Essential Oil and Potential Drug Interactions.

When it comes to understanding the therapeutic dynamics of essential oils, understanding pharmacokinetics and how the body interacts with the essential oil components is important. 

Medical Directory defines Pharmacology as the science that deals with the origin, nature, chemistry, effects and uses of compounds and medicines. This includes pharmacognosy, pharmacokinetics, pharmacodynamics, pharmacotherapeutics and toxicology.

Pharmacokinetics is defined as the study of the bodily processes of absorption, distribution, metabolism and excretion (ADME) of compounds and medicines; while Pharmacodynamics is defined as the study of the effects of individual compounds and medicines and the mechanism of their actions on the body.

An important factor to keep in mind is that essential oils are complex chemical compounds, they are NOT single ingredient drugs. When essential oils are absorbed by the body they will immediately separate out into their individual component parts. How quickly each of these components will be absorbed, distributed, metabolised or eliminated from the body, will depend on that individual component.
Pharmacokinetics

So let us take a look at the pharmacokinetics of essential oil components.

1. Absorption.
   A. The Respiratory Interface through inhalation.
   B. The Dermal Interface through topical application.
   C. The Digestive Interface through ingestion.
   D. The Genitourinary Interface through suppositories.

2. Distribution.
   A. Inhalation provides three possible routes for the essential oil components to enter the body: across the olfactory neurons; through the supporting cells of the mucosa and surrounding capillary bed; directly into the cerebrospinal fluid. Once in the bloodstream these components will move back to the heart and circulation.
   B. Essential oil components from essential oils taken orally will move through the digestive tract and the Liver. Once in the Liver, they will be subjected to the First Pass Metabolism where a large number of these components will be broken down ready for elimination. A small number of these components will make their way into the bloodstream and then move back to the heart and circulation.
   C. Essential oil components from essential oils taken vaginally will move through the wall of the vagina into the capillaries and then move back to the heart and circulation. About a third to half of the essential oil components from essential oils taken rectally will be taken via the superior rectal vein, into the inferior mesenteric vein, into the hepatic portal circulation, into the liver. Once here they will be subjected to the First Pass Metabolism of the liver. Half to two thirds of the essential oil components taken rectally will move into the bloodstream through the inferior rectal vein and middle rectal vein which drain into the inferior vena cava, which goes back to the heart and circulation.

3. Metabolism.
   A. According to the University of Nottingham: Metabolism is the enzymatic conversion of one chemical compound into another. Most drug metabolism occurs in the liver, although some processes occur in the gut wall, lungs and blood plasma. Overall, metabolic processes will convert the drug into a more water-soluble compound by increasing its polarity. This is an essential step before the drug can be excreted in the body fluids such as urine or bile. Only a few drugs can be excreted without being metabolised first. On the whole, as drugs are metabolised their therapeutic effect diminishes.
   B. Tisserand and Young in their book Essential Oil Safety say: Once in the body, all organic compounds are susceptible to metabolism, although they may be metabolized by different routes and at different rates. The liver is the most important metabolizing organ, though the skin, nervous tissue, kidneys, lungs,
intestinal mucosa, blood plasma, the adrenals and placental also have this ability.

C. According to Wikipedia: The first pass effect (also known as first-pass metabolism or presystemic metabolism) is a phenomenon of drug metabolism whereby the concentration of a drug is greatly reduced before it reaches the systemic circulation.

4. Excretion
   A. Once the essential oil components have been subjected to the different chemical reactions of the body (metabolism) they will be eliminated. According to Sue Clarke in her book Essential Chemistry for Safe Aromatherapy: Both drugs and essential oils are excreted through the kidneys in urine, exhaled by the lungs, secreted through the skin, or passed out in the faeces. The rate of elimination of a substance from the body is proportional to its concentration in the bloodstream. It has been shown that most essential oils, and their breakdown products, are eliminated and excreted through the kidneys, with smaller amounts breathed out from the lungs. The skin and faeces account for the least loss.

Keep in mind Essential Oil Components are FAT SOLUBLE.

In order to be able to be excreted they need to be acted on by enzymes to make them WATER SOLUBLE.

This happens in the Liver where they are acted on by the CPY450 enzymes.
Drugs are single component compounds and as such easy to trace as they move through the metabolic cycle.

Essential oils are complex chemical compounds that will break out into its separate components as soon as it enters the blood stream. Each of these components will be metabolized by the liver. It is the individual components that need to be looked at when considering whether there is a potential for a drug interaction with an essential oil.

Some drugs are pro-drug. They are given in their inactive form, and when metabolized in the liver they are activated. Aspirin is an example. Its inactive form, acetylsalicylic acid, becomes the metabolite, salicylic acid, which is responsible for most of aspirin’s effect.

Birch and Wintergreen essential oil contain large amounts of methyl salicylate. When methyl salicylate is metabolized in the liver it becomes salicylic acid. The same metabolite as aspirin.

So methyl salicylate will have the same toxicity, precautions, and therapeutic effectiveness as aspirin!

When essential oils contain just a few components in large amounts like Birch and Wintergreen it is much easier to track their action on the body. Complex essential oils, with lots of different components in varying different amounts become more tricky.
Potential Drug Interactions.
According to the FDA: Drug interactions may make your drug less effective, cause unexpected side effects, or increase the action of a particular drug. So what about potential essential oil/drug interactions?
According to Tisserand and Young in their book 2nd Edition of Essential Oil Safety: It is difficult to predict the probability of essential oil interactions with drugs, as a wide array of mechanisms could be involved. For example, there could be competition for binding sites in tissues or on plasma proteins; there could be competition for specific cell surface or intracellular receptor sites; there could be a change in gut flora composition or in gut motility; metabolic enzymes may be induced or inhibited. Detailed information is scarce in most cases, but interactions with enzymes may be common. Their book has the most comprehensive list of pharmaceutical drugs and essential oils that I have seen available to date. The majority of possible incompatibilities that they list are if the essential oils are taken in oral doses.

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