a specific genetic profile, marked by the presence of Her2-positive receptors. This new class of "designer" cancer drugs, built from research on cancer at the molecular level and designed to have a specific action, will mean better targeted treatments suitable for specific groups of patients. "The molecular era is starting in which we will be able to break down diseases into more specific entities. It has started in cancer in a dramatic way," Sir David Weatherall, Regius Professor of Medicine at Oxford University, said recently.

But there is a downside to this new era of personalised treatment. The drugs will be much more expensive because they are suitable for fewer people. One reason for the high cost of Herceptin - around £20,000 a year - is that the potential market is only one fifth of that for other breast cancer drugs. The new drug for lung cancer, Tarceva, is being hailed as a breakthrough in the treatment of the disease but it costs £75 a day and must be taken for life.

Progress will not only come from drug development. Surgeons will soon attempt the ultimate cosmetic operation - a whole face transplant. New surgical techniques combined with developments in anaesthetics will mean more treatment can be delivered outside hospitals in clinics and GP surgeries. Last week the first woman to have a kidney removed through keyhole surgery was able to leave hospital and return home the same day.

One of the most urgent areas of research is in vaccines against avian flu. The H5N1 virus that has decimated poultry flocks in the Far East, infected 176 people and killed 97, is slowly evolving. The risk of a flu pandemic is higher than it has been for 30 years. Scientists are racing against time to develop an effective vaccine. The lives of millions of people may depend on it.

A new drug for lung cancer costs £75 per day

PFIZER

CP-690,550

#### TREATS RHEUMATOID ARTHRITIS

Rheumatoid arthritis occurs when the immune system is over-active or faulty, leading to inflammation, swelling and pain in healthy tissue. CP-690,550 blocks an enzyme known as Jak3 found only in immune system cells. Blocking Jak3 suppresses the immune system and thus relieves RA, while not affecting other systems of the body. Current drugs target enzymes found in cells throughout the body, resulting in toxic side-effects. CP-690,550 could also treat a number of other autoimmune diseases such as eczema and psoriasis, and help transplant patients.

SOMAXON

Nalmefene

#### TREATS GAMBLING ADDICTION

Behaviour and mental health is one of the biggest growth areas, with more than 2,000 clinical trials recruiting, to test drugs tackling conditions ranging from agoraphobia and gambling, to stress and transsexualism. Nalmefene from Somaxon has been on trial as a way of taking the thrill out of gambling - six out of 10 pathological gamblers who took the pill daily benefited. An opiate antagonist, it blocks the part of the brain that processes pleasure. It is being tested next for compulsive shopping and may work for kleptomania and pyromania.

LAN PHARMACEUTICALS

AAB-001

#### TREATS ALZHEIMER'S

Alzheimer's is a leading target of research, with more than 100 trials recruiting. AAB-001 by lan Pharmaceuticals aims to provide antibodies to beta amyloid, the protein involved in the disease's development. Animal studies have shown this approach is effective in clearing beta amyloid from the brain. Around 30 hospitals are likely to be involved in a clinical trial. Another drug being trialled, FK962, triggers the release of the hormone somatostatin in parts of the brain involved in learning and memory. Alzheimer's is associated with reduced brain levels of several neurotransmitters, including somatostatin.

VANDA

VEC-162

#### TREATS SLEEP DISORDERS

There are more than 40 clinical trials of drugs and treatments for sleep disorders underway. Vanda's VEC-162, now in clinical trials, is a new type of drug known as a melatonin agonist, developed for the treatment of sleep problems and mood disorders. Melatonin is secreted by the pineal gland, a pea-size structure at the centre of the brain, at night, and it helps to regulate the sleep-wake cycles. Melatonin supplements are used for jet lag and increasingly for sleep conditions, but the new drug would get the body to adjust its own production levels of the compound. Research suggest that drugs like VEC-162 induce more natural sleep than traditional sleeping pills.

## OTHERA PHARMACEUTICALS

### OT-551

#### TREATS BLINDNESS

Age-related macular degeneration is the leading cause of blindness in over-60s and affects one in four of this group in Britain. The rods and cones in the central part of the retina stop working, making it difficult or impossible to see fine detail. No exact cause is known, but the buildup of oxidative damage is thought to be a major factor. **OT-551**, being developed by **Othera Pharmaceuticals**, is the first of a new type of drug called catalytic antioxidants that are designed to boost the body's natural defences against free radical damage. A small dose taken as an eye drop could be effective for long periods.

## NATIONAL CENTER FOR COMPLEMENTARY AND ALTERNATIVE MEDICINE

### Mistletoe

#### TREATS LUNG CANCER

More than 240 drugs for lung cancer are at various stages of research and development. A new drug is desperately needed - five-year survival rates are among the lowest of all the malignancies. But not all the new avenues feature man-made drugs. Mistletoe extract, which has a number of uses in traditional folk medicine, is being investigated in a small clinical trial by the National Center for Complementary and Alternative Medicine as a potential treatment for advanced solid tumours. Fifty patients will take the extract along with a more widely used drug. Early research suggests mistletoe stimulates the immune system into attacking cancer cells.

## MERCK

### Isis-113715

#### TREATS OBESITY

Around one in five adults in the UK are obese and hundreds of potential drugs are at varying stages of development. According to McGill University in Montreal, at least 20 companies, including Merck, with Isis-113715, are focusing on an enzyme called PTP1B, which prevents a fat-burning hormone, lep-tin, working properly. Early research on animals shows that those who had low levels, of PTP1B were lean with little or no fat. "If leptin does not work, you will become obese," says Dr Philip Scarpace of the University of Florida. Other research is looking at drugs that tackle the reward system in the brain. Biovitrum in Stockholm is testing a selective serotonin reuptake inhibitor called BVT.933, with promising early results.

## GLAXOSMITHKLINE

### GW274150

#### TREATS MIGRAINE

Prevention as well as the easing of symptoms are the aims of new drugs. GW274150 from GlaxoSmithKline, aims to control nitric oxide, which is thought to play a part in the development of migraine headache. It works by reducing levels of nitric oxide synthase (NOS), a chemical involved in the production of the oxide. GW274150 is on trial as a potential prophylactic treatment for migraine. Another drug, SB-705498, is designed to work on receptors in the trigeminal nerve, one of the cranial nerves on each side of the head. The aim is to block the receptor to get rid of the pain and lower sensitivity.

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