

Weight Loss Product Adulteration

In 2008, the FDA warned consumers to avoid some weight loss products because they contained undeclared, active pharmaceutical ingredients that could put consumers' health at risk. According to an FDA analysis, those undeclared ingredients include sibutramine (a controlled substance), fenproporex (a stimulant not approved for marketing in the United States), fluoxetine (a prescription antidepressant of the selective serotonin reuptake inhibitor (SSRI) class), bumetanide (a diuretic), furosemide (a potent diuretic), phenytoin (a solution used in chemical experiments and a suspected cancer causing agent), rimonabant (a drug not approved for marketing in the United States), cetilistat (an experimental obesity drug), and phenolphthalein (an ingredient presented a potential carcinogenic risk). Taking these products can cause serious health risks, including high blood pressure, seizures, rapid heartbeat, palpitations, heart attack, and stroke.

More than 70 weight loss products are considered harmful and can be found in some retail stores and on the internet. Most of these products, according to the FDA, are adulterated by Sibutramine with the second most frequent adulteration by Phenolphthalein. These active ingredients occur not only in Slim Foods but also dietary supplements claiming to be "natural/herbal ingredients". As stated clearly in the cGMP regulation, adulteration of nutrition supplement products is a violation of final DSHEA laws. It is understandable that most of our responsible members in the industry have no intention of such adulteration. It is our responsibility to ensure that the materials we use in our products and the final products we produce are safe and free of contamination.

To ensure adulteration-free of weight loss foods and nutrition supplements, a qualified laboratory may use a number of testing technologies to detect and quantify these weight-loss compounds. The following table summarizes the techniques frequently used:

Adulteration	Testing Methods	Comment
Sibutramine	GC/MS, LC/MS/MS	HPLC for high concentration; GC/MS, LC/MS/MS for low concentration
Fenproporex	LC-UV, LC/MS/MS	HPLC-UV for higher concentration; LC/MS for low detection
Fluoxetine	LC/MS/MS	HPLC for high concentration; LC/MS for low detection
Bumetanide	LC/MS	HPLC-UV may be used; LC/MS gives better results
Furosemide	CE, HPLC or LC/MS	CE or HPLC for relative high concentration; LC/MS is suitable for low concentration.
Phenolphthalein	HPLC, LC-MS-MS	HPLC for high concentration; LC/MS for low detection
Ephedrines	HPLC-UV, LC/MS/MS	HPLC for high concentration; LC/MS for low detection

Most of the compounds listed can be screened for HPLC or LC/MS methods. Examples of HPLC analysis provide a detection limit at a higher concentration (Figure 1). In addition, interference may occur when the HPLC method is used depending on the sample matrices. To overcome these shortcomings by HPLC, LC/MS or LC/MS/MS is frequently used. Figure 2 shows LC/MS/MS for Sibutramine and *N*-desmethylobutramine. As shown, this method will be conclusive because little interference can occur since the $[M+H]^+$ ion ($m/z = 280.02$) was detected for sibutramine and $m/z = 266.00$ for *N*-desmethylobutramine.

Our laboratory (AAC Labs) has the full capability of testing these possible adulterants. We have a group highly qualified and trained PhD scientists and advanced instrumentations including two LC/MS/MS, and a dozen HPLCs. We will be glad to provide both screening tests and quantitative analysis should you need such service.

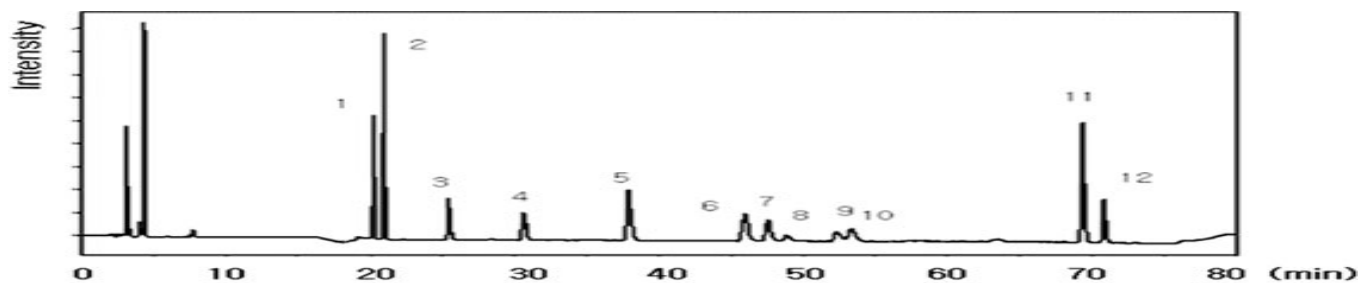
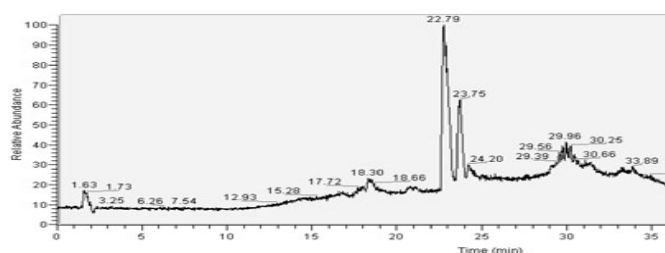
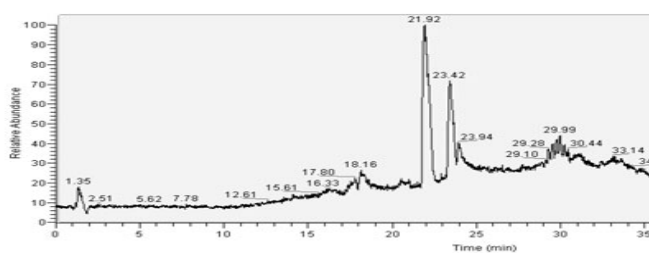


Figure 1. Twelve diabets/obesity drugs can be screened by HPLC: 1, ephedrine (20.27 min). 2, phenformin (20.97 min); 3, rosiglitazone (25.45 min); 4, fenfluramine (30.62 min); 5, T3 (37.90 min); 6, glipizide (45.97 min); 7, T4 (47.57 min); 8, fluoxetine (48.89 min); 9, sibutramine(52.32 min); 10, glimepiride (53.35 min); 11, glibenclamide (69.38 min); 12, gliclazide (70.88 min).

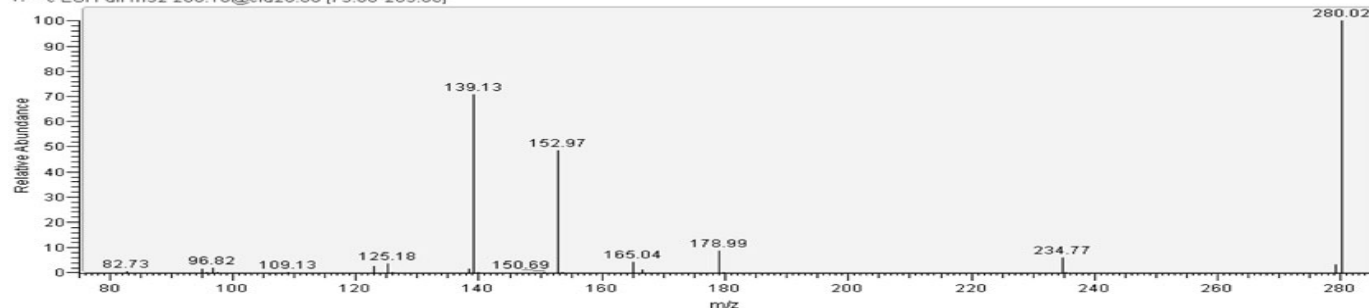


(A) Sibutramine (22.79 min)



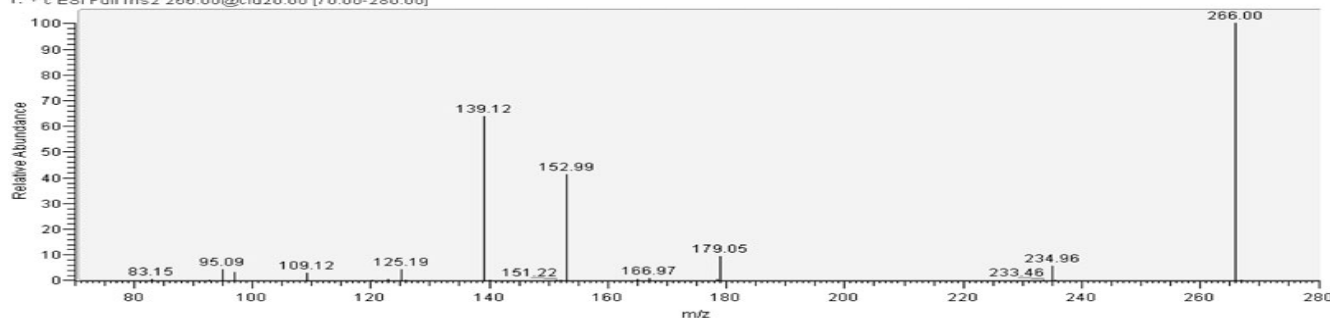
(B) N-desmethyisibutramine (21.92 min)

sibutramine 5ppm_071019093736 #1082 RT: 21.98 AV: 1 NL: 3.02E6
T: + c ESI Full ms2 280.10@cid20.00 [75.00-285.00]



(C) Sibutramine

sibu266 100ng #1106 RT: 22.49 AV: 1 NL: 1.41E6
T: + c ESI Full ms2 266.00@cid20.00 [70.00-280.00]



(D) N-desmethyisibutramine

Figure 2. Total ion chromatogram (TIC) of sibutramine (A) and *N*-desmethyisibutramine (B) by LC/MS, and mass spectrum of sibutramine (C) and *N*-desmethyisibutramine (D) by LC/MS/MS. (From Lee et al. (2009). Biomed Chromat. 23(12), 1259-1265).