

Pharmacology and Treatments – summary

Our knowledge of the ways in which all types of psychoactive drugs affect the brain has been growing fast in recent years. In coming decades we may know enough to develop pharmaceutical treatments to prevent problematic drug use or to minimise its effects. Therapies for treating problem drug use or its effects will also improve. Alongside this, new knowledge will allow novel drugs to be developed, for therapeutic, recreational, and other purposes, which will bring new harms and benefits. These changes may be accompanied by new attitudes to psychoactive drug use.

The Foresight project on Brain Science, Addiction and Drugs asked Kelly Morris and David Nutt of the University of Bristol and Leslie Iversen of the University of Oxford to examine the possible future changes in problem drug use, and potential therapies and treatments for drug problems.

Psychoactive drugs affect chemical systems in the brain called neurotransmitters. We already know some neurotransmitter systems that are affected by alcohol, amphetamine, tobacco, cannabis, MDMA (ecstasy) and other drugs. Our knowledge of the chemical effects of drugs is likely to grow alongside our knowledge of the brain's chemistry. For example, there seem to be about 200 human genes that code for receptors, including many 'orphan' receptors whose function is not yet clear. Some of these are likely to be part of novel neurotransmitter systems.

The brain's system for producing dopamine, a neurotransmitter involved in the way humans appreciate an experience, appears to be central to much drug dependency. Some drugs seem to hijack this system to cause unhelpful learning, which can lead to habituation to drug effects, craving, and other signs of dependence. The importance of other pathways associated with dependency and other drug problems, such as those involving our internal opiates and cannabinoids, is also becoming better-known.

In addition, the interaction between the causes and effects of drug use are becoming more apparent. Neurotransmitter pathways, like dopamine, serotonin and noradrenaline, may be imbalanced in some individuals, leading to conditions such as anxiety, excessive impulsiveness, and depression. These and other conditions seem to increase susceptibility to taking drugs in some individuals, and may also lead to relapse. Some problem drug use may lead to imbalances in neurotransmitter systems that could increase the likelihood of further problem drug use.

These scientific developments are taking place at a time when drug use and other problem behaviours, such as eating disorders and gambling, are on the rise worldwide. In the UK, a more medical and less crime-oriented approach to drug problems is beginning to emerge.

Addiction treatments, which may become more widespread in the near future, involve both agonists and antagonists. Agonists work by providing a similar effect to the drug itself, while antagonists block the drug effect, which can lead to its use dying down.

In the past, there has been reluctance to treat drug dependency by the use of more drugs, which in turn might be abused. This applies especially to agonists rather than antagonists. But our growing knowledge of drug effects is leading to development of agents with little abuse potential, which may allow such treatment to be more effective in future. Drug treatment is likely to be most effective in alliance with psychosocial methods, which are the mainstay of treatment for drug dependency. For example, drug treatments might provide a break from craving, which would be valuable for someone trying to engage in other therapies and might reduce the risk of relapse.

Future drugs

New psychoactive drugs are likely to emerge from current sources, ranging from pharmaceutical companies to illegal laboratories, and perhaps from new players. Some drugs will be intended for recreation, some for therapeutic purposes, and some may have novel uses such as cognitive enhancement. Boundaries could blur as attitudes change.

New knowledge derived from neurosciences, genetics, imaging and other sources will allow new drugs of all types to be developed. Some compounds will be developed from new psychoactive substances derived from plants. Others might arrive by a high-technology route in which compounds are designed to match specific transmitters and receptors in the brain. Imaging could make it possible to match treatments more closely to their intended effects, while genetic knowledge could allow them to be customised for individuals.

A minority of new psychoactive drugs seem likely to lead to dependency or to be abused. But novel agents are likely to be designed for lower levels of toxicity, abuse potential and other harm in coming years. So the major problem drugs of the future are likely to be those we know today such as tobacco, alcohol, opiates like heroin, and stimulants. Problem drug users are likely to become better informed about the drugs they use and about the treatments available for drug use.

Future treatments

Treatment for drug dependency has proven benefits for individual health and to society, in terms of cutting crime and other costs. However, as with many chronic illnesses, treatment can have poor results and relapses can be common. Innovation may allow this to improve. New forms of treatment will be enhanced by new forms of delivery technology going beyond today's sprays, pills and patches. It may be possible to develop active vaccination against some problem drugs to block their effects.

It may also be possible for an intervention to undo the learning that links particular environments or other cues with drug cravings, such as needles for heroin users or pubs for alcoholics. Already, some drugs have proved effective for problem use of a single drug, and these agents may cross over to help other drug problems.

However, given long term trends, most societies will probably see more of all types of drug use in the next 20 years. Legal and illegal drugs are both likely to be cheaper in 2025 than they are today. Social, legal and health policies are likely to be as important as science in coping with this likely growth, in the most beneficial way possible for individuals and society.

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