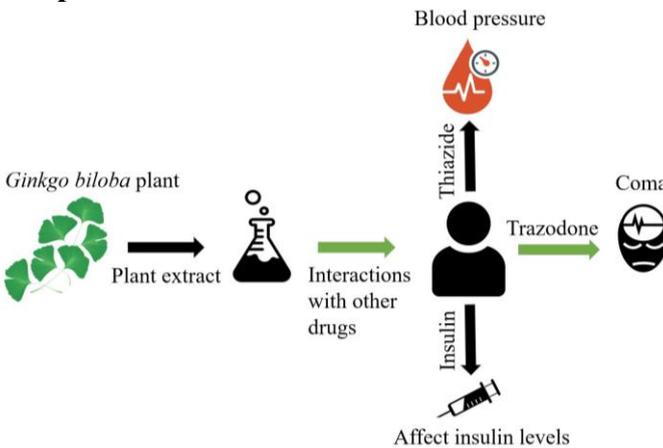


The use of the *Ginkgo Biloba* plant and its interaction with other drugs

Raiza Santos de Góis^a, Wandemberg Farias de Albuquerque Neto^a, Cláudia Kowalesky Silva^a, Lucas Miguel Lima do Amaral^a, Vanessa de Melo Cavalcanti Dantas^a, Daniela Bomfim de Barros^a, Lúcio Roberto Caçado Castellano^b and Paulo Rogério Ferreti Bonan^b

^a FPB – Faculdade Internacional da Paraíba

^b UFPB – Universidade Federal da Paraíba

Graphical Abstract	Abstract.
 <p>The diagram illustrates the process of Ginkgo biloba plant extraction and its interactions with other drugs. It starts with the Ginkgo biloba plant, which is processed into a plant extract. This extract then interacts with other drugs, specifically Thiazide, Trazodone, and Insulin. These interactions lead to various effects: Thiazide increases blood pressure, Trazodone leads to coma, and Insulin affects insulin levels.</p>	<p>The use of phytotherapeutic medicines is widely used, mainly as a complementary medication for patients with chronic diseases. Studies on <i>Ginkgo biloba</i> extract shows relevant pharmacological activities to the treatment on Alzheimer's disease, memory deficit, depression, and promising effects on cognitive functions in clinical studies. As a result, research about the interaction of <i>Ginkgo biloba</i> with other medicinal products has been increasing, as this may interfere with the pharmacokinetics and pharmacodynamics of several drugs and may have serious consequences for the patient.</p>

Introduction

Ginkgo biloba (GB) is a tree native to China, Korea and Japan, an ancient plant that was considered by Charles Darwin to be a "living fossil" (FILHO; FAKOURY; FERRY, 2009). It is one of the best-selling medicinal herbs in the United States and Europe, used in the treatment of central nervous system and cardiovascular diseases (SILVA et al., 2010). Latter has been shown to be effective in patients with mild Alzheimer's disease, since it promotes vasodilation and lowers blood viscosity and protects neurons against oxidative stress. These justifications reiterate the success of this medication when administered at the beginning of the pathology (FORLENZA, 2005; NICOLETTI, et al. 2007). Often, a single drug is not enough to recover health, combining two or more drugs and, therefore, it is indispensable to know the possible drug interactions, since they can occur with several classes of

medicines (allopathic, phytotherapeutic), causing to the user (NICOLETTI, et al., 2007; VENTURINI et al., 2014). In this way, the objective of this work is to show possible interactions between the *Ginkgo biloba* plant and other drugs and that interfere in the pharmacological action of this plant.

Materials and Methods

A search was made to collect information about the possible interactions of *Ginkgo biloba* with several drugs, without date and language restrictions. We used the databases PUBMED, SCIELO and NCBI, with a survey of clinical studies of articles using as descriptors: "*Ginkgo biloba*", "Pharmacological Interaction", "Phytotherapeutics".

Results and Discussion

Concerning the use of the *Ginkgo biloba* extract and other medicines, the use of 80mg of this plant twice daily with Trazodone 20mg twice a day too may cause coma on the third day. To reverse the case, intravenous injection of Flumazenil should be used. This happens because the flavonoids present in GB may increase gabaergic activity, and studies have shown that it can interfere with the action of oral and antiplatelet anticoagulants and with drugs metabolized by the P450-CYP3A4 system (DEFEUDIS, 1998; ALEXANDRE; BAGATANI; SIMÕES, 2008; SILVA et al., 2010). According to Silva et al. (2010), when administered the GB associated with thiazide diuretics (hydrochlorothiazide) can cause, after a week, the increase of the patient's blood pressure. Nicoletti et al. (2007) reinforce that preliminary studies demonstrate that GB can affect insulin levels, which demands additional care for the users of these drugs. It has also been observed that high doses of *Ginkgo biloba* may raise blood pressure when administered with foods that have high levels of protein or in preserves that have tyramine (FILHO; FAKOURY; FERRY, 2009).

Conclusions

The facts presented are insufficient for the wisdom of the harm or benefits of *Ginkgo biloba*, since the number of case reports is still small since there is no common sense among physicians to relate the adverse effects of the drugs to plants or herbal medicines. Further research is needed to understand the effects and mechanism of action of *Ginkgo biloba*.

References

1. Alexandre, R. F.; Bagatini, F., Interactions between drugs and ginkgo or ginseng herbal medicines, Rev Bras Farmacogn, 2008, 18, 117-126, <http://dx.doi.org/10.1590/S0102-695X2008000100021> Available online: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-695X2008000100021 (accessed on 2sept2018).
2. Barnes, P.M.; Powell, G.E., Complementary and alternative medicine use among adults: United States, 2002. Adv Data 2004, 27, 1-19. Available online: <https://www.ncbi.nlm.nih.gov/pubmed/15188733> (accessed on 2sep2018).
3. Filho, A.C.; Fakoury, M.K., Ginkgo biloba and memory – systematic review. Rev. bras. geriatr. gerontol 2009, 13, 145-152, <http://dx.doi.org/10.1590/S1809-98232010000100015> Available online: <http://www.scielo.br/pdf/rbgg/v13n1/a15v13n1.pdf> (accessed on 2sept2018).
4. Forlenza, O.V. Pharmacological treatment of Alzheimer's disease. 2005, <http://dx.doi.org/10.1590/S0101-60832005000300006> Available online:

http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-60832005000300006 (accessed on 2sep2018).

5. Nicoletti, M. A.; Júnior, M. A. O., Principais interações no uso e medicamentos fitoterápicos, *Infarma* 2007, 19, 33-36.
6. Silva, T. F. O.; Marcelino, C. E., Utilizações e Interações Medicamentosas de Produtos Contendo o Ginkgo Biloba, *Colloquium Vitae*, 2010, 2, 54-61.
7. Venturini; Engroff, P.; Interações entre antiparasitários e alimentos. *Revista de Ciências Farmacêuticas Básica e Aplicada*, 2014, 3, 17-23.