A175 Iberogast (STW 5) and components interact with 5-HT$_3$ and 5-HT$_4$ receptors of the intestine

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Irritable bowel syndrome and functional dyspepsia are some of the most common reasons for medical treatment in industrialized countries. The fixed herbal combination STW 5 is composed of 15 ml of a fresh plant extract (1:2, 50 % v/v ethanol) of *Iberis amara* and extracts (1:3, 30 % v/v ethanol) of angelica roots (10 ml), milk thistle fruits (10 ml), caraway fruits (10 ml), celandine herb (10 ml), liquorice roots (10 ml), camomile flowers (20 ml), melissa leaves (10 ml) and peppermint leaves (5 ml) per 100 ml. It has been clinically proven to be effective and to be comparable to metoclopramide and cisapride, medications of proven efficacy in these fields of application, but it has less side effects than these (1, 2). As serotonin receptor subtypes 5-HT$_3$ and 5-HT$_4$ play a central role in the etiology of these functional gastrointestinal diseases (3), an *in vitro* model for studying binding affinities of complex mixtures of herbal extracts to 5-HT$_3$ and 5-HT$_4$ receptors of the small intestine of the rat has been developed and STW 5 and its component extracts have been tested.
STW 5 showed affinities to both receptor subtypes with a >10 fold preference to 5-HT$_4$ than to 5-HT$_3$ receptors. STW 5 inhibited the binding of the 5-HT$_4$ receptor antagonist ^{3}H-GR113808 at a tincture dilution of 1:2000 (IC_{50} value). Among the nine herbal extracts present in STW 5, camomile flowers and celandine herb were selective to 5-HT$_4$ subtype by a factor >10 (IC_{50} for 5-HT$_4$ receptor = extract dilution of 1:10000), while angelica roots was non-selective (IC_{50} = extract dilution of 1:2000 for both receptor types). On the other hand liquorice roots had a four times higher affinity to 5-HT$_3$ receptors with an IC_{50} value at an extract dilution of 1:2000. In conclusion, it has been shown that Iberogast® (STW 5) exerts significant actions on both 5-HT$_3$ and 5-HT$_4$ receptors known to be important targets for the treatment of IBS.

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A176 Sulfemodin-8-O-β-D-glucoside, a sulfated anthraquinone glycoside from *Rheum emodi*

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The root of *Rheum emodi* Wall. is widely used in Ayurvedic medicine and in Asian folk medicine (1). Only few data are available on the anthracene derivatives of this plant (2,3). In a study of *Rheum emodi* root the drug was extracted with methanol and the extract fractionated by VLC and CC. In addition to several anthraquinones, anthrones and auronols (4), a very polar anthracene derivative **1** was isolated.
By detailed MS studies the molecular formula of (**1**-H$^+$)$^-$ was determined as $C_{21}H_{19}SO_{13}$. ^{1}H- and ^{13}C NMR as well as 2D NMR- (H,H-COSY, HSQC, HMBC, HSQC-TOCSY) and NOE studies revealed the structure of a derivative of emodinglucoside. Long range correlation of the anomeric proton with C-8 proved the linkage of the sugar moiety to C-8. Compared to the resonances of authentic emodin-8-O-glucoside **2** (4), the signals of H-5 and H-7 were affected by a marked chemical shift to higher frequency. The other ^{1}H NMR signals were in agreement with those of **2**, as also the ^{13}C NMR resonances with exception of C-5 to C-10 and C-8a. This suggested the presence of a strongly electronegative inorganic substituent at C-6-OH. In accordance with the HR-FAB MS data and the polarity of the compound, the C-6-OSO_3H substitution was confirmed.
Consequently, **1** was proven to be emodin-8-O-β-D-glucosyl-6-O-sulfate. This is the first characterisation of a sulfated anthraquinone glycoside. Only two anthraquinone derivatives have yet been detected in *Rumex pulcher*, with a suggested sulfate substitution in the sugar moiety (5).

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