

Facts on Alcohol

Interactions between Alcohol and Medicines

Background

Drug-alcohol interactions often cause serious side effects and alter the effectiveness of medicines. Drug-alcohol interactions are particularly unpredictable and dangerous in older patients who take multiple drugs and drink alcohol occasionally or regularly^{2,3}. These interactions affect the absorption, distribution and breakdown of medicines in the body^{1,7}. In these interactions, both alcohol can affect the effects of certain drugs and some drugs can change the properties of alcohol^{7,9}. Alcohol-drug interactions affect all people and are by no means limited to groups with addiction problems¹⁴.

Health Risks due to Altered Effects of Medicines

Alcohol can accelerate or increase the effects of certain medicines (Fig. 1). This is because alcohol delays gastric emptying and thus prolongs the time it takes for the drug to be absorbed by the body. In addition, alcohol's ability to act as a solvent can alter the release of drugs from slow-release medications, such as extended-release tablets, leading to more rapid absorption and distribution of the drug into the bloodstream⁴. The resulting high levels of the drug in the body can lead to increased drug action or unwanted side

effects which may be dangerous (Fig. 2). For example, fatal respiratory inhibition can occur when opioids with altered drug release and alcohol are taken at the same time¹¹.

Moreover, the sleep-inducing and intoxicating effects of sleeping pills and sedatives are increased when alcohol is consumed at the same time. Taking doses of sleeping pills and sedatives higher than recommended at the same time as more than one glass of alcohol increases the risk of life-threatening coma¹⁶.

Acute and Chronic Alcohol Use Has Different Effects

Acute and occasional alcohol consumption increases the effect of some medicines, whereas chronic and regular alcohol consumption decreases the effect of some medicines.

Acute alcohol consumption inhibits liver enzymes involved in the metabolism of many medicines and reduces kidney function, delaying the metabolism of some drugs¹⁵. This increases the concentration of active agents in the blood and increases the effectiveness and side effects of some medicines.

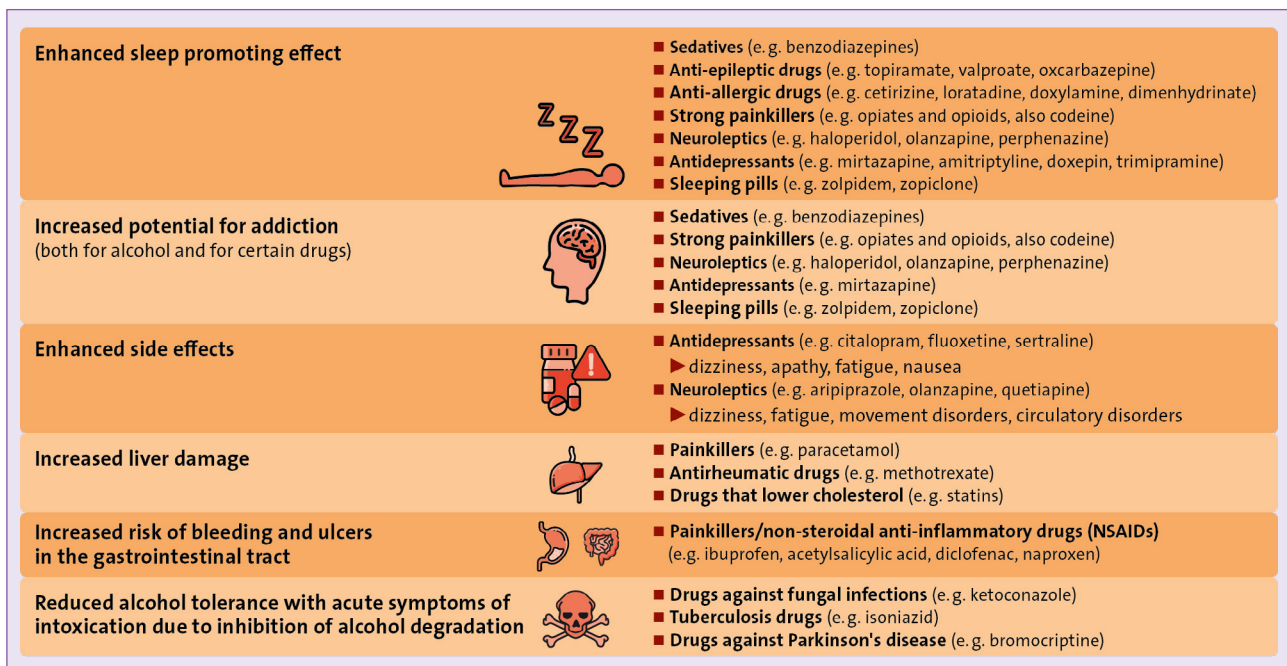


Figure 1: Examples of serious interactions between alcohol and medicines: Enhancement of adverse effects or medication risks. Illustration: German Cancer Research Center, Cancer Prevention Unit, 2023

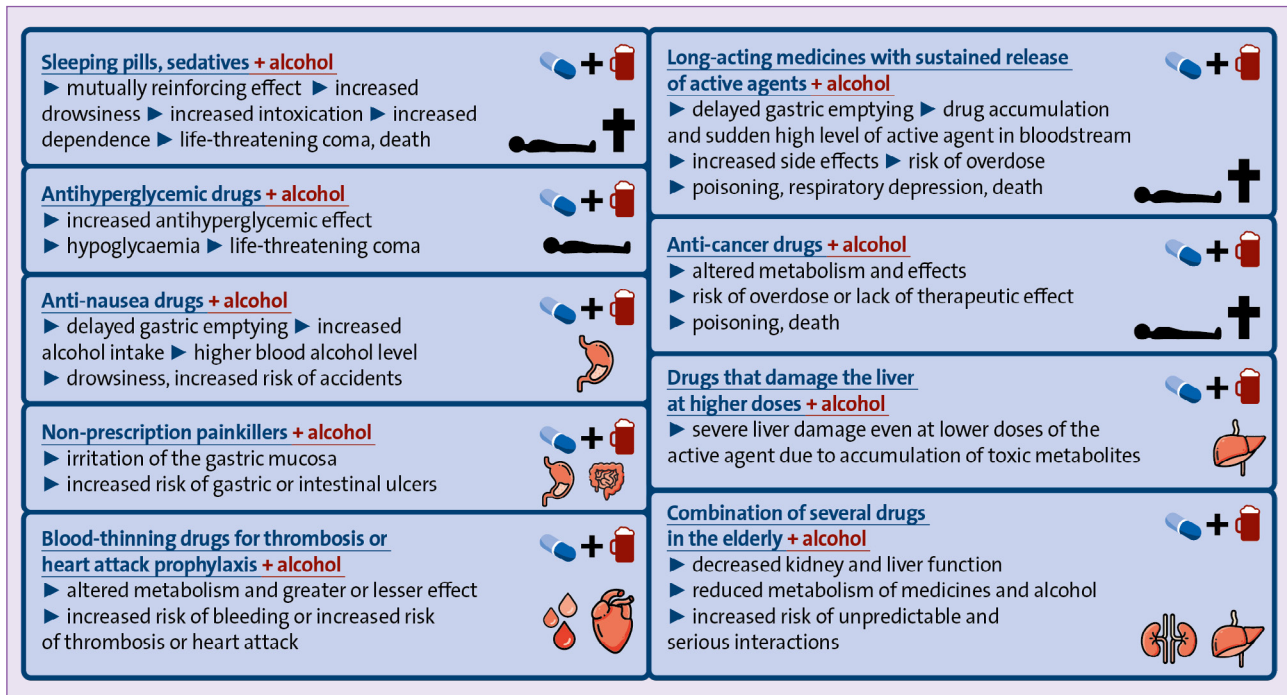


Figure 2: Effects of using medicines and alcohol simultaneously. Illustration: German Cancer Research Center, Cancer Prevention Unit, 2023

Chronic alcohol use has the opposite effect: It activates certain liver enzymes, increases kidney function and accelerates the metabolism of many medicines⁵. As a result, a lower amount of the drug is available at the target organ and the desired effect will be lower. In addition, chronic alcohol use can increase the metabolism of certain drugs, such as paracetamol, and their liver-damaging effects in unpredictable ways^{12,13}.

Possible Mechanisms

Alcohol alters the metabolism of some drugs. The enzyme alcohol dehydrogenase is the main actor of for the metabolic transformation of alcohol to acetaldehyde at low alcohol concentrations. The enzyme aldehyde dehydrogenase, which is located in the liver, further converts acetaldehyde to acetyl-coenzyme A and is inhibited by certain drugs. At higher blood alcohol concentrations or in chronic alcohol use, alcohol is also metabolised by the microsomal ethanol oxidising system (MEOS) in the liver. An essential component of the MEOS is the cytochrome P450-dependent isoenzyme CYP2E1. Long-term consumption of large amounts of alcohol

can increase the activity of this enzyme, whereas acute intake of large amounts of alcohol can inhibit CYP2E1⁸. Inhibition or activation of liver enzymes involved in alcohol metabolism by certain drugs is a possible mechanism how alcohol and drugs interact and influence each other's effects (Fig. 2)¹. Alcohol consumption is also a risk factor for bleeding in the gastrointestinal tract, due to the direct irritation of the gastric mucosa by alcohol and the reduced production of coagulation factors in the alcohol-damaged liver. Thus, the increased risk of gastrointestinal bleeding due to the high-dose and long-term use of certain painkillers, such as ibuprofen, is a well-known and dangerous interaction^{6,10}.

Conclusion

Alcohol interacts with many drugs in different ways. Some interactions occur unexpectedly, can reduce the success of treatment and can pose serious health risks. Alcohol use should always be avoided when taking medicines. Doctors should make patients aware of the risks and the potential for serious drug-alcohol interactions.

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