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Pharmacokinetic and Pharmacodynamic Activity of Drugs during Drug Interactions

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Commentary

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DESCRIPTION

When another drug or medications are present, the effects of one drug are changed, a phenomena known as a drug-drug interaction occurs. Drug interactions have the potential to alter a drug's pharmacokinetic and/or pharmacodynamic profile, alter a drug's effect, or even cause totally new effects to develop. The most frequent form of drug-drug interactions is pharmacokinetic, and those that change the activity of metabolic enzymes are particularly frequent. Pharmacokinetic drug interactions affect a medication's absorption, distribution, metabolism, and/or excretion.

When a medicine is used in conjunction with another drug, pharmacodynamics interactions occur that change the pharmacological activity of the individual drugs. Drug interactions can occasionally be linked to medication toxicity, but when they are understood and predicted, they can also have positive effects or even be completely irrelevant. Given the strong evidence that a significant portion of drug abusers habitually use many drugs at the same time to either enhance or offset the effects of a particular substance, drug-drug interactions related to drugs of abuse are of particular significance to forensic toxicologists. This chapter describes how several substances of abuse that are significant to forensic toxicologists interact with one another.

In vivo interactions between medications are referred to as drug interactions. Medication interactions can be absolute or relative contraindications to taking other medications at the same time. Drug interactions may cause a drug's impact to be reduced or increased, or they may cause toxicity. Drug interactions typically have a pharmacokinetic or pharmacodynamic basis.

Pharmacodynamics interactions are the pharmacologic effects of two drugs that may be antagonistic (e.g., metoclopramide and dopamine have antagonistic effects on renal blood flow), act at the same site (e.g., two NSAIDs), or enhance the effects through sequential or complementary effects (e.g., effects of corticosteroids and NSAIDs on gastric integrity). Before using a medicine combination, it is important to carefully examine it for drug interactions. Many pharmacodynamic interactions are possible.

Inhibiting or enhancing each other's metabolism or renal excretion are examples of pharmacokinetic interactions. One medication may push another out of protein binding sites, increasing free drug concentrations and the pharmacologic action as a result. Depending on the nature of the interaction, drug interactions may cause ADRs to occur at dosages or plasma concentrations below what is generally anticipated.

Drug interactions with pharmacokinetics in tiny animals are still poorly understood. Metabolic interaction at the level of cytochrome P450 in the liver is probably the most frequent pathway for pharmacokinetic interactions. The system of drug-metabolizing enzymes in the cytochrome P450 family is distinct. It is made up of over 20 distinct enzymes, of which 4 or 5 are probably in charge of most drug metabolism. The regulation and substrate selectivity of these enzymes change significantly between species.

The medication interactions based on cytochrome P450 in dogs or cats are therefore not always the same as those in humans, despite the fact that there are numerous similarities across species. We so heavily rely on extrapolating probable drug interactions in humans to drug interactions in dogs and cats, albeit this may not always be accurate. To completely understand the scope of clinically important metabolic medication interactions, more research in companion animals is necessary. Nevertheless, it is prudent to avoid mixing medications with a clearance that is dependent on metabolism and when interactions have been observed in other species, unless it has been demonstrated that they do not occur in veterinary species.