Chemistry of natural and synthetic appetite suppressants: a short presentation

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ABSTRACT

The World Health Organization (WHO) has defined obesity as excessive and abnormal fat accumulation, which may reach levels that can affect health in several age groups. Medicinal plants have proven to be effective in the treatment for this pathology and, thus, have generated increase in their use and study of phytotherapeutic agents with curative purposes in the process of losing weight. Treatment for obesity with synthetic drugs is also a common practice in endocrinologists’ and physician nutrition specialists’ offices. In the literature, synthetic drugs that help the process of losing weight are fenproporex, amfepramone, mazindol, sibutramine and orlistat. The study reported by this chapter aimed at carrying out a literature review of the main drugs (natural and synthetic ones) used in treatments for obesity. The methodology was a systematic review that comprised papers on the main drugs used for treating obesity. Thirty papers were reviewed and showed that most drugs used for treating obesity are synthetic ones which derive from amphetamines that act directly on the central nervous system. Regarding natural appetite suppressants, they may help to treat obesity since they act on five different mechanisms: they decrease lipid absorption, decrease carbohydrate absorption, increase energy expenditure, decrease pre-adipocyte differentiation and proliferation, decrease lipogenesis and increase lipolysis. However, the study suggests that pharmaceutical care is fundamental to promote health since it can mitigate problems related to excessive use of appetite suppressants.

Keywords: Phytotherapy, Appetite Suppressants, Research Project, IFTM - Campus UDICENTRO.
INTRODUCTION

Obesity has been considered one of the most severe problems in public health and an epidemic worldwide (CRUZ et al., 2013). Its prevalence, which has increased in the last decades, is associated with the development of noncommunicable chronic diseases (MALTA et al., 2014).

According to Cruz and collaborators (2013), obesity is a chronic disease that requires the use of drugs as a supplementary treatment when mere changes in patients’ lifestyles do not reach the desired effect and/or when other diseases are related to it or predispose to it. Not using drugs may aggravate the cases and pose risks to patients’ health. The Brazilian Sanitary Surveillance Agency (ANVISA) acknowledges five drugs that have been used in Brazil to treat obesity: fenproporex (1), amfepramone (2), mazindol (3), sibutramine (4) and orlistat (5).

Figure 1. Chemical structures of synthetic drugs used for treating obesity.

In treatments for obesity, several medicinal plants, phytotherapeutic agents and nutraceuticals have been used as coadjutants since they have chemical components, such as flavonoids, alkaloids and terpenoids, which favor the process of losing weight, mainly
because of their hypolipidemic, hypocholesteremic, antihyperglycemic, antihyperlipidemic and antioxidant activities, decrease lipid absorption, consume little energy, increase energy expenditure, decrease pre-adipocyte differentiation and proliferation, decrease lipogenesis and increase lipolysis (YUN, 2010).

The most cited medicinal plants used as auxiliaries in treatments for obesity were *Cassia angustifolia* (senna, 1), *Quassia amara* L. (bitterwood, 2), *Camellia sinensis* (L.) Kuntze (tea plant, 3), *Cordia ecalyculata* Vell (porangaba, 4) and *Baccharis trimera* (broom, 5); the last one has been included in the list of 71 medicinal plants of interest to the Brazilian Unified Health System (Figure 2).

**Figure 2.** Medicinal plants used as alternatives for treating obesity.

The study reported by this chapter aimed at identifying medicinal plants (sold as phyto-therapeutic agents) and over-the-counter synthetic drugs used for controlling obesity. In short, relevant information on the theme “obesity and its treatment methods” is summarized by an updated literature review.

### METHODOLOGICAL DEVELOPMENT

The methodology used for compiling this chapter was a systematic literature review. It was an investigation that focused on well-defined questions which aimed at identifying, selecting, evaluating and summarizing relevant and available evidence, i.e., it consisted in a movement that was based on pre-determined criteria and consistent evidence. Thus,
the review was carried out with 30 papers, dissertations and theses published from 2019 to 2021 in the following databases: Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Scientific Electronic Library Online (SCIELO), Google Acadêmico and Pubmed. In the search, the following descriptors were used: obesity, treatment, fenproporex, amfepramone, mazindol, sibutramine, orlistat, weight-loss medicinal plants, weight-loss phytotherapeutic agents and natural drugs to lose weight.

**RESULTS AND DISCUSSION**

Obesity may be defined as abnormal fat accumulation which may impair an individual’s health; it is considered a chronic disease that is hard to control since, when it is severe, therapeutic measures may not be successful, besides the fact that recurrence may happen (WINCK et al., 2016).

The parameter created by the World Health Organization (WHO) to diagnose obesity is the Body Mass Index (BMI), which is the relation between an individual’s height (m²) and body weight (kg). People whose BMI is between 30.0 and 34.9 kg/m² are considered Class 1 while the ones whose BMI ranges from 35.0 to 39.9 kg/m² are Class 2 and the ones whose BMI is above 40.0 kg/m² are Class 3 (MOREIRA et al., 2012).

Individuals who are considered Class 3, the most severe form of obesity, are more prone to develop cardiovascular diseases, some types of cancer, diabetes, arterial hypertension, dyslipidemia, respiratory disorders and other health problems (MOREIRA et al., 2012; FONSECA-JUNIOR et al., 2013).

Treatments for obesity have lately been based on non-pharmacological measures and pharmacological ones. The former include behavioral therapies that focus on healthy eating habits, physical activity and nutritionists’ guidelines on decrease in fat and calorie consumption. The latter are considered coadjuvant therapies in the treatment since they are only used when there are cases of therapeutic failure associated with the non-pharmacological treatment, Class 2 and 3 obesity and some other pathology associated with obesity (MARTINS et al., 2012).

Results show that most medicinal plants, phytotherapeutic agents and/or nutraceuticals sold in compounding pharmacies and healers’ stands in Cuiabá, Mato Grosso (MG) state, Brazil, are native to Brazil (51%). Their most common forms are teas (68%), capsules (21%), pills (5%), dyes (3%) and powder (3%). Regarding their posology, most are taken once a day (11%), twice a day (30%), three times a day (40%) and four times a day (3%).

Concerning other phytotherapeutic agents that have been prescribed as auxiliaries in processes of losing weight, the literature has recommended *Silybum marianum* (L) Gaertn (milk thistle), which belongs to the family Asteraceae and whose active ingredients are extracted
from its fruit (25 %), *Citrus aurantium* (bitter orange), which belongs to the family Rutaceae and whose active ingredients are extracted from several parts of the plant (16.7%), *Cynara scolymus* (artichoke), which belongs to the family Asteraceae and whose active ingredients are also extracted from different parts of the plant (16.7%), *Garcinia cambogia* L (Malabar tamarind), which belongs to the family Gutiferáceas (11.7%), *Maytenus ilicifolia* Mart. ex Reissek (*espinheira santa*, in Portuguese), which belongs to the family Celastraceae (11.7%), *Camellia sinensis* (tea plant), which belongs to the family Theaceae and whose active ingredients are extracted from its leaves (8.6%), *Withania somnifera* (Indian ginseng), which belongs to the family Solanaceae and whose active ingredients are extracted from its roots (8.6%), *Capsicum annuum* L (sweet pepper - capsiate), which belongs to the family Solanaceae and whose active ingredients are extracted from its fruit (1%) (COSTA *et al.*, 2020).

**CONCLUSIONS**

Studies compiled by this chapter show that most drugs applied to the treatment for obesity are synthetic drugs that derive from amphetamines which act directly on the central nervous system and specifically on hypothalamus regulations. However, complementary therapies, such as phytotherapy, may contribute to control obesity. It should be highlighted that increase in prevalence of obesity in the country is extremely important in public health and that attention must be paid to excessive self-medication with the use of anorexigenic drugs, which cause several side effects, as shown by this study. Finally, this study suggests that pharmaceutical care is fundamental to promote health, since it can mitigate problems related to excessive use of appetite suppressants, and points out risks of self-medication not only with the use of these drugs, but also with other compounds.

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**REFERENCES**


