Three sides of a coin

Any neutral observer of humanity might come to the conclusion that most adults in the developed world have a range of serious addiction problems. Young people often begin to explore the effects of alcohol, nicotine, cannabis and other drugs for social and psychological reasons, continuing their use of their preferred narcotic into adult life. In adults, the cocktail is enhanced by the use of aspirin, ibuprofen or other non-steroid painkillers to deal with unpleasant after-effects, while increasing age requires the use of additional compounds to keep failing mental and physiological functions under control: beta-blockers, statins, SSRI-uptake inhibitors, steroid and non-steroid inflammation blockers, all manner of vitamins, micronutrients, lipid formulas and other concoctions to make us look and feel better. But, in addition to those adults and young people on a hedonistic or age-denying narcotic bender are patients who literally cannot live without drugs. People with diabetes, viral and bacterial infections, HIV/AIDS, high blood pressure, severe depression, or many forms of cancer have little choice but to dose up on a range of highly toxic compounds that can as easily kill as cure.

Our relationship with drugs is therefore obviously complex, and the use and acceptability of drugs—both medically and socially—has essentially three components: efficacy, toxicity and sociality.

A drug is a chemical compound that exerts a physiological response by interfering with the function of one or more target molecules. All other factors are context—the biology of the organism, the dosage, timing and delivery of the drug, the genetic, environmental and social factors—but still have important consequences for the potency and action of the drug, including whether it kills or cures. Many cancer drugs, for example, are extraordinarily potent

cytotoxins that would kill at higher doses. When nicotine is ingested, it is lethal; when inhaled, it is addictive. Human growth hormone is an approved therapy for treating growth-inhibited children, but it is illegal for use in professional sports.

Generally, the main criterion for any drug is evidence of a strongly positive effect: the ability of a protein kinase inhibitor to efficiently kill rapidly dividing cancer cells, for example; the anti-inflammatory action of ibuprofen; or the stimulating effect of caffeine in the morning. But the flip side of a drug's chemical potency are the unpleasant, unwanted and sometimes life-threatening side effects. Certain types of chemotherapy lead to hair loss and severe nausea; morphine is highly valued in medicine as a powerful pain killer but it is also highly addictive. Some patients, through an unlucky combination of genetic or environmental factors, develop severe or deadly responses to drugs that are otherwise perfectly safe in the vast majority of patients; even aspirin has been shown to cause gastrointestinal bleeding or tinnitus in some people.

The third side of the coin—after efficacy and toxicity—is the social use and acceptability of drugs, which often has little to do with the physiological effects. Why, for example, is the use of comparatively harmless drugs such as LSD or methamphetamine illegal when they have no biologically life-threatening effects and little potential to create addiction? Why are their consumers and producers branded as criminals, whereas those who indulge in alcohol and nicotine—both highly addictive and toxic compounds that cause severe health problems—are considered law-abiding citizens? We prescribe Ritalin to an ever-growing number of school children because they are diagnosed with attention-deficit hyperactivity disorder, but when college students use Ritalin to improve their natural performance

in class and in tests, we are uneasy about their performance 'doping'. Society similarly draws a clear line between the use of drugs such as steroids or erythropoietin as therapeutics, which is OK, and their use in sports, which is not.

Our new Science & Society series on 'Science & Drugs' will explore these complexities. This issue of the journal launches the series with Howy Jacobs confessing his personal addiction(s) and how this impacts on his life, in particular when travelling to the USA. Ravi lyengar's essay (page 1039) explores how a systems understanding of drug action, from cellular function to human physiology, incorporating a comprehensive analysis of drug effects, can lead us to combination treatments that are far more effective than the use of a single drug in isolation. Edzard Ernst's opinion on page 1025 voices his skepticism about the views expressed by proponents of alternative medicine regarding drugs and medical practice in general.

In the coming months, we will continue to explore the fascinating complexity of our relationship with drugs and how we as humans and societies use and abuse them. The topics covered will include our overuse of antibiotics and the fatal consequences for human health, the question of how and why humans came to enjoy and become addicted to the unpleasant side effects of poisonous drugs such as nicotine or opiates, the search for new and more efficient ways to determine the toxicity of drugs, and attempts to treat health problems without any drug at all by exploiting the placebo effect. We will tackle the biological, social and ethical angles of these topics and hope to stimulate debate among you in the pub, around the coffee table or on cigarette breaks.

Holger Breithaupt

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