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Original article

Antibacterial activity of a novel series of 3-bromo-4-(1*H*-3-indolyl)-2,5-dihydro-1*H*-2,5-pyrroledione derivatives – An extended structure–activity relationship study

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Dedicated to Professor Wolfgang Wiegrebe on the occasion of his 75th birthday.

Abstract

Compounds containing 3-bromo-2,5-dihydro-1*H*-2,5-pyrroledione and indole substructures were found to have antibacterial activity against resistant strains of *Staphylococcus aureus* and some other Gram positive bacteria. The investigated compounds exhibit minimal inhibition concentrations (MICs) lower than those of common antibiotics like vancomycin or ciprofloxacin. Activity against multiresistant strains suggests a mechanism of action different from common antibiotics. This might be important in circumventing existing resistance mechanisms. Here we report about the antibacterial activity in an extended structure–activity relationship study.

Keywords: SAR study; Antibacterial compounds; Indole derivatives; Resistance of *Staphylococcus aureus*

1. Introduction

The incidence of infections caused by multidrug-resistant Gram positive bacteria is increasing despite advances in antibacterial therapy over the last decades. As the pathogens causing these infections are frequently resistant to most currently available antibacterials, they are extremely difficult to treat. Almost all bacteria treated with antibiotics have developed at least some degree of resistance against these drugs [1]. The emergence of high levels of penicillin resistance followed by the evolvement and spread of strains resistant to the semisynthetic penicillins (methicillin, nafcillin, and oxacillin), macrolides, tetracyclines, aminoglycosides and glycopeptides (e.g., vancomycin) has made therapy of staphylococcal diseases a global challenge. In many countries, an increasing number of clinical isolates of multiresistant *Staphylococcus aureus* strains have been observed and the pathogenetic potential in nosocomial and community acquired infections is well known [2].

Indole-substituted pyrrolediones like, for example, arcyriarubin A (see Fig. 1) and related compounds, in which one indole substituent can be replaced by various heterocycles, show high antimicrobial and antiviral activity and are potent protein kinase C inhibitors [3,4]. Recently we reported on the antimicrobial activity of indole-substituted 2,5-dihydro-1*H*-2,5-pyrrolediones developed by our group [5]. These compounds are derivatives of the lead structure 3-bromo-4-(1*H*-3-indolyl)-2,5-dihydro-1*H*-2,5-pyrroledione (Fig. 2) with variable substituents in the indole-2-position. In the present work we demonstrate the results of the biological activity of more substances of this class of compounds with substitutions in indole 2,5- and/or 2,7-position.

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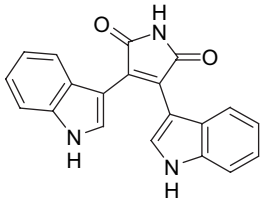
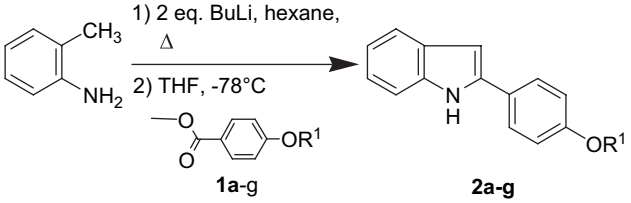


Fig. 1. Arcyriarubin A.



Scheme 1. Formation of 2-alkyloxyphenyl indoles according to Smith et al. [6,7].

2. Chemistry

The preparation of the investigated compounds comprises two main steps. In the first step we prepared a substituted indole. The second step was the condensation of dibromomaleinimide with the respective indole.

Indoles **2a–g** (Scheme 1) and **32a–h** (Scheme 5) were prepared analogous to Smith et al. [6,7]. The 4-alkoxybenzoic acid methylesters **1a–g** used for the synthesis of **2a–g** were obtained following the literature methods [8]. Thus, in analogy to the protocols of Smith et al. [6,7], *N*-trimethylsilyl-ω-toluidine (TMSOT) was lithiated with 2 eq of *n*-BuLi leading to metallation at the NH–Si– and the methyl group. Reaction of the bis-lithiated Li_2TMSOT at −78 °C with the respective carboxylic acid esters **1a–g** gave the desired 2-substituted indoles **2a–g** [6,7] (Table 1).

In order to produce the indoles **8a–f**, **9a–e**, **14a–f**, **15a–f**, **20a–d** and **21a–e** we followed Bowden et al. [9] Thus, we obtained the suitable substituted ω-bromoacetophenones (**4a–c**) by bromination of the respective acetophenones (**3a–c**) with Br_2/HBr [10]. The anilines **5a–f** used were prepared according to well known methods [11], or were commercially available (**5g–r**) (Fig. 3). The indoles were obtained by stirring a mixture of dimethylaniline, xylene, the respective ω-bromoacetophenone and the respective aniline for 24 h at 150 °C. To form the indoles **8a–f**, **14a–f** and **20a–d**, we used ω-bromoacetophenone (**4a**). Compounds **9a–e**, **15a–f** and **21a–e** were prepared from ω-bromo-4-methoxyacetophenone (**4b**) (Scheme 2) [9].

The formation of the indoles **26a–h** was performed in analogy to the protocols of Bischler et al. by stirring a mixture of ω-bromo-3-methoxyacetophenone (**4c**) and the respective anilines (**5a–l**) in DMF for 2 h at 150 °C (Scheme 3) [12].

We got another series of indoles (**32a–h**) by linking a substituted anilide substructure to the indole-2-position by an alkyl spacer (Scheme 4). We had to modify Smith's method to form the spacer linked indole–anilides **32a–h** [6,7]. Thus, we prepared the anilides **31a–h** from the commercially available dicarboxylic acid monoesters or monoester halides **29a–e** and the respective anilines **30a–d**. These ester–anilides (**31a–h**; **31f** and **31g** are commercially available [13]) had to be N-metallated with *n*-BuLi before being reacted with Li_2TMSOT. Otherwise, the amide H protonates the Li_2TMSOT, regenerating its methyl group and so preventing the indole formation. Therefore, we added 1 eq of *n*-BuLi at −78 °C before we added the Li_2TMSOT suspension. Using this procedure, we got the desired indoles **32a–h**.

To couple dibromomaleinimide with the respective indole, we first protected the NH-group with TBS (*tert*-butyldimethylsilyl) by stirring a solution of dibromomaleinimide, TBSCl and NEt_3 in dichloromethane for 1 h at room temperature [14]. To form the bond between the indole and the pyrroledione, we lithiated the 3-position of the respective indole with lithium hexamethyldisilazane (LiHMDS). The reaction of the lithiated indole and TBS–dibromomaleinimide led to silyl-protected products, which we isolated as raw materials (mixture of protected and unprotected products and remaining indoles). After removal of the silyl-protecting group by tetrabutylammonium fluoride, we could easily isolate the final products (Scheme 5).

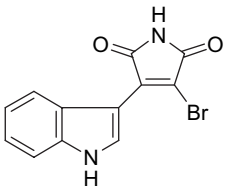


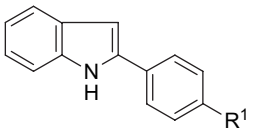
Fig. 2. Lead structure for the synthesized compounds.

3. Pharmacology

3.1. General antimicrobial properties

The synthesized compounds were tested against the Gram positive bacteria *Bacillus subtilis* (ATCC 6633), *Mycobacterium vaccae* (IMET10670), *Mycobacterium aurum* (SB 66), *Mycobacterium fortuitum* B, *Mycobacterium smegmatis* SG 987, *S. aureus* SG 511, the multiresistant epidemic strains *S. aureus* 134/93 [15] and *S. aureus* 994/93 [16] and the vancomycin resistant *Enterococcus faecalis* 1528 [17]. The compounds had good activities against the *S. aureus* strains but

Table 1
Substitution patterns of compounds **2a–g**



Nr.	R^1	Nr.	R^1
2a	OMe	**2e**	ODec
2b	OBu	**2f**	OBenz
2c	OPen	**2g**	*O*-CH_2–Naph
2d	OOct		

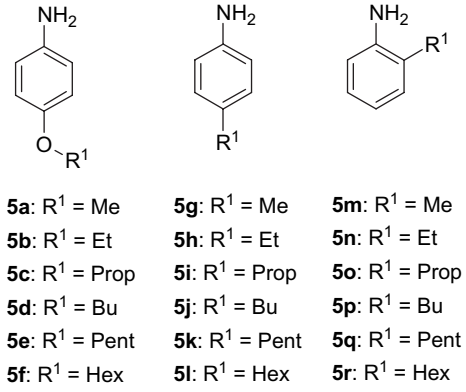


Fig. 3. Anilines used for indole synthesis.

only moderate activities against the other Gram positive bacteria. The compounds had no activity against the Gram negative bacterium *Escherichia coli* and the fungus *Candida albicans* (data not shown). As a reference antibiotic we used ciprofloxacin.

3.2. Structure–activity relationship for S. aureus 134/93 and M. smegmatis SG 987

In our earlier investigations [5] we showed that the compounds with the 3-bromo-4-(1*H*-3-indolyl)-2,5-dihydro-1*H*-2,5-pyrroledione lead structure (Fig. 2) clearly exhibit a structure–activity relationship between their hydrophobic properties and their activity against *S. aureus* 134/93 and *M. smegmatis* SG 987.

We defined

$$\mathrm{pMIC} = -\log(\mathrm{MIC}/\mathrm{mol/l}) \tag{1}$$

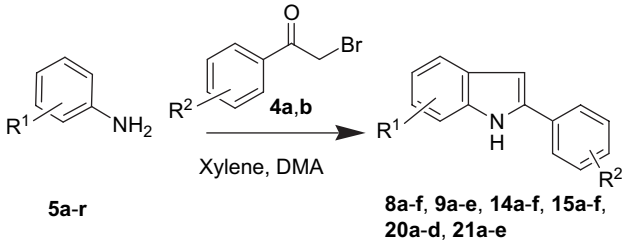
and found a linear correlation between pMIC and log(*P*). *P* is the partition coefficient of the compound in the *n*-octanol/water system and describes the hydrophobic properties of a compound. Linear regression led to the function

$$\mathrm{pMIC} = 0.79\log(P) + 3.87 \tag{2}$$

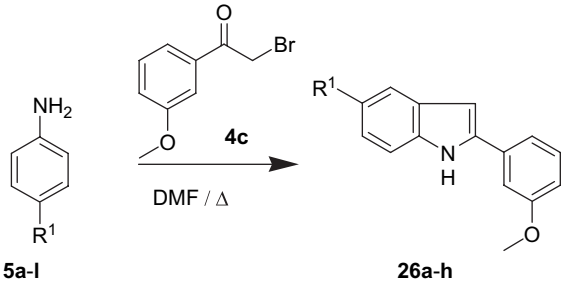
for the activity of the compounds against *S. aureus* 134/93 and

$$\mathrm{pMIC} = 1.63\log(P) + 0.57 \tag{3}$$

for the activity of the compounds against *M. smegmatis* SG 987 with a correlation coefficient of 94%. The experimental



Scheme 2. Formation of the substituted indoles according to Bowden et al. [9].



Scheme 3. Formation of the substituted indoles according to Bischler et al. [12].

error, estimated from the dilution steps used in the antimicrobial tests (see Section 6), is

$$\Delta\mathrm{pMIC} = \pm 0.3 \tag{4}$$

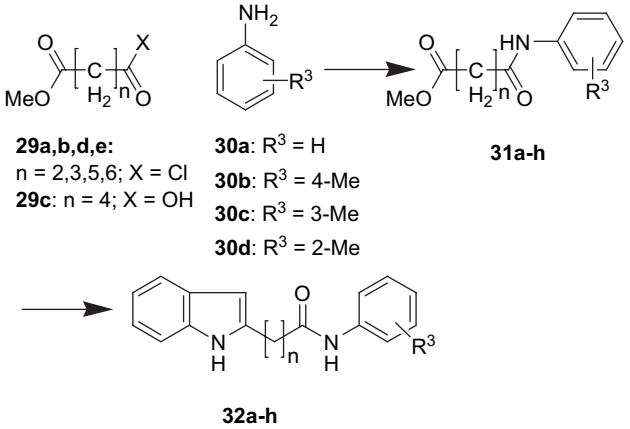
The Eqs. (2) and (3) allow the calculation of expected MIC values for every substance under the presumption that the MIC is influenced only by the activity of the structural elements in the lead structure and the pharmacokinetical properties of the material.

The factor Δ describes the deviation of an observed pMIC (pMIC(obs)) to the value expected from the log(*P*) functions (Eq. (2)) or (Eq. (3)) (pMIC(cal)), that is

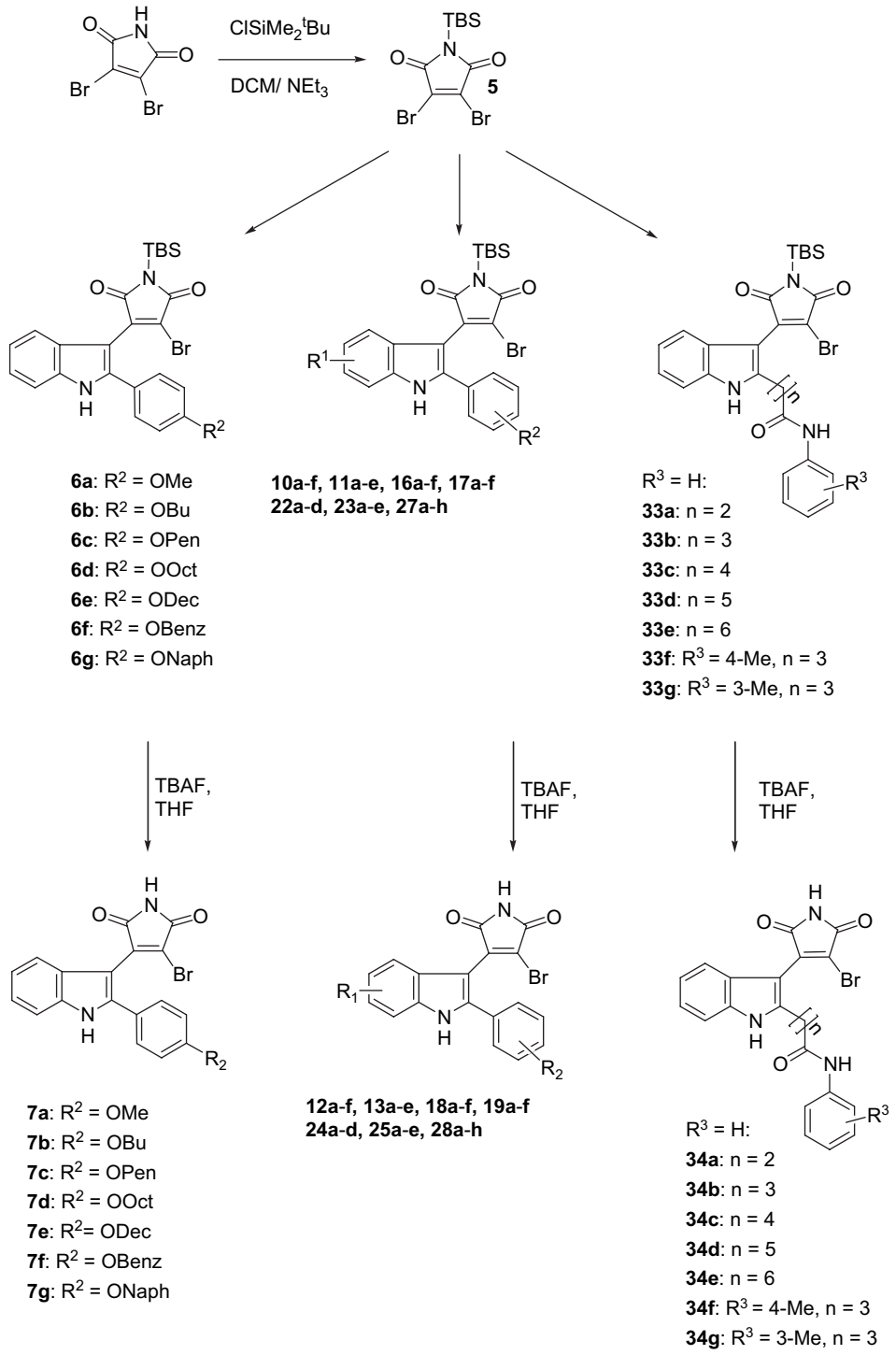
$$\Delta = \mathrm{pMIC(obs)} - \mathrm{pMIC(cal)} \tag{5}$$

The MICs of the novel compounds investigated vs. *S. aureus* 134/93 and their Δ value to calculated MICs are listed in Table 2.

The results shown in Table 2 demonstrate that the compounds **7a–g** substituted in 2-position, except for **7d** and **7e**, show antibacterial activities in a submicromolar range. The activity decreases with increasing chain length of the alkyloxy substituents, **7d** and **7e** have either weak or no activity against *S. aureus* 134/93. The antibacterial activities of the compounds **12a–f** are not uniform. The activities of **12a**, **12c** and **12d** are within experimental error consistent with expected values of the log(*P*) function (Eq. (2)). The compounds



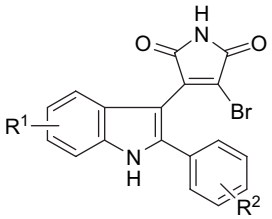
Scheme 4. Formation of the substituted indoles according to Smith et al. [6,7].



Scheme 5. Reaction with dibromomaleinimide.

12b, **12e** and **12f** exhibit a significant weaker activity as expected. In the case of **12e** and **12f** the weak solubility of the materials in the test medium might contribute to the low activities. Compounds **13a–e** show increasing activities with increasing length of the alkyloxy chain, except for **13d** and **13e**, which precipitated in the test medium due to low solubility. Compounds **18a–e** and **19a–e** having alkyl substituents instead of alkyloxy substituents, demonstrate antibacterial activity in a submicromolar range. Their activities decrease with increasing substituents. Compounds with small substituents like **18a**, **18b**, and **19a** show much stronger activities as expected from Eq. (2). The compounds **24a–d** and **25a–e** with various alkyl substituents in 7-position of the indole show increasing activities against *S. aureus* with increasing length of the alkyl substituents. These activities, however, are much weaker than expected from Eq. (2). The activities

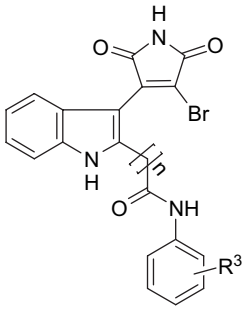
Table 2
Activity of compounds against *Staphylococcus aureus* 134/93



Nr.	R^1	R^2	MIC $\mu g^{-1}\,ml^{-1}$	MIC 10^{-6} M	pMIC	Δ	Log(*P*)
7a	H	4-OMe	0.13	0.32	6.5	0.7	2.42
7b	H	4-OBu	0.2	0.45	6.3	−0.6	3.87
7c	H	4-OPen	0.4	0.88	6.1	−1.1	4.20
7d	H	4-OOct	25	50	4.3	−3.7	5.21
7e	H	4-ODec	n.d.	n.d.	n.d.	n.d.	5.94
7f	H	4-OBzl	0.1	0.21	6.7	0.2	3.30
7g	H	4-ONaph	0.8	1.5	5.8	−1.0	3.76
12a	5-OMe	H	0.40	1.00	6.0	0.2	2.48
12b	5-OEt	H	1.56	3.80	5.4	−0.6	2.77
12c	5-OPr	H	0.4	0.95	6.0	−0.3	3.16
12d	5-OBu	H	0.05	0.11	6.9	0.4	3.42
12e	5-OPen	H	12.5	27	4.6	−2.3	3.75
12f	5-OHex	H	n.d.	n.d.	n.d.	n.d.	4.08
13a	5-OEt	4-OMe	0.8	2.0	5.7	−0.3	2.77
13b	5-OPr	4-OMe	0.2	0.44	6.4	0.0	3.12
13c	5-OBu	4-OMe	0.05	0.10	7.0	0.4	3.43
13d	5-OPen	4-OMe	n.d.	n.d.	n.d.	n.d.	3.77
13e	5-OHex	4-OMe	n.d.	n.d.	n.d.	n.d.	4.10
18a	5-Me	H	0.05	0.13	6.9	0.7	2.88
18b	5-Et	H	0.05	0.13	6.9	0.5	3.15
18c	5-Pr	H	0.2	0.50	6.3	−0.3	3.43
18d	5-Bu	H	0.1	0.24	6.6	−0.2	3.74
18e	5-Pen	H	0.4	0.91	6.0	−1.0	4.07
18f	5-Hex	H	n.d.	n.d.	n.d.	n.d.	4.39
19a	5-Me	4-OMe	0.05	0.12	6.9	0.8	2.85
19b	5-Et	4-OMe	0.1	0.23	6.6	0.2	3.23
19c	5-Pr	4-OMe	0.2	0.45	6.3	−0.3	3.45
19d	5-Bu	4-OMe	0.2	0.44	6.4	−0.5	3.83
19e	5-Pen	4-OMe	0.4	0.85	6.1	−1.0	4.10
19f	5-Hex	4-OMe	n.d.	n.d.	n.d.	n.d.	n.d.
24a	7-Me	H	1.56	3.98	5.4	−1.0	3.19
24b	7-Et	H	0.78	2.51	5.7	−0.9	3.42
24c	7-Bu	H	0.10	0.25	6.6	−0.3	3.88
24d	7-Pen	H	0.20	0.50	6.3	−0.8	4.11
25a	7-Me	4-OMe	0.78	2.00	5.7	−0.6	3.12
25b	7-Et	4-OMe	0.20	0.50	6.3	−0.2	3.35
25c	7-Pr	4-OMe	0.20	0.50	6.3	−0.4	3.58
25d	7-Bu	4-OMe	0.10	0.25	6.6	−0.2	3.81
25e	7-Hex	4-OMe	0.20	0.40	6.4	−0.9	4.27
28a	5-OMe	3-OMe	0.8	1.90	5.7	−0.3	2.79
28b	5-OEt	3-OMe	1.56	3.50	5.5	−0.8	2.97
28c	5-OBu	3-OMe	1.56	3.30	5.5	−1.1	3.46
28d	5-OHex	3-OMe	6.25	12.60	4.9	−2.1	3.92
28e	5-Me	3-OMe	0.1	0.20	6.6	0.3	3.12
28f	5-Et	3-OMe	0.2	0.50	6.3	−0.2	3.35
28g	5-Bu	3-OMe	1.56	3.40	5.5	−1.4	3.81
28h	5-Hex	3-OMe	12.5	26.00	4.6	−2.6	4.26

(*continued on next page*)

Table 2 (*continued*)



Nr.	n	R^3	MIC $\mu g^{-1}\,ml^{-1}$	MIC 10^{-6} M	pMIC	Δ	Log(*P*)
34a	2	H	0.08	0.18	6.7	0.9	2.42
34b	3	H	0.8	1.7	5.8	−0.1	2.56
34c	4	H	0.8	1.7	5.8	−0.1	2.56
34d	5	H	0.05	0.10	7.0	1.0	2.68
34e	6	H	0.05	0.10	7.0	0.9	2.85
34f	3	4-Me	0.6	1.58	5.8	−0.4	2.56
34g	3	3-Me	0.3	0.79	6.1	0.0	2.56
34h [5]	3	2-Me	0.15	0.32	6.5	0.6	2.56
Ciprofloxacin			12.5	38.1	4.4	–	2.56

of compounds **21a–e** with the exception of **21d** are nearly parallel to the values of Eq. (2) but on a lower level. Compounds **28a–h** demonstrate decreasing activity with increasing length of the respective substituents in 5-position of the indole. Finally, the compounds **34a–h** having a substituted anilide substructure linked to the indole-2-position by an alkyl spacer (*n*-pentyl and *n*-hexyl spacers), are the most active compounds in these tests (**34d** and **34e**). The effect of a methylated phenyl group (**34f–h**) induces highest activity on *ortho*-methylated **34h** which has been described in our previous work [5].

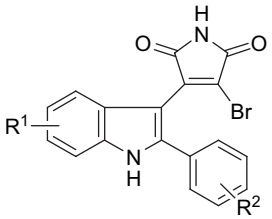
The MIC values compiled in Table 3 demonstrate that most of our compounds exhibit only moderate activities against *M. smegmatis* SG 987, as already observed for analogous compounds in our previous work. Compounds **18a–f**, **19a–f** and **28a–h** show the best results compared with other related series. Their activities do not strongly depend on their substituents. In the homologous series **18a–f** and **19a–f** the Δ values (Eq. (5)) are decreasing with increasing substituent lengths. The activities of **28a–h** are parallel to the values of Eq. (3) but on a much lower level. Most of the compounds of series **13a–e** are inactive against *M. smegmatis* SG 987.

4. Discussion

In our former work [5] we discussed that derivatives with the 3-bromo-4-(1*H*-3-indolyl)-2,5-dihydro-1*H*-2,5-pyrroledione (Fig. 2) lead structure show increasing activities against *S. aureus* 134/93 increasing with their properties.

The Δ values (Eq. (5)) show the difference between the observed activity and the activities expected from the log(*P*) function (Eqs. (2) or (3)) of the respective compound. The Δ values (Eq. (5)) of the phenyl compounds **7a–g** may be interpreted in a way that voluminous substituents in 4-position cause a decrease in antibacterial activity which eliminates the improvement of activity caused by a hydrogen-bond acceptor in this position [5]. The effect of alkoxy substituents in the indole-5-position is investigated in the series **12a–f**, **13a–e** and **28a–d**. The influence of this structural modification is not uniform. In the case of large substituents the results are influenced by the poor solubility of the compounds. The influence of alkyl substituents in position 5 of the indole is shown by the activities of **18a–f**, **19a–f** and **28e–h**. Small substituents' activity is lost, however, with increasing length of the substituents due to steric obstruction. Alkylation in position 7 of the indole weakens the activity as demonstrated by compounds **24a–d** and **25a–e**. On an average the activities of **24a–d** are 10 times lower than that expected from the log(*P*) function (Eq. (2)). The effect is not as obvious in compounds **25a–e**. The positive effect of the hydrogen-bond acceptor in phenyl-4-position partly neutralizes the negative effect of the indole-7-alkylation. In our previous work [5] we have investigated a series of compounds having a *o*-toluide substructure linked to the indole-2-position by an alkyl spacer. Here we found that the activity strongly depends on the length of the alkyl spacer. We observed the best Δ values with propyl (**34h**) and butyl (**34c**) spacers (pMIC = 6.5 and 6.6, respectively). Other spacers led to activities close to the expected values of Eq. (2). The activities of the compounds **31a–h** show the influence and importance of the methyl group in the toluide substructure. Compounds **34a–e** are a subset of anilide derivatives without any methyl group in the substructure. In the case of anilide compounds we find a similar importance of the spacer as we have observed with the toluide derivatives. Our most active substances **34d** and **34e**, however, have the large pentyl and hexyl group spacers. The activity of **34d** and **34e**, with pMIC = 7.0 is about 3 times higher than the most active toluide compound. Compounds **34f** and **34g** are equipped with a propyl spacer but have different positions

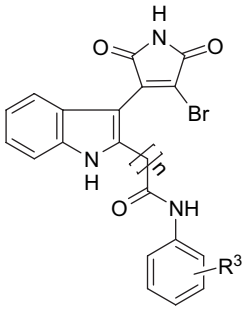
Table 3
Activity of compounds against *M. smegmatis* SG 987



Nr.	R^1	R^2	MIC $\mu g^{-1}\,ml^{-1}$	MIC 10^{-6} M	pMIC	Δ	Log(*P*)
7a	H	4-OMe	20	50.12	4.3	−0.2	2.42
7b	H	4-OBu	6.25	15.85	4.8	−2.0	3.87
7c	H	4-OPen	50	125.89	3.9	−3.5	4.20
7d	H	4-OOct	50	100.00	4.0	−5.1	5.21
7e	H	4-ODec	50	100.00	4.0	−6.2	5.94
7f	H	4-OBzl	12.5	25.12	4.6	−1.3	3.30
7g	H	4-ONaph	1.56	3.16	5.5	−1.2	3.76
12a	5-OMe	H	12.5	31.5	4.5	−0.1	2.48
12b	5-OEt	H	12.5	30.4	4.5	−0.6	2.77
12c	5-OPr	H	25	58.8	4.2	−1.5	3.16
12d	5-OBu	H	12.5	28.4	4.5	−1.6	3.42
12e	5-OPen	H	12.5	27.5	4.6	−2.0	3.75
12f	5-OHex	H	n.d.	n.d.	n.d.	n.d.	4.08
13a	5-OEt	4-OMe	6.25	14.1	4.8	−0.2	2.77
13b	5-OPr	4-OMe	n.d.	n.d.	n.d.	n.d.	3.12
13c	5-OBu	4-OMe	n.d.	n.d.	n.d.	n.d.	3.43
13d	5-OPen	4-OMe	n.d.	n.d.	n.d.	n.d.	3.77
13e	5-OHex	4-OMe	n.d.	n.d.	n.d.	n.d.	4.10
18a	5-Me	H	1.56	4.1	5.4	0.1	2.88
18b	5-Et	H	1.56	4.0	5.4	−0.3	3.15
18c	5-Pr	H	1.56	3.8	5.4	−0.7	3.43
18d	5-Bu	H	0.8	1.9	5.7	−1.0	3.74
18e	5-Pen	H	1.56	3.6	5.5	−1.8	4.07
18f	5-Hex	H	n.d.	n.d.	n.d.	n.d.	4.39
19a	5-Me	4-OMe	3.1	7.6	5.1	−0.1	2.85
19b	5-Et	4-OMe	1.56	3.67	5.4	−0.4	3.23
19c	5-Pr	4-OMe	0.8	1.8	5.7	−0.4	3.45
19d	5-Bu	4-OMe	1.56	3.4	5.5	−1.3	3.83
19e	5-Pen	4-OMe	1.56	3.3	5.5	−1.7	4.10
19f	5-Hex	4-OMe	n.d.	n.d.	n.d.	n.d.	n.d.
24a	7-Me	H	12.5	32.6	4.5	−1.3	3.19
24b	7-Et	H	12.5	31.7	4.5	−1.7	3.42
24c	7-Bu	H	6.25	14.7	4.8	−2.1	3.88
24d	7-Pen	H	6.25	14.3	4.9	−2.4	4.11
25a	7-Me	4-OMe	12.5	30.4	4.5	−1.1	3.12
25b	7-Et	4-OMe	12.5	29.4	4.5	−1.5	3.35
25c	7-Pr	4-OMe	6.25	14.2	4.8	−1.5	3.58
25d	7-Bu	4-OMe	n.d.	n.d.	n.d.	n.d.	n.d.
25e	7-Hex	4-OMe	n.d.	n.d.	n.d.	n.d.	n.d.
28a	5-OMe	3-OMe	6.25	15.85	4.8	−3.6	2.79
28b	5-OEt	3-OMe	4.69	6.31	5.2	−3.8	2.97
28c	5-OBu	3-OMe	3.12	6.31	5.2	−3.8	3.46
28d	5-OHex	3-OMe	3.12	6.31	5.2	−3.8	3.92
28e	5-Me	3-OMe	3.12	7.94	5.1	−3.8	3.12
28f	5-Et	3-OMe	2.34	3.98	5.4	−4.0	3.35
28g	5-Bu	3-OMe	2.34	3.16	5.5	−4.0	3.81
28h	5-Hex	3-OMe	3.12	6.31	5.2	−3.8	4.26

(*continued on next page*)

Table 3 (*continued*)



Nr.	n	R^3	MIC $\mu g^{-1}\,ml^{-1}$	MIC 10^{-6} M	pMIC	Δ	Log(*P*)
34a	2	H	9.2	21	4.7	0.2	2.42
34b	3	H	25	55	4.3	−0.4	2.56
34c	4	H	12.5	26	4.6	−0.1	2.56
34d	5	H	12.5	26	4.6	−0.3	2.68
34e	6	H	6.25	12.6	4.9	−0.3	2.85
34f	3	4-Me	12.5	27	4.6	−0.6	2.56
34g	3	3-Me	12.5	27	4.6	−0.5	2.56
34h [5]	3	2-Me	8.0	17.1	4.8	−0.1	2.56
Ciprofloxacin			0.4	1.2	5.9	–	2.36

for the methyl group in the toluide substructure. The test shows that the *o*-position favours the activity whereas other positons do not improve the activity against *S. aureus* 134/93.

In our previous work [5] we have shown that the influence of the hydrophobicity of the substances on the antibacterial activity is about three times higher for *M. smegmatis* SG 987 than for *S. aureus* 134/93. Unfortunately we did not find a structural modification which additionally increases the activity against *M. smegmatis* SG 987. Most of our structural modifications weaken the activity in respect of the expected values according to Eq. (3). The 5-alkoxy derivatives with a methoxy group in the 4-position of the phenyl ring (**13a–f**) are in most cases even inactive against *M. smegmatis*. We observed activities close to the expected values of Eq. (3) in the case of methyl and ethyl substitution in indole-5-position. Larger alkyl groups weaken the activity. We have also observed hydrophobic control of the activities at the spacer linked anilide derivatives **34a–e**. It should be noted that the same structural modification which improves the activity against *S. aureus* 134/93, in the case of *M. smegmatis* SG 987 led to activities close to the expected values of the hydrophobic function (Eq. (3)). As observed earlier, both microorganisms show similar effects in our structure–activity relationship study.

5. Conclusion

In our present work we extended our structure–activity relationship (SAR) study on substituted indolyl–maleinimide derivatives in order to find structural modifications which in addition to the hydrophobic property can be used to improve the antibacterial activity of our compounds against *S. aureus* 134/93 and *M. smegmatis* SG 987. For *S. aureus* 134/93 we found that alkylation with methyl and ethyl groups in position 5 of the indole generally improved the activity. In the case of spacer linked indolyl-amides, removal of the methyl group in the toluide substructure along with the elongation of the alkyl spacer led to three-fold increase of the activity. With those modifications we could produce compounds with MIC values of 10^{-7} mol/L against *S. aureus*. Alkylation in position 7 of the indole and oxyalkylation in position 4 of the phenyl group in general weakens the activity. In the case of *M. smegmatis* SG 987, we found no structural modifications which generally improved the antibacterial activity. The same modifications which improve the activity against *S. aureus* 134/93, as shown above, led to hydrophobically controlled activities against *M. smegmatis* SG 987. As observed in our previous work [5], the structure–activity relationship (SAR) was similar for both microorganisms.

6. Experimental

6.1. Biological testing procedure

Antibacterial activity of the compounds was studied by determination of minimal inhibitory concentrations (MICs) according to the NCCLS guidelines [18] using the broth microdilution method [19]. The bacteria were grown overnight at 37 °C in Mueller–Hinton broth (MHB) (Difco). Fifty microliters of a 2 mM compound solution were serially diluted by factor 2 with MHB. Then the wells were inoculated with 50 μl of the test organisms to give a final concentration of 5×10^5 CFU/ml. After incubation of the microtiter plates at 37 °C for 24 h, the MIC values were read with a Nepheloscan Ascent 1.4 automatic plate reader (Labsystems, Vantaa, Finland) as the lowest dilution of antibiotic allowing no visible growth.

6.2. Chemistry

General. NMR spectra were recorded with a Bruker Avance 300 MHz spectrometer at 300 K, using TMS as an internal

standard, IR spectra (KBr or pure solid) were measured with a Bruker Tensor 27 spectrometer. Melting points were determined with a Büchi B-545. MS spectra were measured with a Finnigan MAT 95 (EI, 70 eV), or with a Finnigan Thermo Quest TSQ 7000 (ES) (DCM/MeOH + 10 mmol/l NH_4Ac). All reactions were carried out under nitrogen atmosphere. Elemental analyses were performed by the Analytical Lab. of the University of Regensburg with an average deviation of ±0.4%. Thin layer chromatography (TLC) was carried out on Al-sheets coated with 60 F_{245} silica. Column chromatography (CC) was performed using Merck 60 (70–230 mesh ASTM) silica. Solvents and commercially available reagents were dried and purified before use according to standard procedures.

log(*P*) values were determined using HPLC retention data. All compounds were dissolved in methanol and subjected to HPLC. Column: LiChrospher 100 RP-18 (5 μm) 250 × 4 mm, Merck Art. 50983; eluent: methanol/water/acetic acid (80:20:0.1), adjusted with ammonia to pH 5.5; flow: 1.00 ml min^{-1}; detection: 254 nm; temperature: 25 °C. From the retention data, the capacity factor k' is calculated according to Eq. (6):

$$k' = \log((t_R/t_0) - 1) \quad (6)$$

where t_R = retention time of the compound and t_0 = retention time of methanol. From k' we have determined log(*P*) using a linear function which was calibrated with the following reference substances: 4-nitrophenol (log(*P*) = 1.91), 4-chlorophenol (log(*P*) = 2.39), benzophenone (log(*P*) = 3.18), naphthalene (log(*P*) = 3.44) and anthracene (log(*P*) = 4.49). We have carried out two series of determinations, using two different specimen of columns and separately mixed eluents. Every log(*P*) value, given in tables, is an average value of two estimations. The average deviation was ±0.03 and in no case larger than ±0.1 log(*P*) units.

*6.2.1. Synthesis of the substituted indoles **2a–g***

N-Trimethylsilyl-2-toluidine (TMSOT) was dissolved in hexane and *n*-BuLi (2 eq) was added dropwise at −78 °C. The solution was stirred to reflux overnight, then the respective carboxylic acid esters (**1a–g**) were added dropwise. After stirring to reflux for 7 h, the mixture was cooled with ice water and the crude product extracted with EE. The extracts were washed with 0.5 N HCl, dried with Na_2SO_4 and recrystallized from DCM.

*6.2.1.1. 2-(4-Methoxyphenyl)-1H-indole [9] (**2a**).* Yield: 11.6 g (52 mmol) from 16.6 g (100 mmol) of **1a** [20] (52%), yellow crystals, m.p. 237 °C. ^{1}H NMR ($CDCl_3$): δ (ppm) = 3.80 (s, 3H), 6.72 (s, 1H), 6.98–7.08 (m, 4H), 7.37–7.56 (m, 2H), 7.80 (d, 2H, *J* = 9 Hz), 11.36 (s, 1H).

*6.2.1.2. 2-(4-Butoxyphenyl)-1H-indole (**2b**).* Yield: 0.72 g (2.7 mmol) from 3.0 g (16.7 mmol) of **1b** [21] (16%), brown crystals, m.p. 211 °C. IR (KBr): ν (cm^{-1}) = 3440, 2956, 1609, 1547. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.93 (t, 3H, *J* = 7.3 Hz), 1.37–1.51 (m, 2H), 1.65–1.76 (m, 2H), 3.99 (t, 2H, *J* = 6.3 Hz), 6.73 (d, 1H, *J* = 2.0 Hz), 6.93–7.07 (m, 4H), 7.35 (d, 1H, *J* = 7.9 Hz), 7.47 (d, 1H, *J* = 7.5 Hz), 7.75 (d, 2H, *J* = 8.7 Hz), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 265 (88) [$M^{+\bullet}$], 209 (100) [$M - C_4^{\bullet}H_8$]$^+$. Anal. ($C_{18}H_{19}NO$) C, H, N.

*6.2.1.3. 2-(4-Pentyloxyphenyl)-1H-indole (**2c**).* Yield: 0.83 g (3.0 mmol) from 3.2 g (14.9 mmol) of **1c** [21] (21%), brown crystals, m.p. 200 °C. IR (KBr): ν (cm^{-1}) = 3431, 2930, 1609, 1547. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, *J* = 6.9 Hz), 1.36–1.42 (m, 4H), 1.69–1.75 (m, 2H), 3.99 (t, 2H, *J* = 6.3 Hz), 6.73 (d, 1H, *J* = 1.6 Hz), 6.93–7.07 (m, 4H), 7.35 (d, 1H, *J* = 7.5 Hz), 7.47 (d, 1H, *J* = 7.1 Hz), 7.75 (d, 2H, *J* = 8.7 Hz), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 279 (100) [$M^{+\bullet}$]. Anal. ($C_{19}H_{21}NO$) C, H, N.

*6.2.1.4. 2-(4-Octyloxyphenyl)-1H-indole (**2d**).* Yield: 0.75 g (2.3 mmol) from 3.8 g (14.4 mmol) of **1d** [8] (16%), brown crystals, m.p. 208 °C. IR (KBr): ν (cm^{-1}) = 3438, 2921, 2855, 1547. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.86 (t, 3H, *J* = 6.7 Hz), 1.20–1.50 (m, 10H), 1.65–1.80 (m, 2H), 3.99 (t, 2H, *J* = 6.7 Hz), 6.73 (d, 1H, *J* = 1.6 Hz), 6.93–7.07 (m, 4H), 7.35 (d, 1H, *J* = 7.1 Hz), 7.47 (d, 1H, *J* = 7.5 Hz), 7.76 (d, 2H, *J* = 8.7 Hz), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 321 (100) [$M^{+\bullet}$], 209 (80) [$M - C_8^{\bullet}H_{16}$]$^+$. Anal. ($C_{22}H_{27}NO$) C, H, N.

*6.2.1.5. 2-(4-Decyloxyphenyl)-1H-indole (**2e**).* Yield: 0.35 g (1.0 mmol) from 3.90 g (14.6 mmol) of **1e** [8] (7%), brown crystals, m.p. 212 °C. IR (KBr): ν (cm^{-1}) = 3438, 2923, 2853, 1609, 1547. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.84 (t, 3H, *J* = 6.7 Hz), 1.20–1.50 (m, 12H), 1.65–1.80 (m, 2H), 3.99 (t, 2H, *J* = 6.5 Hz), 6.73 (d, 1H, *J* = 1.6 Hz), 6.93–7.07 (m, 4H), 7.35 (d, 1H, *J* = 7.5 Hz), 7.47 (d, 1H, *J* = 7.5 Hz), 7.76 (d, 2H, *J* = 9.1 Hz), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 349 (100) [$M^{+\bullet}$], 209 (88) [$M - C_{10}^{\bullet}H_{20}$]$^+$. Anal. ($C_{24}H_{31}NO$) C, H, N.

*6.2.1.6. 2-(4-Benzyloxyphenyl)-1H-indole (**2f**).* Yield: 0.36 g (1.2 mmol) from 3.5 g (15.1 mmol) of **1f** [22] (9%), brown crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3440, 1501. ^{1}H NMR (DMSO-d_6): δ (ppm) = 5.15 (s, 2H), 6.75 (d, 1H, *J* = 1.6 Hz), 6.93–7.05 (m, 4H), 7.09 (d, 2H, *J* = 9.1 Hz), 7.29–7.49 (m, 7H), 7.78 (d, 2H, *J* = 8.7 Hz), 11.39 (s, 1H). EI-MS (70 eV) *m/z* (%): 299 (56) [$M^{+\bullet}$], 208 (100) [$M - C_7^{\bullet}H_7$]$^+$. Anal. ($C_{21}H_{17}NO$) C, H, N.

*6.2.1.7. 2-[4-(Naphthalen-1-ylmethoxy)-phenyl]-1H-indole (**2g**).* Yield: 0.69 g (2.0 mmol) from 4.2 g (14.4 mmol) of **1g** [23] (14%), brown crystals, m.p. 167 °C. IR (KBr): ν (cm^{-1}) = 3436, 1609, 1501, 1285. ^{1}H NMR (DMSO-d_6): δ (ppm) = 5.60 (s, 2H), 6.76 (d, 1H, *J* = 1.2 Hz), 6.96 (t, 1H, *J* = 7.5 Hz), 7.06 (t, 1H, *J* = 7.5 Hz), 7.19 (d, 2H, *J* = 9.1 Hz), 7.37 (d, 1H, *J* = 7.9 Hz), 7.47–7.62 (m, 3H), 7.70 (d, 1H, *J* = 7.1 Hz), 7.81 (d, 2H, *J* = 9.1 Hz), 7.92–8.00 (m, 2H), 8.10–8.14 (m, 1H), 11.42 (s, 1H). EI-MS (70 eV) *m/z* (%): 349 (36) [$M^{+\bullet}$], 209 (36) [$M - C_{11}^{\bullet}H_9$]$^+$, 141 (100) [$C_{11}^{\bullet}H_9$]$^+$. Anal. ($C_{25}H_{19}NO$) C, H, N.

*6.2.2. Condensation of TBS–dibromomaleinimide with indole derivatives (**6a–g**, Scheme 5)*

The respective indoles (**2a–g**) were dissolved in dry THF and cooled under argon to −20 °C. Then LiHMDS (2 eq, 1 M in THF) was slowly added. After stirring for 45 min, TBS–dibromomaleinimide (1 eq) in THF was added within 3 h. The solution was stirred for 15 min, poured into sat. aq. NH_4Cl, extracted with ethyl acetate, dried over Na_2SO_4 and concentrated *in vacuo*. The crude products were processed to **7a–g** without further purification.

*6.2.3. Removal of the sylil-protecting group to give **7a–g** (Scheme 5)*

The raw silyl-protected indole–maleinimides (**6a–g**) were dissolved in THF under N_2 and tetrabutylammonium fluoride trihydrate (1.3 eq) was added. The mixture was stirred for 2 h, poured into ice, mixed with saturated NH_4Cl solution and extracted with ethyl acetate. The extract was dried over Na_2SO_4, the solvent was removed *in vacuo* and the remaining oil was purified by CC (DCM) and crystallized from pentane.

*6.2.3.1. 3-Bromo-4-[2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**7a**).* Yield: 0.044 g (0.11 mmol) from 0.45 g (2.0 mmol) of **2a** [9] (5%), red crystals, m.p. 200 °C. IR (KBr): ν (cm^{-1}) = 3376, 1771, 1721, 1609, 1580, 1495. ^1H NMR (DMSO-d_6): δ (ppm) = 3.80 (s, 3H), 7.03 (d, 2H, J = 9.1 Hz), 7.09 (ddd, 1H, J = 1.1, 7.3 Hz), 7.19 (ddd, 1H, J = 1.2, 7.1 Hz), 7.43 (d, 1H, J = 7.2 Hz), 7.46 (d, 1H, J = 9.1 Hz), 7.50 (d, 2H, J = 8.7 Hz), 11.26 (s, 1H), 12.03 (s, 1H). EI-MS (70 eV) *m/z* (%): 398 (70) [$M^{+\bullet}$]. Anal. ($C_{19}H_{13}BrN_2O_3$) C, H, N.

*6.2.3.2. 3-Bromo-4-[2-(4-butoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**7b**).* Yield: 0.28 g (0.63 mmol) from 0.54 g (2.0 mmol) of **2b** (31%), red crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3365, 1773, 1709, 1609, 1543, 1495. ^1H NMR (DMSO-d_6): δ (ppm) = 0.93 (t, 3H, J = 7.3 Hz), 1.37–1.52 (m, 2H), 1.65–1.76 (m, 2H), 4.00 (t, 2H, J = 6.7 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.07 (t, 1H, J = 7.9 Hz), 7.18 (1H, J = 7.5 Hz), 7.42 (d, 1H, J = 7.1 Hz), 7.46 (d, 1H, J = 7.1 Hz), 7.47 (d, 2H, J = 8.7 Hz), 11.32 (s, 1H), 12.01 (s, 1H). EI-MS (70 eV) *m/z* (%): 438 (68) [$M^{+\bullet}$], 260 (100). Anal. ($C_{22}H_{19}BrN_2O_3$) C, H, N.

*6.2.3.3. 3-Bromo-4-[2-(4-pentyloxyphenyl)-1H-indole-3-yl]-pyrrole-2,5-dione (**7c**).* Yield: 0.15 g (0.33 mmol) from 0.56 g (2.0 mmol) of **2c** (17%), red crystals, m.p. 200 °C. IR (KBr): ν (cm^{-1}) = 3361, 1773, 1709, 1605, 1495. ^1H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, J = 7.1 Hz), 1.36–1.39 (m, 4H), 1.65–1.76 (m, 2H), 3.99 (t, 2H, J = 6.3 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.08 (t, 1H, J = 7.9 Hz), 7.18 (1H, J = 7.5 Hz), 7.42 (d, 1H, J = 7.1 Hz), 7.45 (d, 1H, J = 6.7 Hz), 7.47 (d, 2H, J = 9.1 Hz), 11.25 (s, 1H), 12.01 (s, 1H). EI-MS (70 eV) *m/z* (%): 452 (56) [$M^{+\bullet}$], 260 (100). Anal. ($C_{23}H_{21}BrN_2O_3$) C, H, N.

*6.2.3.4. 3-Bromo-4-[2-(4-octyloxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**7d**).* Yield: 0.15 g (0.3 mmol) from 0.65 g (2.0 mmol) of **2d** (15%), red crystals, m.p. 185 °C. IR (KBr): ν (cm^{-1}) = 3376, 2927, 1719, 1607, 1497. ^1H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, J = 6.7 Hz), 1.2–1.5 (m, 10H), 1.65–1.76 (m, 2H), 3.98 (t, 2H, J = 6.3 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.08 (t, 1H, J = 7.9 Hz), 7.18 (1H, J = 7.3 Hz), 7.42 (d, 1H, J = 7.1 Hz), 7.45 (d, 1H, J = 6.7 Hz), 7.47 (d, 2H, J = 8.7 Hz), 11.31 (s, 1H), 12.01 (s, 1H). EI-MS (70 eV) *m/z* (%): 494 (100) [$M^{+\bullet}$], 260 (100), Anal. ($C_{26}H_{27}BrN_2O_3$) C, H, N.

*6.2.3.5. 3-Bromo-4-[2-(4-decyloxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**7e**).* Yield: 0.115 g (0.22 mmol) from 0.70 g (2.0 mmol) of **2e** (11%), red crystals, m.p. 190 °C. IR (KBr): ν (cm^{-1}) = 3378, 2925, 1709, 1609, 1497. ^1H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, J = 6.5 Hz), 1.2–1.5 (m, 12H), 1.65–1.76 (m, 2H), 3.98 (t, 2H, J = 6.4 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.08 (t, 1H, J = 8.1 Hz), 7.18 (1H, J = 8.1 Hz), 7.43 (d, 1H, J = 6.7 Hz), 7.45 (d, 1H, J = 6.7 Hz), 7.47 (d, 2H, J = 9.1 Hz), 11.32 (s, 1H), 12.01 (s, 1H). EI-MS (70 eV) *m/z* (%): 522 (100) [$M^{+\bullet}$], 260 (92), Anal. ($C_{28}H_{31}BrN_2O_3$) C, H, N.

*6.2.3.6. 3-[2-(4-Benzyloxyphenyl)-1H-indole-3-yl]-4-bromo-pyrrole-2,5-dione (**7f**).* Yield: 0.23 g (0.5 mmol) from 0.6 g (2.0 mmol) of **2f** (25%), red crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3394, 3054, 1773, 1611, 1495. ^1H NMR (DMSO-d_6): δ (ppm) = 5.14 (s, 2H), 7.05–7.21 (m, 4H), 7.33–7.51 (m, 9H). EI-MS (70 eV) *m/z* (%): 472 (28) [$M^{+\bullet}$]. Anal. ($C_{25}H_{17}BrN_2O_3$) C, H, N.

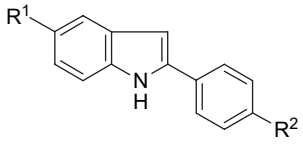
*6.2.3.7. 3-Bromo-4-{2-[4-(naphthalen-1-ylmethoxy)-phenyl]-1H-indole-3-yl}pyrrole-2,5-dione (**7g**).* Yield: 0.27 g (0.51 mmol) from 0.7 g (2.0 mmol) of **2g** (26%), red crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3386, 3241, 1775, 1609, 1495. ^1H NMR (DMSO-d_6): δ (ppm) = 5.60 (s, 2H), 7.05–7.22 (m, 4H), 7.41–7.62 (m, 7H), 7.70 (d, 1H, J = 7.0 Hz), 7.93–8.00 (m, 2H), 8.10 (d, 1H, J = 6.7 Hz). EI-MS (70 eV) *m/z* (%): 522 (10) [$M^{+\bullet}$], 141 (100) [$C_{11}^{\bullet}H_9$]$^+$. Anal. ($C_{29}H_{19}BrN_2O_3 \cdot 1/4$pentane) C, H, N.

*6.2.4. Formation of the indoles **8a–f** and **9a–e** (Table 4)*

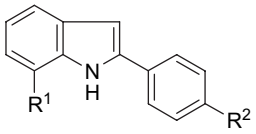
The respective anilines (3 eq, **5a–f**) were dissolved in *N*,*N*-dimethylaniline (DMA) and stirred at reflux in an N_2 atmosphere. A solution of 1 eq of **4a** or **4b** in xylene was added dropwise to the hot solution and was subsequently stirred at 150 °C for 15 h. The solution was cooled to 0 °C and the precipitated crude product was filtered and washed with EE and methanol. The crude product was purified by CC (DCM/EE = 10/1).

*6.2.4.1. 5-Methoxy-2-phenyl-1H-indole (**8a**) [9].* Yield: 4.0 g (18 mmol) from 19.9 g (100 mmol) of **4a** and 12.3 g (100 mmol) of 4-methoxyphenylamine (**5a**) [24] (18%), colourless crystals, m.p. 177–177.5 °C. ^1H NMR (DMSO-d_6): δ (ppm) = 3.75 (s, 3H), 6.72–7.00 (m, 3H), 7.26–7.64 (m, 4H), 7.77–7.87 (m, 2H), 11.30 (s, 1H).

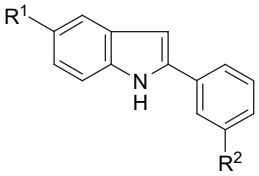
Table 4
Compounds **8a–f**, **9a–e**, **14a–f**, **15a–f**, **20a–d**, **21a–e** and **26a–h**



Nr.	R^1	R^2	Nr.	R^1	R^2
8a	OMe	H	**14a**	Me	H
8b	OEt	H	**14b**	Et	H
8c	OPr	H	**14c**	Pr	H
8d	OBu	H	**14d**	Bu	H
8e	OPen	H	**14e**	Pen	H
8f	OHex	H	**14f**	Hex	H
9a	OEt	OMe	**15a**	Me	OMe
9b	OPr	OMe	**15b**	Et	OMe
9c	OBu	OMe	**15c**	Pr	OMe
9d	OPen	OMe	**15d**	Bu	OMe
9e	OHex	OMe	**15e**	Pen	OMe



20a	Me	H	**21a**	Me	OMe
20b	Et	H	**21b**	Et	OMe
20c	Bu	H	**21c**	Pr	OMe
20d	Pen	H	**21d**	Bu	OMe
			21e	Hex	OMe



26a	OMe	OMe	**26e**	Me	OMe
26b	OEt	OMe	**26f**	Et	OMe
26c	OBu	OMe	**26g**	Bu	OMe
26d	OHex	OMe	**26h**	Hex	OMe

*6.2.4.2. 5-Ethoxy-2-phenyl-1H-indole (**8b**).* Yield: 1.96 g (8.3 mmol) from 4.9 g (24.6 mmol) of **4a** and 3.4 g (24.6 mmol) of 4-ethoxyphenylamine (**5b**) [24] (34%), yellow crystals, m.p. 135 °C. IR (KBr): ν (cm^{-1}) = 3433, 2975, 1601, 1539, 1456, 1391. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.33 (t, 3H, J = 7.0 Hz), 4.00 (q, 2H, J = 6.9 Hz), 6.72 (dd, 1H, J_o = 8.9 Hz, J_m = 2.5 Hz), 6.78 (d, 1H, J = 1.6 Hz), 6.99 (d, 1H, J = 2.4 Hz), 7.22–7.31 (m, 2H), 7.43 (m, 2H), 7.81 (d, 2H, J = 7.2 Hz), 11.34 (s, 1H). EI-MS (70 eV) *m/z* (%): 223 (100) [$M^{+\bullet}$], 208 (44) [$M - C^{\bullet}H_3$]$^+$. Anal. ($C_{16}H_{15}NO$) C, H, N.

*6.2.4.3. 2-Phenyl-5-propoxy-1H-indole (**8c**).* Yield: 2.0 g (8.0 mmol) from 5.0 g (25 mmol) of **4a** and 3.7 g (25 mmol) of 4-propoxyphenylamine (**5c**) [25] (32%), yellow crystals, m.p. 126 °C. IR (KBr): ν (cm^{-1}) = 3430, 2967, 1622, 1540, 1457, 1393. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.99 (t, 3H, J = 7.4 Hz), 1.73 (m, 2H), 3.90 (t, 2H, J = 6.5 Hz), 6.73 (dd, 1H, J_o = 8.7 Hz, J_m = 2.4 Hz), 6.78 (d, 1H, J = 1.6 Hz), 7.00 (d, 1H, J = 2.4 Hz), 7.26 (d, 1H, J = 8.7 Hz), 7.29 (d, 1H, J = 7.5 Hz), 7.43 (m, 2H), 7.81 (d, 2H, J = 7.7 Hz), 11.33 (s, 1H). EI-MS (70 eV) *m/z* (%): 251 (56) [$M^{+\bullet}$], 209 (44) [$M - C^{\bullet}_3H_6$]$^+$. Anal. ($C_{17}H_{17}NO$) C, H, N.

*6.2.4.4. 5-Butoxy-2-phenyl-1H-indole (**8d**).* Yield: 3.1 g (11.7 mmol) from 6.4 g (32.2 mmol) of **4a** and 5.3 g (32.2 mmol) of 4-butoxyphenylamine (**5d**) [26] (36%), yellow crystals, m.p. 132 °C. IR (KBr): ν (cm^{-1}) = 3453, 2957, 1622, 1540, 1457, 1396. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.94 (t, 3H, J = 7.3 Hz), 1.45 (m, 2H), 1.70 (m, 2H), 3.94 (t, 2H, J = 6.4 Hz), 6.72 (dd, 1H, J_o = 8.7 Hz, J_m = 2.4 Hz), 6.78 (d, 1H, J = 1.6 Hz), 7.00 (d, 1H, J = 2.4 Hz), 7.26 (d, 1H, J = 9.5 Hz), 7.29 (d, 1H, J = 7.5 Hz), 7.43 (m, 2H), 7.81 (d, 2H, J = 7.5 Hz), 11.33 (s, 1H). EI-MS (70 eV) *m/z* (%): 265 (64) [$M^{+\bullet}$], 209 (100) [$M - C^{\bullet}_4H_8$]$^+$. Anal. ($C_{18}H_{19}NO$) C, H, N.

*6.2.4.5. 5-Pentyloxy-2-phenyl-1H-indole (**8e**).* Yield: 2.6 g (9.3 mmol) from 6.4 g (32.2 mmol) of **4a** and 5.7 g (32.2 mmol) of 4-pentoxyphenylamine (**5e**) [24] (29%), yellow crystals, m.p. 130 °C. IR (KBr): ν (cm^{-1}) = 3451, 2959, 1623, 1540, 1457, 1395. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, J = 6.9 Hz), 1.38 (m, 4H), 1.71 (m, 2H), 3.93 (t, 2H, J = 6.5 Hz), 6.72 (dd, 1H, J_o = 8.7 Hz, J_m = 2.4 Hz), 6.78 (d, 1H, J = 1.6 Hz), 6.99 (d, 1H, J = 2.3 Hz), 7.28 (m, 2H), 7.43 (t, 2H, J = 7.5 Hz), 7.81 (d, 2H, J = 7.5 Hz), 11.33 (s, 1H). EI-MS (70 eV) *m/z* (%): 279 (68) [$M^{+\bullet}$], 209 (100) [$M - C^{\bullet}_5H_{10}$]$^+$. Anal. ($C_{19}H_{21}NO \cdot 1/20EE$) C, H, N.

*6.2.4.6. 5-Hexyloxy-2-phenyl-1H-indole (**8f**).* Yield: 3.4 g (11.6 mmol) from 5.6 g (28.1 mmol) of **4a** and 6.2 g (28.1 mmol) of 4-hexoxyphenylamine (**5f**) [24] (41%), yellow crystals, m.p. 135 °C. IR (KBr): ν (cm^{-1}) = 3451, 2927, 1625, 1542, 1457, 1395. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.88 (t, 3H, J = 6.9 Hz), 1.31 (m, 4H), 1.43 (m, 2H), 1.71 (m, 2H), 3.93 (t, 2H, J = 6.3 Hz), 6.72 (dd, 1H, J_o = 8.7 Hz, J_m = 2.4 Hz), 6.78 (d, 1H, J = 1.6 Hz), 6.99 (d, 1H, J = 2.4 Hz), 7.27 (m, 2H), 7.43 (m, 2H), 7.81 (d, 2H, J = 7.1 Hz), 11.33 (s, 1H). EI-MS (70 eV) *m/z* (%): 293 (72) [$M^{+\bullet}$], 209 (100) [$M - C^{\bullet}_6H_{12}$]$^+$. Anal. ($C_{20}H_{23}NO$) C, H, N.

*6.2.4.7. 5-Ethoxy-2-(4-methoxyphenyl)-1H-indole (**9a**).* Yield: 4.48 g (16.7 mmol) from 5.2 g (22.7 mmol) of **4b** (74%), yellow crystals, m.p. 200 °C. IR (KBr): ν (cm^{-1}) = 3417, 2936, 1622, 1609, 1547, 1457, 1391. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.32 (t, 3H, J = 7.15 Hz), 3.79 (s, 3H), 3.99 (q, 2H, J = 6.7 Hz), 6.64 (d, 1H, J = 1.5 Hz), 6.68 (dd, 1H, J = 2.4, 8.7 Hz), 6.96 (d, 1H, J = 2.4 Hz), 7.00 (d, 2H, J = 9.1 Hz), 7.22 (d, 1H, J = 8.7 Hz), 7.74 (d, 2H, J = 8.7 Hz). EI-MS (70 eV) *m/z* (%): 267 (100) [$M^{+\bullet}$]. Anal. ($C_{17}H_{17}NO_2$) C, H, N.

*6.2.4.8. 2-(4-Methoxyphenyl)-5-propoxy-1H-indole (**9b**).* Yield: 3.5 g (12.4 mmol) from 5.2 g (22.6 mmol) of **4b** (55%), yellow

crystals, m.p. 170 °C. IR (KBr): ν (cm^{-1}) = 3419, 2938, 1623, 1609, 1549, 1457, 1389. ^1H NMR (DMSO-d_6): δ (ppm) = 0.99 (t, 3H, J = 7.2 Hz), 1.72 (m, 2H), 3.79 (s, 3H), 3.87 (t, 2H, J = 6.3 Hz), 6.64 (d, 1H, J = 1.6 Hz), 6.69 (dd, 1H, J = 2.4, 8.7 Hz), 6.96 (d, 1H, J = 2.3 Hz), 7.00 (d, 2H, J = 9.1 Hz), 7.23 (d, 1H, J = 8.7 Hz), 7.74 (d, 2H, J = 9.1 Hz), 11.2 (s, 1H). EI-MS (70 eV) *m/z* (%): 281 (100) [$M^{+\bullet}$], 239 (88). Anal. ($C_{18}H_{19}NO_2$) C, H, N.

*6.2.4.9. 5-Butoxy-2-(4-methoxyphenyl)-1H-indole (**9c**).* Yield: 5.21 g (17.7 mmol) from 7.4 g (32.3 mmol) of **4b** (55%), yellow crystals, m.p. 165 °C. IR (KBr): ν (cm^{-1}) = 3417, 2930, 1623, 1609, 1549, 1457, 1389. ^1H NMR (DMSO-d_6): δ (ppm) = 0.94 (t, 3H, J = 7.3 Hz), 1.45 (m, 2H), 1.69 (m, 2H), 3.79 (s, 3H), 3.93 (t, 2H, J = 6.4 Hz), 6.64 (d, 1H, J = 1.1 Hz), 6.68 (dd, 1H, J = 2.4 Hz, J = 8.7 Hz), 6.97 (d, 1H, J = 2.4 Hz), 7.00 (d, 2H, J = 8.7 Hz), 7.22 (d, 1H, J = 8.7 Hz), 7.74 (d, 2H, J = 8.7 Hz), 11.20 (s, 1H). EI-MS (70 eV) *m/z* (%): 295 (100) [$M^{+\bullet}$], 239 (64). Anal. ($C_{19}H_{21}NO_2 \cdot 1/4H_2O$) C, H, N.

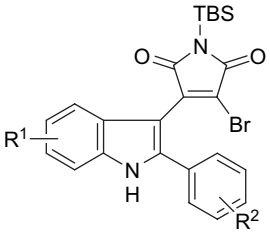
*6.2.4.10. 2-(4-Methoxyphenyl)-5-pentyloxy-1H-indole (**9d**).* Yield: 1.5 g (4.9 mmol) from 5.7 g (24.8 mmol) of **4b** (19%), yellow crystals, m.p. 196 °C. IR (KBr): ν (cm^{-1}) = 3415, 2956, 1620, 1611, 1549, 1456, 1389. ^1H NMR (DMSO-d_6): δ (ppm) = 0.90 (t, 3H, J = 7.0 Hz), 1.38 (m, 4H), 1.69 (m, 2H), 3.79 (s, 3H), 3.92 (t, 2H, J = 6.5 Hz), 6.64 (d, 1H, J = 1.2 Hz), 6.68 (dd, 1H, J = 2.4 Hz, J = 8.7 Hz), 6.96 (d, 1H, J = 2.4 Hz), 7.00 (d, 2H, J = 8.7 Hz), 7.22 (d, 1H, J = 8.7 Hz), 7.74 (d, 2H, J = 8.7 Hz), 11.19 (s, 1H). EI-MS (70 eV) *m/z* (%): 309 (90) [$M^{+\bullet}$], 239 (100). Anal. ($C_{20}H_{23}NO_2$) C, H, N.

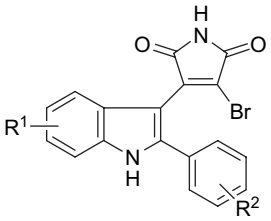
*6.2.4.11. 5-Hexyloxy-2-(4-methoxyphenyl)-1H-indole (**9e**).* Yield: 1.0 g (3.1 mmol) from 5.7 g (24.8 mmol) of **4b** (12%), yellow crystals, m.p. 185 °C. IR (KBr): ν (cm^{-1}) = 3415, 2927, 1622, 1611, 1456, 1302. ^1H NMR (DMSO-d_6): δ (ppm) = 0.87 (t, 3H, J = 6.7 Hz), 1.31 (m, 4H), 1.43 (m, 2H), 1.70 (m, 2H), 3.79 (s, 3H), 3.92 (t, 2H, J = 6.5 Hz), 6.64 (d, 1H, J = 1.5 Hz), 6.68 (dd, 1H, J = 2.4, 8.7 Hz), 6.96 (d, 1H, J = 2.4 Hz), 7.00 (d, 2H, J = 8.7 Hz), 7.22 (d, 1H, J = 8.7 Hz), 7.74 (d, 2H, J = 9.1 Hz), 11.21 (s, 1H). EI-MS (70 eV) *m/z* (%): 323 (100) [$M^{+\bullet}$]. Anal. ($C_{21}H_{25}NO_2$) C, H, N.

6.2.5. Condensation of TBS–dibromomaleinimide with indole derivatives (**10a–f** and **11a–e**, Table 5)

The respective indoles (**8a–f** and **9a–e**) were dissolved in dry THF and cooled under argon to −20 °C. Then LiHMDS (2 eq, 1 M in THF) was slowly added. After stirring the solution for 45 min, TBS–dibromomaleinimide (1 eq) in THF was added within 3 h. The solution was stirred for 15 min at −20 °C, poured into sat. aq. NH_4Cl, extracted with ethyl acetate, dried over Na_2SO_4 and concentrated *in vacuo*. The crude products were processed to **12a–f** and **13a–e** without further purification.

Table 5





Nr.	R^1	R^2	Nr.	R^1	R^2
10a	5-OMe	H	**12a**	5-OMe	H
10b	5-OEt	H	**12b**	5-OEt	H
10c	5-OPr	H	**12c**	5-OPr	H
10d	5-OBu	H	**12d**	5-OBu	H
10e	5-OPen	H	**12e**	5-OPen	H
10f	5-OHex	H	**12f**	5-OHex	H
11a	5-OEt	4-OMe	**13a**	5-OEt	4-OMe
11b	5-OPr	4-OMe	**13b**	5-OPr	4-OMe
11c	5-OBu	4-OMe	**13c**	5-OBu	4-OMe
11d	5-OPen	4-OMe	**13d**	5-OPen	4-OMe
11e	5-OHex	4-OMe	**13e**	5-OHex	4-OMe
16a	5-Me	H	**18a**	5-Me	H
16b	5-Et	H	**18b**	5-Et	H
16c	5-Pr	H	**18c**	5-Pr	H
16d	5-Bu	H	**18d**	5-Bu	H
16e	5-Pen	H	**18e**	5-Pen	H
16f	5-Hex	H	**18f**	5-Hex	H
17a	5-Me	4-OMe	**19a**	5-Me	4-OMe
17b	5-Et	4-OMe	**19b**	5-Et	4-OMe
17c	5-Pr	4-OMe	**19c**	5-Pr	4-OMe
17d	5-Bu	4-OMe	**19d**	5-Bu	4-OMe
17e	5-Pen	4-OMe	**19e**	5-Pen	4-OMe
17f	5-Hex	4-OMe	**19f**	5-Hex	4-OMe
22a	7-Me	H	**24a**	7-Me	H
22b	7-Et	H	**24b**	7-Et	H
22c	7-Bu	H	**24c**	7-Bu	H
22d	7-Pen	H	**24d**	7-Pen	H
23a	7-Me	4-OMe	**25a**	7-Me	4-OMe
23b	7-Et	4-OMe	**25b**	7-Et	4-OMe
23c	7-Pr	4-OMe	**25c**	7-Pr	4-OMe
23d	7-Bu	4-OMe	**25d**	7-Bu	4-OMe
23e	7-Hex	4-OMe	**25e**	7-Hex	4-OMe
27a	5-OMe	3-OMe	**28a**	5-Ome	3-OMe
27b	5-OEt	3-OMe	**28b**	5-Oet	3-OMe
27c	5-OBu	3-OMe	**28c**	5-Obu	3-OMe
27d	5-OHex	3-OMe	**28d**	5-OHex	3-OMe
27e	5-Me	3-OMe	**28e**	5-Me	3-OMe
27f	5-Et	3-OMe	**28f**	5-Et	3-OMe
27g	5-Bu	3-OMe	**28g**	5-Bu	3-OMe
27h	5-Hex	3-OMe	**28h**	5-Hex	3-OMe

6.2.6. Removal of the silyl-protecting group to give **12a–f** and **13a–e** (Table 5)

The raw silyl-protected indole–maleinimides (**10a–f** and **11a–e**) were dissolved in THF under N_2, tetrabutylammonium fluoride trihydrate (1.3 eq) was added, and the mixture was stirred for 2 h, poured into ice, mixed with saturated NH_4Cl solution and extracted with ethyl acetate. The extract was dried over Na_2SO_4, the solvent was removed *in vacuo* and the remaining oil was purified by CC (DCM) and crystallized from pentane.

*6.2.6.1. 3-Bromo-4-(5-methoxy-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**12a**).* Yield: 0.080 g (0.2 mmol) from 0.45 g (2.0 mmol) of **8a** (10%), red crystals, m.p. 250 °C decomp. IR (KBr): ν (cm^{-1}) = 3340, 1721, 1622, 1485. ^1H NMR ($CDCl_3$): δ (ppm) = 3.87 (s, 3H), 6.95 (d, 1H, 8.7 Hz), 6.98 (s, 1H), 7.34–7.67 (m, 6H), 11.29 (s, 1H), 11.98 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 398 (100) $[M+H]^+$. Anal. ($C_{19}H_{13}BrN_2O_3$) C, H, N.

*6.2.6.2. 3-Bromo-4-(5-ethoxy-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**12b**).* Yield: 0.10 g (0.2 mmol) from 0.47 g (2.0 mmol) of **8b** (10%), red crystals, m.p. 235 °C. IR (KBr): ν (cm^{-1}) = 3421, 3214, 1775, 1719, 1632, 1476. ^1H NMR ($CDCl_3$): δ (ppm) = 1.34 (t, 3H, J = 7.0 Hz), 4.00 (q, 2H, J = 7.1 Hz), 6.83 (dd, 1H, J = 2.4, 8.7 Hz), 6.92 (d, 1H, J = 2.4 Hz), 7.32–7.54 (m, 6H), 11.29 (s, 1H), 11.98 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 413 (100) $[M+H]^+$. Anal. ($C_{20}H_{15}BrN_2O_3 \cdot 1/10$pentane) C, H, N.

*6.2.6.3. 3-Bromo-4-(2-phenyl-5-propoxy-1H-indole-3-yl)pyrrole-2,5-dione (**12c**).* Yield: 0.12 g (0.28 mmol) from 0.5 g (2.0 mmol) of **8c** (14%), red crystals, m.p. 222 °C. IR (KBr): ν (cm^{-1}) = 3409, 3232, 1780, 1711, 1619, 1457. ^1H NMR ($CDCl_3$): δ (ppm) = 0.98 (t, 3H, J = 7.3 Hz), 1.74 (m, 2H), 3.90 (t, 2H, J = 6.3 Hz), 6.84 (dd, 1H, J = 2.4, 8.7 Hz), 6.93 (d, 1H, J = 2.4 Hz), 7.32–7.54 (m, 6H), 11.29 (s, 1H), 11.98 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 425 (100) $[M+H]^+$. Anal. ($C_{21}H_{17}BrN_2O_3 \cdot 1/5$pentane) C, H, N.

*6.2.6.4. 3-Bromo-4-(5-butoxy-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**12d**).* Yield: 0.4 g (0.9 mmol) from 0.53 g (2.0 mmol) of **8d** (45%), red crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3382, 3195, 1775, 1717, 1611, 1464. ^1H NMR ($CDCl_3$): δ (ppm) = 0.93 (t, 3H, J = 7.3 Hz), 1.44 (m, 2H), 1.69 (m, 2H), 3.94 (t, 2H, J = 6.4 Hz), 6.84 (dd, 1H, J = 2.4, 8.7 Hz), 6.93 (d, 1H, J = 2.0 Hz), 7.32–7.54 (m, 6H), 11.29 (s, 1H), 11.97 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 441 (100) $[M+H]^+$. Anal. ($C_{22}H_{19}BrN_2O_3$) C, H, N.

*6.2.6.5. 3-Bromo-4-(5-pentyloxy-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**12e**).* Yield: 0.44 g (0.97 mmol) from 0.56 g (2.0 mmol) of **8e** (48%), red crystals, m.p. 205 °C. IR (KBr): ν (cm^{-1}) = 3403, 3226, 1780, 1713, 1620, 1474. ^1H NMR ($CDCl_3$): δ (ppm) = 0.94 (t, 3H, J = 6.9 Hz), 1.44 (m, 4H), 1.81 (m, 2H), 4.00 (t, 2H, J = 6.6 Hz), 6.94 (dd, 1H, J = 2.4, 8.7 Hz), 6.98 (d, 1H, J = 2.0 Hz), 7.26–7.47 (m, 6H), 8.57 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 455 (100) $[M+H]^+$. Anal. ($C_{23}H_{21}BrN_2O_3$) C, H, N.

*6.2.6.6. 3-Bromo-4-(5-hexyloxy-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**12f**).* Yield: 0.21 g (0.45 mmol) from 0.59 g (2.0 mmol) of **8f** (22%), red crystals, m.p. 195 °C. IR (KBr): ν (cm^{-1}) = 3399, 3201, 1781, 1713, 1620, 1474. ^1H NMR ($CDCl_3$): δ (ppm) = 0.91 (t, 3H, J = 6.7 Hz), 1.36 (m, 4H), 1.49 (m, 2H), 1.82 (m, 2H), 4.00 (t, 2H, J = 6.6 Hz), 6.95 (dd, 1H, J = 2.4, 8.7 Hz), 6.97 (d, 1H, J = 2.4 Hz), 7.26–7.46 (m, 6H), 8.56 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 467 (100) $[M+H]^+$. Anal. ($C_{24}H_{23}BrN_2O_3$) C, H, N.

*6.2.6.7. 3-Bromo-4-[5-ethoxy-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**13a**).* Yield: 0.16 g (0.36 mmol) from 0.54 g (2.0 mmol) of **9a** (18%), red crystals, m.p. 190 °C. IR (KBr): ν (cm^{-1}) = 3390, 1779, 1715, 1613, 1474. ^1H NMR ($CDCl_3$): δ (ppm) = 1.33 (t, 3H, J = 7.0 Hz), 3.78 (s, 3H), 3.99 (q, 2H, J = 6.9 Hz), 6.80 (dd, 1H, J = 2.4, 8.7 Hz), 6.89 (d, 1H, J = 2.4 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.33 (d, 1H, J = 8.7 Hz), 7.45 (d, 2H, J = 8.7 Hz), 11.27 (s, 1H), 11.86 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 441 (100) $[M+H]^+$. Anal. ($C_{21}H_{17}BrN_2O_4$) C, H, N.

*6.2.6.8. 3-Bromo-4-[2-(4-methoxyphenyl)-5-propoxy-1H-indole-3-yl]pyrrole-2,5-dione (**13b**).* Yield: 0.13 g (0.28 mmol) from 0.57 g (2 mmol) of **9b** (14%), red crystals, m.p. 185 °C. IR (KBr): ν (cm^{-1}) = 3392, 3288, 1779, 1713, 1613, 1483. ^1H NMR ($CDCl_3$): δ (ppm) = 0.98 (t, 3H, J = 7.3 Hz), 1.74 (m, 2H), 3.79 (s, 3H), 3.89 (t, 2H, J = 6.5 Hz), 6.81 (dd, 1H, J = 2.4, 8.7 Hz), 6.89 (d, 1H, J = 2.0 Hz), 7.01 (d, 2H, J = 9.1 Hz), 7.32 (d, 1H, J = 8.7 Hz), 7.45 (d, 2H, J = 8.7 Hz), 11.26 (s, 1H), 11.85 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 457 (100) $[M+H]^+$. Anal. ($C_{22}H_{19}BrN_2O_4$) C, H, N.

*6.2.6.9. 3-Bromo-4-[5-butoxy-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**13c**).* Yield: 0.27 g (0.57 mmol) from 0.59 g (2.0 mmol) of **9c** (29%), red crystals, m.p. 230 °C. IR (KBr): ν (cm^{-1}) = 3392, 1779, 1713, 1613, 1580, 1483. ^1H NMR ($CDCl_3$): δ (ppm) = 0.93 (t, 3H, J = 7.3 Hz), 1.44 (m, 2H), 1.69 (m, 2H), 3.78 (s, 3H), 3.94 (t, 2H, J = 6.4 Hz), 6.80 (dd, 1H, J = 2.4, 8.7 Hz), 6.89 (d, 1H, J = 2.4 Hz), 7.01 (d, 2H, J = 9.1 Hz), 7.32 (d, 1H, J = 8.7 Hz), 7.45 (d, 2H, J = 8.7 Hz), 11.26 (s, 1H), 11.85 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 471 (100) $[M+H]^+$. Anal. ($C_{23}H_{21}BrN_2O_4$) C, H, N.

*6.2.6.10. 3-Bromo-4-[2-(4-methoxyphenyl)-5-pentyloxy-1H-indole-3-yl]pyrrole-2,5-dione (**13d**).* Yield: 0.47 g (1.0 mmol) from 0.62 (2.0 mmol) of **9d** (50%), red crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3392, 1779, 1713, 1611, 1483. ^1H NMR ($CDCl_3$): δ (ppm) = 0.89 (t, 3H, J = 7.1 Hz), 1.37 (m, 4H), 1.72 (m, 2H), 3.78 (s, 3H), 3.93 (t, 2H, J = 6.7 Hz), 6.80 (dd, 1H, J = 2.4, 8.7 Hz), 6.89 (d, 1H, J = 2.4 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.34 (d, 1H, J = 8.7 Hz), 7.45 (d, 2H, J = 8.7 Hz), 11.27 (s, 1H), 11.85 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 485 (100) $[M+H]^+$. Anal. ($C_{24}H_{23}BrN_2O_4$) C, H, N.

*6.2.6.11. 3-Bromo-4-[5-hexyloxy-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**13e**).* Yield: 0.3 g (0.6 mmol) from 0.48 g (2.0 mmol) of **9e** (30%), red crystals, m.p. 200 °C. IR (KBr): ν (cm^{-1}) = 3392, 2933, 1779, 1713, 1611, 1484. ^1H NMR ($CDCl_3$): δ (ppm) = 0.87 (t, 3H, J = 7.1 Hz), 1.32 (m, 4H), 1.42 (m, 2H), 1.71 (m, 2H), 3.78 (s, 3H), 3.93 (t, 2H,

$J = 6.5$ Hz), 6.80 (dd, 1H, $J = 2.4$, 8.8 Hz), 6.89 (d, 1H, $J = 2.4$ Hz), 7.01 (d, 2H, $J = 9.1$ Hz), 7.32 (d, 1H, $J = 8.7$ Hz), 7.45 (d, 2H, $J = 8.7$ Hz), 11.30 (s, 1H), 11.85 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 499 (25) $[M + H]^+$. Anal. ($C_{25}H_{25}BrN_2O_4$) C, H, N.

*6.2.7. Formation of the indoles **14a–f** and **15a–f** (Table 4)*

The respective anilines (**5g–l**, 3 eq) were dissolved in DMA and stirred at reflux in an N_2 atmosphere. A solution of 1 eq of **4a** or **4b** in hot xylene (70 °C) was slowly added dropwise to the hot solution which was subsequently stirred at 150 °C for 15 h. The solution was cooled to 0 °C and the precipitated crude product was filtered and washed with ethyl acetate and methanol. The crude product was purified by CC (DCM) and crystallized from pentane.

*6.2.7.1. 5-Methyl-2-phenyl-1H-indole (**14a**).* Yield: 6.05 g (29 mmol) from 10 g (50 mmol) of **4a** (58%), colourless crystals, m.p. 210 °C. IR (KBr): ν (cm^{-1}) = 3405, 2859, 1613, 1551, 1506, 1391. ^1H NMR (DMSO-d_6): δ (ppm) = 2.49 (s, 3H), 6.79 (d, 1H, $J = 1.6$ Hz), 6.91 (dd, 1H, $J_o = 7.9$ Hz, $J_m = 1.6$ Hz), 7.26–7.31 (m, 3H), 7.44 (t, 2H, $J = 7.5$ Hz), 7.83 (d, 2H, $J = 7.9$ Hz), 11.37 (s, 1H). EI-MS (70 eV) *m/z* (%): 207 (100) $[M^{+\bullet}]$, 206 (60) $[M - H]^+$. Anal. ($C_{15}H_{13}N$) C, H, N.

*6.2.7.2. 5-Ethyl-2-phenyl-1H-indole (**14b**).* Yield: 2.00 g (9 mmol) from 4.9 g (24 mmol) of **4a** (36%), colourless crystals, m.p. 151 °C. IR (KBr): ν (cm^{-1}) = 3432, 2961, 1603, 1541, 1503, 1402. ^1H NMR (DMSO-d_6): δ (ppm) = 1.21 (t, 3H, $J = 7.5$ Hz), 2.65 (q, 2H, $J = 7.6$ Hz), 6.80 (d, 1H, $J = 1.6$ Hz), 6.95 (dd, 1H, $J_o = 7.9$ Hz, $J_m = 1.6$ Hz), 7.25–7.31 (m, 3H), 7.43 (t, 2H, $J = 7.7$ Hz), 7.83 (d, 2H, $J = 7.1$ Hz), 11.37 (s, 1H). EI-MS (70 eV) *m/z* (%): 221 (84) $[M^{+\bullet}]$, 206 (100) $[M - {}^{\bullet}CH_3]^+$. Anal. ($C_{16}H_{15}N$) C, H, N.

*6.2.7.3. 5-Propyl-2-phenyl-1H-indole (**14c**).* Yield: 3.8 g (16 mmol) from 7.1 g (35 mmol) of **4a** (45%), colourless crystals, m.p. 133 °C. IR (KBr): ν (cm^{-1}) = 3430, 2954, 1603, 1541, 1506, 1401. ^1H NMR (DMSO-d_6): δ (ppm) = 0.90 (t, 3H, $J = 7.3$ Hz), 1.54–1.68 (m, 2H), 2.59 (t, 2H, $J = 7.5$ Hz), 6.80 (d, 1H, $J = 1.6$ Hz), 6.93 (dd, 1H, $J_o = 8.3$ Hz, $J_m = 1.6$ Hz), 7.25–7.31 (m, 3H), 7.44 (t, 2H, $J = 7.5$ Hz), 7.83 (d, 2H, $J = 7.7$ Hz), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 235 (60) $[M^{+\bullet}]$, 206 (100) $[M - {}^{\bullet}C_2H_5]^+$. Anal. ($C_{17}H_{17}N$) C, H, N.

*6.2.7.4. 5-Butyl-2-phenyl-1H-indole (**14d**).* Yield: 1.85 g (7.4 mmol) from 6.4 g (32 mmol) of **4a** (23%), colourless crystals, m.p. 148 °C. IR (KBr): ν (cm^{-1}) = 3433, 2954, 1603, 1542, 1497, 1403. ^1H NMR (DMSO-d_6): δ (ppm) = 0.90 (t, 3H, $J = 7.3$ Hz), 1.27–1.36 (m, 2H), 1.52–1.61 (m, 2H), 2.62 (t, 2H, $J = 7.5$ Hz), 6.80 (d, 1H, $J = 1.6$ Hz), 6.93 (dd, 1H, $J_o = 8.3$ Hz, $J_m = 1.6$ Hz), 7.25–7.31 (m, 3H), 7.44 (t, 2H, $J = 7.5$ Hz), 7.84 (d, 2H, $J = 7.5$ Hz), 11.37 (s, 1H). EI-MS (70 eV) *m/z* (%): 249 (66) $[M^{+\bullet}]$, 206 (100) $[M - {}^{\bullet}C_3H_7]^+$. Anal. ($C_{18}H_{19}N$) C, H, N.

*6.2.7.5. 5-Pentyl-2-phenyl-1H-indole (**14e**).* Yield: 3.3 g (12.5 mmol) from 6.1 g (30.6 mmol) of **4a** (41%), colourless crystals, m.p. 130 °C. IR (KBr): ν (cm^{-1}) = 3429, 2950, 1603, 1542, 1495, 1403. ^1H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, $J = 6.7$ Hz), 1.20–1.40 (m, 4H), 1.52–1.65 (m, 2H), 2.61 (t, 2H, $J = 7.5$ Hz), 6.80 (d, 1H, $J = 1.6$ Hz), 6.93 (dd, 1H, $J_o = 8.3$ Hz, $J_m = 1.6$ Hz), 7.25–7.31 (m, 3H), 7.44 (t, 2H, $J = 7.5$ Hz), 7.82 (d, 2H, $J = 7.1$ Hz), 11.37 (s, 1H). EI-MS (70 eV) *m/z* (%): 263 (68) $[M^{+\bullet}]$, 206 (100) $[M - {}^{\bullet}C_4H_9]^+$. Anal. ($C_{19}H_{21}N$) C, H, N.

*6.2.7.6. 5-Hexyl-2-phenyl-1H-indole (**14f**).* Yield: 5.9 g (21 mmol) from 7.5 g (37.6 mmol) of **4a** (56%), colourless crystals, m.p. 130 °C. IR (KBr): ν (cm^{-1}) = 3438, 2952, 1603, 1542, 1472, 1403. ^1H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, $J = 6.7$ Hz), 1.20–1.40 (m, 6H), 1.50–1.70 (m, 2H), 2.61 (t, 2H, $J = 7.5$ Hz), 6.80 (d, 1H, $J = 1.6$ Hz), 6.92 (dd, 1H, $J_o = 8.3$ Hz, $J_m = 1.6$ Hz), 7.25–7.31 (m, 3H), 7.44 (t, 2H, $J = 7.5$ Hz), 7.82 (d, 2H, $J = 7.1$ Hz), 11.37 (s, 1H). EI-MS (70 eV) *m/z* (%): 277 (74) $[M^{+\bullet}]$, 206 (100) $[M - {}^{\bullet}C_5H_{11}]^+$. Anal. ($C_{20}H_{23}N$) C, H, N.

*6.2.7.7. 5-Methyl-2-(4-methoxyphenyl)-1H-indole (**15a**).* Yield: 5.7 g (25 mmol) from 11.5 g (50 mmol) of **4b** (50%), colourless crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3436, 2919, 1609, 1547, 1503, 1398. ^1H NMR (DMSO-d_6): δ (ppm) = 2.34 (s, 3H), 3.78 (s, 3H), 6.64 (d, 1H, $J = 1.6$ Hz), 6.87 (dd, 1H, $J_o = 7.9$ Hz, $J_m = 1.6$ Hz), 7.00 (d, 2H, $J = 8.7$ Hz), 7.24 (d, 1H, $J = 7.2$ Hz), 7.26 (s, 1H), 7.75 (d, 2H, $J = 9.0$ Hz), 11.24 (s, 1H). EI-MS (70 eV) *m/z* (%): 237 (100) $[M^{+\bullet}]$, 222 (52) $[M - C^{\bullet}H_3]^+$. Anal. ($C_{16}H_{15}NO$) C, H, N.

*6.2.7.8. 5-Ethyl-2-(4-methoxyphenyl)-1H-indole (**15b**).* Yield: 3.65 g (14.5 mmol) from 5.7 g (25 mmol) of **4b** (58%), colourless crystals, m.p. 200 °C. IR (KBr): ν (cm^{-1}) = 3435, 2963, 1609, 1547, 1503, 1399. ^1H NMR (DMSO-d_6): δ (ppm) = 1.20 (t, 3H, $J = 7.7$ Hz), 2.64 (q, 2H, $J = 7.5$ Hz), 3.79 (s, 3H), 6.66 (d, 1H, $J = 1.9$ Hz), 6.91 (dd, 1H, $J_o = 8.1$ Hz, $J_m = 1.4$ Hz), 7.01 (d, 2H, $J = 8.7$ Hz), 7.26 (d, 1H, $J = 8.3$ Hz), 7.28 (s, 1H), 7.75 (d, 2H, $J = 8.7$ Hz), 11.25 (s, 1H). EI-MS (70 eV) *m/z* (%): 251 (100) $[M^{+\bullet}]$, 236 (68) $[M - {}^{\bullet}CH_3]^+$. Anal. ($C_{17}H_{17}NO$) C, H, N.

*6.2.7.9. 5-Propyl-2-(4-methoxyphenyl)-1H-indole (**15c**).* Yield: 4.3 g (16.2 mmol) from 6.2 g (27 mmol) of **4b** (59%), colourless crystals, m.p. 192 °C. IR (KBr): ν (cm^{-1}) = 3409, 2952, 1609, 1549, 1505, 1397. ^1H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, $J = 7.3$ Hz), 1.56–1.65 (m, 2H), 2.59 (t, 2H, $J = 7.3$ Hz), 3.79 (s, 3H), 6.65 (d, 1H, $J = 1.6$ Hz), 6.88 (dd, 1H, $J_o = 8.5$ Hz, $J_m = 1.4$ Hz), 7.01 (d, 2H, $J = 8.7$ Hz), 7.23–7.27 (m, 2H), 7.75 (d, 2H, $J = 8.7$ Hz), 11.25 (s, 1H). EI-MS (70 eV) *m/z* (%): 265 (100) $[M^{+\bullet}]$, 236 (88) $[M - {}^{\bullet}C_2H_5]^+$. Anal. ($C_{18}H_{19}NO$) C, H, N.

*6.2.7.10. 5-Butyl-2-(4-methoxyphenyl)-1H-indole (**15d**).* Yield: 4.8 g (17 mmol) from 7.4 g (32 mmol) of **4b** (53%), colourless crystals, m.p. 195 °C. IR (KBr): ν (cm^{-1}) = 3436, 2956, 1609,

1549, 1505, 1397. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, J = 7.5 Hz), 1.24–1.38 (m, 2H), 1.51–1.63 (m, 2H), 2.61 (t, 2H, J = 7.5 Hz), 3.79 (s, 3H), 6.65 (d, 1H, J = 1.6 Hz), 6.88 (dd, 1H, J_o = 8.3 Hz, J_m = 1.6 Hz), 7.01 (d, 2H, J = 9.1 Hz), 7.23–7.27 (m, 2H), 7.75 (d, 2H, J = 8.7 Hz), 11.24 (s, 1H). EI-MS (70 eV) *m/z* (%): 279 (92) [$M^{+\bullet}$], 236 (100) [$M - {}^{\bullet}C_3H_7]^+$. Anal. ($C_{19}H_{21}NO$) C, H, N.

*6.2.7.11. 5-Pentyl-2-(4-methoxyphenyl)-1H-indole (**15e**).* Yield: 4.9 g (16.7 mmol) from 6.5 g (28 mmol) of **4b** (59%), colourless crystals, m.p. 175 °C. IR (KBr): ν (cm^{-1}) = 3434, 2929, 1609, 1547, 1503, 1397. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, J = 6.5 Hz), 1.24–1.38 (m, 4H), 1.51–1.63 (m, 2H), 2.60 (t, 2H, J = 7.5 Hz), 3.79 (s, 3H), 6.65 (d, 1H, J = 1.6 Hz), 6.88 (dd, 1H, J_o = 8.3 Hz, J_m = 1.6 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.23–7.27 (m, 2H), 7.75 (d, 2H, J = 8.7 Hz), 11.25 (s, 1H). EI-MS (70 eV) *m/z* (%): 293 (100) [$M^{+\bullet}$], 236 (68) [$M - {}^{\bullet}C_4H_9]^+$. Anal. ($C_{20}H_{23}NO$) C, H, N.

*6.2.7.12. 5-Hexyl-2-(4-methoxyphenyl)-1H-indole (**15f**).* Yield: 2.9 g (9.4 mmol) from 4.3 g (18.8 mmol) of **4b** (50%), colourless crystals, m.p. 183 °C. IR (KBr): ν (cm^{-1}) = 3436, 2929, 1609, 1549, 1503, 1399. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.84 (t, 3H, J = 6.8 Hz), 1.24–1.38 (m, 6H), 1.51–1.63 (m, 2H), 2.60 (t, 2H, J = 7.5 Hz), 3.79 (s, 3H), 6.66 (d, 1H, J = 1.6 Hz), 6.88 (dd, 1H, J_o = 8.3 Hz, J_m = 1.6 Hz), 7.01 (d, 2H, J = 8.7 Hz), 7.23–7.27 (m, 2H), 7.75 (d, 2H, J = 8.7 Hz), 11.25 (s, 1H). EI-MS (70 eV) *m/z* (%): 307 (100) [$M^{+\bullet}$], 236 (68) [$M - {}^{\bullet}C_5H_{11}]^+$. Anal. ($C_{21}H_{25}NO$) C, H, N.

*6.2.8. Condensation of TBS–dibromomaleinimide with indole derivatives (**16a–f** and **17a–f**) (Table 5)*

The respective indoles (**14a–f** and **15a–f**) were dissolved in dry THF, and the solution was cooled under argon to −20 °C. Then LiHMDS (2 eq, 1 M in THF) was slowly added. After stirring the solution for 45 min at −20 °C, TBS–dibromomaleinimide (1 eq) in THF was added within 3 h. The solution was stirred for 15 min, poured into sat. aq. NH_4Cl, extracted with ethyl acetate, dried over Na_2SO_4 and concentrated *in vacuo*. The crude products were processed to **18a–f** and **19a–f** without further purification.

*6.2.9. Removal of the silyl-protecting group to give **18a–f** and **19a–f** (Table 5)*

The raw silyl-protected indole–maleinimides (**16a–f** and **17a–f**) were dissolved in THF under N_2, tetrabutylammonium fluoride trihydrate (1.3 eq) was added, and the mixture was stirred for 2 h at room temperature, poured into ice, mixed with saturated NH_4Cl solution and extracted with ethyl acetate. The extract was dried over Na_2SO_4, the solvent was removed *in vacuo* and the remaining oil was purified by CC (DCM) and crystallized from pentane.

*6.2.9.1. 3-Bromo-4-(5-methyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**18a**).* Yield: 0.32 g (0.84 mmol) from 0.420 g (2 mmol) of **14a** (41%), red crystals, m.p. 240 °C. IR (KBr): ν (cm^{-1}) = 3444, 3208, 1771, 1711, 1619, 1478. ^{1}H NMR (DMSO-d_6): δ (ppm) = 2.38 (s, 3H), 7.03 (dd, 1H, J = 1.4, 8.3 Hz), 7.24 (s, 1H), 7.32–7.56 (m, 6H), 11.32 (s, 1H), 12.01 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 381 (100) $[M + H]^+$. Anal. ($C_{19}H_{13}BrN_2O_2$) C, H, N.

*6.2.9.2. 3-Bromo-4-(5-ethyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**18b**).* Yield: 0.36 g (0.91 mmol) from 2.0 mmol of **14b** (45%), red crystals, m.p. 205.3 °C. IR (KBr): ν (cm^{-1}) = 3374, 3189, 1771, 1711, 1613, 1478. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.21 (t, 3H, J = 7.7 Hz), 2.67 (q, 2H, J = 7.5 Hz), 7.07 (dd, 1H, J = 1.6, 8.3 Hz), 7.26 (s, 1H), 7.32–7.56 (m, 6H), 11.32 (s, 1H), 12.01 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 395 (100) $[M + H]^+$. Anal. ($C_{20}H_{15}BrN_2O_2 \cdot 1/2$pentane) C, H, N.

*6.2.9.3. 3-Bromo-4-(5-propyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**18c**).* Yield: 0.39 (0.95 mmol) from 0.47 g (2.0 mmol) of **14c** (47%), red crystals, m.p. 198.2 °C. IR (KBr): ν (cm^{-1}) = 3359, 3191, 1773, 1711, 1611, 1476. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.90 (t, 3H, J = 7.3 Hz), 1.57–1.65 (m, 2H), 2.62 (t, 2H, J = 7.3 Hz), 7.04 (dd, 1H, J = 1.6, 8.3 Hz), 7.25 (s, 1H), 7.32–7.56 (m, 6H), 11.31 (s, 1H), 12.02 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 409 (100) $[M + H]^+$. Anal. ($C_{21}H_{17}BrN_2O_2$) C, H, N.

*6.2.9.4. 3-Bromo-4-(5-butyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**18d**).* Yield: 0.40 g (0.95 mmol) from 0.50 g (2 mmol) of **14d** (47%), red crystals, m.p. 200.2 °C. IR (KBr): ν (cm^{-1}) = 3378, 2954, 1775, 1726, 1613, 1464. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, J = 7.3 Hz), 1.27–1.36 (m, 2H), 1.52–1.61 (m, 2H), 2.64 (t, 2H, J = 7.5 Hz), 7.04 (dd, 1H, J = 1.6, 8.3 Hz), 7.24 (s, 1H), 7.32–7.56 (m, 6H), 11.31 (s, 1H), 12.01 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 423 (100) $[M + H]^+$. Anal. ($C_{22}H_{19}BrN_2O_2 \cdot 1/6$DCM) C, H, N.

*6.2.9.5. 3-Bromo-4-(5-pentyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**18e**).* Yield: 0.40 g (0.91 mmol) from 0.53 g (2.0 mmol) of **14e** (45%), red crystals, m.p. 185 °C. IR (KBr): ν (cm^{-1}) = 3399, 2927, 1771, 1709, 1615, 1460. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, J = 6.7 Hz), 1.27–1.31 (m, 4H), 1.50–1.70 (m, 2H), 2.63 (t, 2H, J = 7.5 Hz), 7.04 (dd, 1H, J = 1.6, 8.3 Hz), 7.24 (s, 1H), 7.32–7.56 (m, 6H), 11.31 (s, 1H), 12.01 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 437 (100) $[M + H]^+$. Anal. ($C_{23}H_{21}BrN_2O_2$) C, H, N.

*6.2.9.6. 3-Bromo-4-(5-hexyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**18f**).* Yield: 0.35 g (0.77 mmol) from 0.550 g (1.98 mmol) of **14f** (39%), red crystals, m.p. 175 °C. IR (KBr): ν (cm^{-1}) = 3438, 2954, 1773, 1713, 1617, 1462. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.84 (t, 3H, J = 6.7 Hz), 1.27–1.31 (m, 6H), 1.50–1.70 (m, 2H), 2.63 (t, 2H, J = 7.5 Hz),

7.04 (dd, 1H, $J = 1.6$, 8.3 Hz), 7.24 (s, 1H), 7.32–7.56 (m, 6H), 11.31 (s, 1H), 12.01 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 451 (100) $[M + H]^+$. Anal. ($C_{24}H_{23}BrN_2O_2$) C, H, N.

*6.2.9.7. 3-Bromo-4-[5-methyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**19a**).* Yield: 0.44 g (1.1 mmol) from 0.48 g (2.0 mmol) of **15a** (53%), red crystals, m.p. 260 °C. IR (KBr): ν (cm^{-1}) = 3380, 2936, 1711, 1611, 1449. ^1H NMR (DMSO-d_6): δ (ppm) = 2.37 (s, 3H), 3.79 (s, 3H), 6.99–7.04 (m, 3H), 7.20 (s, 1H), 7.33 (d, 1H, $J = 8.3$ Hz), 7.47 (d, 2H, $J = 8.7$ Hz), 11.30 (s, 1H), 11.98 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 411 (100) $[M + H]^+$. Anal. ($C_{20}H_{15}BrN_2O_3$) C, H, N.

*6.2.9.8. 3-Bromo-4-[5-ethyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**19b**).* Yield: 0.42 g (1.0 mmol) from 0.50 g (2.0 mmol) of **15b** (50%), red crystals, m.p. 245 °C. IR (KBr): ν (cm^{-1}) = 3363, 2927, 1707, 1609, 1491. ^1H NMR (DMSO-d_6): δ (ppm) = 1.20 (t, 3H, $J = 7.5$ Hz), 2.66 (q, 2H, $J = 7.5$ Hz), 3.79 (s, 3H), 7.00–7.06 (m, 3H), 7.23 (s, 1H), 7.36 (d, 1H, $J = 8.3$ Hz), 7.47 (d, 2H, $J = 9.1$ Hz), 11.29 (s, 1H), 11.90 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 425 (100) $[M + H]^+$. Anal. ($C_{21}H_{17}BrN_2O_3$) C, H, N.

*6.2.9.9. 3-Bromo-4-[5-propyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**19c**).* Yield: 0.44 g (1 mmol) from 0.53 g (2.0 mmol) of **15c** (50%), red crystals, m.p. 230 °C. IR (KBr): ν (cm^{-1}) = 3349, 2957, 1709, 1607, 1491. ^1H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, $J = 7.5$ Hz), 1.56–1.65 (m, 2H), 2.61 (t, 2H, $J = 7.3$ Hz), 3.79 (s, 3H), 6.90–7.05 (m, 3H), 7.21 (s, 1H), 7.35 (d, 1H, $J = 8.3$ Hz), 7.47 (d, 2H, $J = 8.7$ Hz), 11.29 (s, 1H), 11.90 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 439 (100) $[M + H]^+$. Anal. ($C_{22}H_{19}BrN_2O_3 \cdot 1/5H_2O$) C, H, N.

*6.2.9.10. 3-Bromo-4-[5-butyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**19d**).* Yield: 0.36 g (0.8 mmol) from 0.56 g (2.0 mmol) of **15d** (50%), red crystals, m.p. 230 °C. IR (KBr): ν (cm^{-1}) = 3349, 2929, 1711, 1607, 1439. ^1H NMR (DMSO-d_6): δ (ppm) = 0.89 (t, 3H, $J = 7.3$ Hz), 1.27–1.36 (m, 2H), 1.50–1.60 (m, 2H), 2.62 (t, 2H, $J = 7.5$ Hz), 3.79 (s, 3H), 6.98–7.05 (m, 3H), 7.22 (s, 1H), 7.34 (d, 1H, $J = 7.9$ Hz), 7.49 (d, 2H, $J = 8.7$ Hz), 11.29 (s, 1H), 11.90 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 453 (100) $[M + H]^+$. Anal. ($C_{23}H_{21}BrN_2O_3$) C, H, N.

*6.2.9.11. 3-Bromo-4-[5-pentyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**19e**).* Yield: 0.41 g (0.89 mmol) from 0.59 (2.0 mmol) of **15e** (44%), red crystals, m.p. 215 °C. IR (KBr): ν (cm^{-1}) = 3390, 2927, 1711, 1611, 1447. ^1H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, $J = 7.3$ Hz), 1.27–1.37 (m, 4H), 1.50–1.70 (m, 2H), 2.62 (t, 2H, $J = 7.3$ Hz), 3.79 (s, 3H), 6.98–7.05 (m, 3H), 7.21 (s, 1H), 7.34 (d, 1H, $J = 7.9$ Hz), 7.46 (d, 2H, $J = 9.1$ Hz), 11.29 (s, 1H), 11.90 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 467 (100) $[M + H]^+$. Anal. ($C_{24}H_{23}BrN_2O_3$) C, H, N.

*6.2.9.12. 3-Bromo-4-[5-hexyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**19f**).* Yield: 0.43 g (0.9 mmol) from 0.60 g (2.0 mmol) of **15f** (45%), red crystals, m.p. 205 °C. IR (KBr): ν (cm^{-1}) = 3371, 2927, 1709, 1609, 1447. ^1H NMR (DMSO-d_6): δ (ppm) = 0.83 (t, 3H, $J = 7.1$ Hz), 1.20–1.40 (m, 6H), 1.50–1.70 (m, 2H), 2.62 (t, 2H, $J = 7.5$ Hz), 3.79 (s, 3H), 6.98–7.07 (m, 3H), 7.20 (s, 1H), 7.34 (d, 1H, $J = 8.3$ Hz), 7.46 (d, 2H, $J = 8.7$ Hz), 11.29 (s, 1H), 11.90 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 481 (100) $[M + H]^+$. Anal. ($C_{25}H_{25}BrN_2O_3$) C, H, N.

*6.2.10. Formation of the indoles **20a–d** and **21a–e** (Table 4)*

The respective anilines (**5m–r**, 3 eq) were dissolved in DMA and stirred at reflux in an N_2 atmosphere. A solution of 1 eq of **4a** or **4b** in xylene was added dropwise to the hot solution, which was subsequently stirred at 150 °C for 15 h. The solution was cooled to 0 °C, and the precipitated crude product was filtered and washed with EE and methanol. The crude product was purified by CC (DCM) and crystallized from pentane.

*6.2.10.1. 7-Methyl-2-phenyl-1H-indole (**20a**).* Yield: 3.75 g (18 mmol) from 6.1 g (30 mmol) of **4a** (59%), colourless crystals, m.p. 110 °C. IR (KBr): ν (cm^{-1}) = 3450, 1667, 1448, 1301. ^1H NMR (DMSO-d_6): δ (ppm) = 2.53 (s, 3H), 6.87 (d, 1H, $J = 3.0$ Hz), 6.88–6.98 (m, 2H), 7.27–7.36 (m, 2H), 7.42–7.48 (m, 2H), 7.90–7.95 (m, 2H), 11.04 (s, 1H). EI-MS (70 eV) *m/z* (%): 207 (100) $[M^{+\bullet}]$. Anal. ($C_{15}H_{13}N$) C, H, N.

*6.2.10.2. 7-Ethyl-2-phenyl-1H-indole (**20b**).* Yield: 5.12 g (23 mol) from 6.1 g (31 mmol) of **4a** (75%), colourless crystals, m.p. 55 °C. IR (KBr): ν (cm^{-1}) = 3454, 1601, 1450, 1296. ^1H NMR (DMSO-d_6): δ (ppm) = 1.28 (t, 3H, $J = 7.3$ Hz), 2.95 (q, 2H, $J = 7.5$ Hz), 6.87 (d, 1H, $J = 2.0$ Hz), 6.88–6.97 (m, 2H), 7.27–7.36 (m, 2H), 7.45 (t, 2H, $J = 7.5$ Hz), 7.93 (d, 2H, $J = 7.9$ Hz), 11.03 (s, 1H). EI-MS (70 eV) *m/z* (%): 221 (100) $[M^{+\bullet}]$, 206 (76) $[M - {}^{\bullet}CH_3]^+$. Anal. ($C_{17}H_{15}N$) C, H, N.

*6.2.10.3. 7-Butyl-2-phenyl-1H-indole (**20c**).* Yield: 4.5 g (18 mmol) from 6.1 g (31 mmol) of **4a** (59%), oil. IR (KBr): ν (cm^{-1}) = 3450, 2928, 1605, 1451, 1303. ^1H NMR ($CDCl_3$): δ (ppm) = 0.98 (t, 3H, $J = 7.3$ Hz), 1.40–1.55 (m, 2H), 1.70–1.82 (m, 2H), 2.87 (t, 2H, $J = 7.7$ Hz), 6.83 (d, 1H, $J = 2.1$ Hz), 6.99–7.11 (m, 2H), 7.29–7.38 (m, 2H), 7.42–7.49 (m, 2H), 7.67–7.78 (m, 2H), 8.20 (s, 1H). EI-MS (70 eV) *m/z* (%): 249 (83) $[M^{+\bullet}]$, 206 (100) $[M - {}^{\bullet}C_3H_7]^+$. Anal. ($C_{18}H_{19}N \cdot 1/10$pentane) C, H, N.

*6.2.10.4. 7-Pentyl-2-phenyl-1H-indole (**20d**).* Yield: 4.6 g (17 mmol) from 4.5 g (23 mmol) of **4a** (77%), oil. IR (KBr): ν (cm^{-1}) = 3450, 2928, 1605, 1452, 1302. ^1H NMR ($CDCl_3$): δ (ppm) = 0.92 (t, 3H, $J = 7.0$ Hz), 1.33–1.67 (m,

4H), 1.72–1.84 (m, 2H), 2.87 (t, 2H, $J = 7.7$ Hz), 6.83 (d, 1H, $J = 1.8$ Hz), 6.99–7.11 (m, 2H), 7.29–7.35 (m, 2H), 7.42–7.49 (m, 2H), 7.67–7.78 (m, 2H), 8.20 (s, 1H). EI-MS (70 eV) *m/z* (%): 263 (78) [$M^{+\bullet}$], 206 (100) [$M - {}^{\bullet}C_4H_9$]$^+$. Anal. ($C_{19}H_{21}N \cdot 1/6H_2O$) C, H, N.

*6.2.10.5. 7-Methyl-2-(4-methoxyphenyl)-1H-indole (**21a**).* Yield: 3.5 g (15 mmol) from 6.5 g (28.4 mmol) of **4b** (53%), colourless crystals, m.p. 125 °C. IR (KBr): ν (cm^{-1}) = 3400, 1608, 1550, 1506, 1355. ^{1}H NMR (DMSO-d_6): δ (ppm) = 2.52 (s, 3H), 3.80 (s, 3H), 6.73 (d, 1H, $J = 2.1$ Hz), 6.82–6.91 (m, 2H), 7.02 (d, 2H, $J = 8.8$ Hz), 7.30 (dd, 1H, $J_o = 7.2$ Hz, $J_m = 1.4$ Hz), 7.85 (d, 2H, $J = 8.8$ Hz), 10.93 (s, 1H). EI-MS (70 eV) *m/z* (%): 237 (100) [$M^{+\bullet}$], 222 (58) [$M - {}^{\bullet}CH_3$]$^+$. Anal. ($C_{16}H_{15}NO$) C, H, N.

*6.2.10.6. 7-Ethyl-2-(4-methoxyphenyl)-1H-indole (**21b**).* Yield: 3.8 g (15 mmol) from 6.5 g (28.4 mmol) of **4b** (53%), colourless crystals, m.p. 120 °C. IR (KBr): ν (cm^{-1}) = 3454, 2964, 1613, 1506, 1350. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.28 (t, 3H, $J = 7.5$ Hz), 2.94 (q, 2H, $J = 7.5$ Hz), 3.80 (s, 3H), 6.73 (d, 1H, $J = 2.0$ Hz), 6.85–6.94 (m, 2H), 7.02 (d, 2H, $J = 8.7$ Hz), 7.30 (dd, 1H, $J_o = 6.9$ Hz, $J_m = 1.8$ Hz), 7.85 (d, 2H, $J = 8.7$ Hz), 10.92 (s, 1H). EI-MS (70 eV) *m/z* (%): 251 (100) [$M^{+\bullet}$], 236 (56) [$M - {}^{\bullet}CH_3$]$^+$. Anal. ($C_{17}H_{17}NO$) C, H, N.

*6.2.10.7. 7-Propyl-2-(4-methoxyphenyl)-1H-indole (**21c**).* Yield: 2.45 g (9.2 mmol) from 6.5 g (28.4 mmol) of **4b** (32%), colourless crystals, m.p. 100 °C. IR (KBr): ν (cm^{-1}) = 3450, 2953, 1613, 1505, 1352. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.97 (t, 3H, $J = 7.3$ Hz), 1.62–1.74 (m, 2H), 2.89 (t, 2H, $J = 7.6$ Hz), 3.80 (s, 3H), 6.72 (d, 1H, $J = 2.0$ Hz), 6.85–6.93 (m, 2H), 7.02 (d, 2H, $J = 8.8$ Hz), 7.30 (dd, 1H, $J_o = 7.3$ Hz, $J_m = 1.3$ Hz), 7.85 (d, 2H, $J = 8.8$ Hz), 10.89 (s, 1H). EI-MS (70 eV) *m/z* (%): 265 (100) [$M^{+\bullet}$], 236 (57) [$M - {}^{\bullet}C_2H_5$]$^+$. Anal. ($C_{18}H_{19}NO$) C, H, N.

*6.2.10.8. 7-Butyl-2-(4-methoxyphenyl)-1H-indole (**21d**).* Yield: 3.8 g (14 mmol) from 6.5 g (28.4 mmol) of **4b** (49%), colourless crystals, m.p. 85 °C. IR (KBr): ν (cm^{-1}) = 3431, 2928, 1608, 1508, 1356. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.92 (t, 3H, $J = 7.3$ Hz), 1.32–1.47 (m, 2H), 1.59–1.72 (m, 2H), 2.91 (t, 2H, $J = 7.5$ Hz), 3.80 (s, 3H), 6.72 (d, 1H, $J = 2.0$ Hz), 6.83–6.93 (m, 2H), 7.02 (d, 2H, $J = 8.7$ Hz), 7.30 (dd, 1H, $J_o = 7.3$ Hz, $J_m = 1.3$ Hz), 7.85 (d, 2H, $J = 8.7$ Hz), 10.88 (s, 1H). EI-MS (70 eV) *m/z* (%): 279 (100) [$M^{+\bullet}$], 236 (55) [$M - {}^{\bullet}C_3H_7$]$^+$. Anal. ($C_{19}H_{21}NO \cdot 1/12DCM$) C, H, N.

*6.2.10.9. 7-Hexyl-2-(4-methoxyphenyl)-1H-indole (**21e**).* Yield: 4.6 g (15 mmol) from 6.4 g (27.9 mmol) of **4b** (54%), colourless crystals, m.p. 100 °C. IR (KBr): ν (cm^{-1}) = 3435, 2925, 1608, 1504, 1352. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, $J = 3.2$ Hz), 1.20–1.40 (m, 6H), 1.50–1.70 (m, 2H), 2.91 (t, 2H, $J = 7.5$ Hz), 3.80 (s, 3H), 6.72 (d, 1H, $J = 2.0$ Hz), 6.83–6.93 (m, 2H), 7.02 (d, 2H, $J = 8.7$ Hz), 7.30 (dd, 1H, $J_o = 7.3$ Hz, $J_m = 1.3$ Hz), 7.85 (d, 2H, $J = 8.7$ Hz), 10.88 (s, 1H). EI-MS (70 eV) *m/z* (%): 307 (100) [$M^{+\bullet}$], 236 (52) [$M - {}^{\bullet}C_5H_{11}$]$^+$. Anal. ($C_{21}H_{25}NO \cdot 1/20DCM$) C, H, N.

*6.2.11. Condensation of TBS–dibromomaleinimide with indole derivatives (**22a–d** and **23a–e**) (Table 5)*

The respective indoles (**20a–d** and **21a–e**) were dissolved in dry THF and cooled under argon to −20 °C. Then LiHMDS (2 eq, 1 M in THF) was slowly added. After stirring the solution for 45 min at −20 °C, TBS–dibromomaleinimide (1 eq) in THF was added within 3 h. The solution was stirred for 15 min, poured into sat. aq. NH_4Cl, extracted with ethyl acetate, dried over Na_2SO_4 and concentrated *in vacuo*. The crude products were processed to **24a–d** and **25a–e** without further purification.

*6.2.12. Removal of the silyl-protecting group to give **24a–d** and **25a–e** (Table 5)*

The raw silyl-protected indole–maleinimides (**22a–d** and **23a–e**) were dissolved in THF under N_2, tetrabutylammonium fluoride trihydrate (1.3 eq) was added, and the mixture was stirred for 2 h, poured into ice, mixed with saturated NH_4Cl solution and extracted with ethyl acetate. The extract was dried over Na_2SO_4, the solvent was removed *in vacuo* and the remaining oil was purified by CC (DCM) and crytallized from pentane.

*6.2.12.1. 3-Bromo-4-(7-methyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**24a**).* Yield: 0.24 g (0.63 mmol) from 0.42 g (2.0 mmol) of **20a** (32%), red crystals, m.p. 250 °C. IR (KBr): ν (cm^{-1}) = 3367, 1705, 1602, 1456, 1330. ^{1}H NMR (DMSO-d_6): δ (ppm) = 2.55 (s, 3H), 7.00 (d, 2H, 6.1 Hz), 7.25–7.28 (m, 1H), 7.35–7.48 (m, 3H), 7.55–7.72 (m, 2H), 11.31 (s, 1H), 11.81 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 381 (100) [$M + H$]$^+$. Anal. ($C_{19}H_{13}BrN_2O_2$) C, H, N.

*6.2.12.2. 3-Bromo-4-(7-ethyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**24b**).* Yield: 0.35 g (0.88 mmol) from 0.44 g (2.0 mmol) of **20b** (44%), red crystals, m.p. 228 °C. IR (KBr): ν (cm^{-1}) = 3357, 1770, 1716, 1616, 1456, 1328. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.34 (t, 3H, $J = 7.5$ Hz), 3.02 (q, 2H, $J = 6.2$ Hz), 7.06–7.12 (m, 2H), 7.31–7.37 (m, 1H), 7.40–7.51 (m, 3H), 7.53–7.63 (m, 2H), 11.36 (s, 1H), 11.72 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 395 (100) [$M + H$]$^+$. Anal. ($C_{20}H_{15}BrN_2O_2 \cdot H_2O$) C, H, N.

*6.2.12.3. 3-Bromo-4-(7-butyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**24c**).* Yield: 0.36 g (0.85 mmol) from 0.50 g (2.0 mmol) of **20c** (42%), red crystals, m.p. 229 °C. IR (KBr): ν (cm^{-1}) = 3381, 1770, 1706, 1619, 1453, 1333. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.98 (t, 3H, $J = 7.3$ Hz), 1.41–1.51 (m, 2H), 1.66–1.77 (m, 2H), 2.99 (t, 2H, $J = 6.8$ Hz), 7.04–7.11 (m, 2H), 7.31–7.35 (m, 1H), 7.38–7.45 (m, 3H), 7.49–7.62 (m, 2H), 11.35 (s, 1H), 11.85 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 423 (100) [$M + H$]$^+$. Anal. ($C_{22}H_{19}BrN_2O_2$) C, H, N.

*6.2.12.4. 3-Bromo-4-(7-pentyl-2-phenyl-1H-indole-3-yl)pyrrole-2,5-dione (**24d**).* Yield: 0.25 g (0.57 mmol) from 0.53 g (2.0 mmol) of **20d** (29%), red crystals, m.p. 223 °C. IR (KBr): ν (cm^{-1}) = 3364, 1768, 1705, 1618, 1454, 1330. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.87 (t, 3H, J = 5.9 Hz), 1.20–1.50 (m, 4H), 1.60–1.80 (m, 2H), 2.93 (t, 2H, J = 6.5 Hz), 6.98–7.05 (m, 2H), 7.24–7.28 (m, 1H), 7.35–7.40 (m, 3H), 7.44–7.56 (m, 2H), 11.31 (s, 1H), 11.79 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 437 (100) $[M+H]^+$. Anal. ($C_{23}H_{21}BrN_2O_2 \cdot 3/2DCM$) C, H, N.

*6.2.12.5. 3-Bromo-4-[7-methyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**25a**).* Yield: 0.36 g (0.88 mmol) from 0.48 g (2.0 mmol) of **21a** (44%), red crystals, m.p. 250 °C. IR (KBr): ν (cm^{-1}) = 3340, 1727, 1611, 1494, 1450, 1326. ^{1}H NMR (DMSO-d_6): δ (ppm) = 2.54 (s, 3H), 3.79 (s, 3H), 6.97–7.05 (m, 4H), 7.24 (dd, 1H, J_o = 6.5 Hz, J_m = 2.6 Hz), 7.50 (d, 2H, J = 8.7 Hz), 11.30 (s, 1H), 11.71 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 411 (100) $[M+H]^+$. Anal. ($C_{20}H_{15}BrN_2O_3$) C, H, N.

*6.2.12.6. 3-Bromo-4-[7-ethyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**25b**).* Yield: 0.48 g (1.12 mmol) from 0.5 g (2.0 mmol) of **21b** (56%), red crystals, m.p. 220 °C. IR (KBr): ν (cm^{-1}) = 3348, 1769, 1716, 1611, 1489, 1446, 1323. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.29 (t, 3H, J = 7.5 Hz), 2.96 (q, 3H, J = 7.5 Hz), 3.79 (s, 3H), 6.98–7.05 (m, 4H), 7.24 (dd, 1H, J_o = 6.4 Hz, J_m = 2.8 Hz), 7.50 (d, 2H, J = 8.7 Hz), 11.29 (s, 1H), 11.70 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 425 (100) $[M+H]^+$. Anal. ($C_{21}H_{17}BrN_2O_3 \cdot 1/3H_2O$) C, H, N.

*6.2.12.7. 3-Bromo-4-[7-propyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**25c**).* Yield: 0.44 g (0.99 mmol) from 0.53 g (2.0 mmol) of **21c** (49%), red crystals, m.p. 203 °C. IR (KBr): ν (cm^{-1}) = 3373, 1770, 1707, 1608, 1489, 1448, 1332. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.98 (t, 3H, J = 7.3 Hz), 1.60–1.80 (m, 2H), 2.91 (t, 2H, J = 7.3 Hz), 3.79 (s, 3H), 6.97–7.05 (m, 4H), 7.24 (dd, 1H, J_o = 6.4 Hz, J_m = 2.8 Hz), 7.50 (d, 2H, J = 8.7 Hz), 11.29 (s, 1H), 11.70 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 439 (100) $[M+H]^+$. Anal. ($C_{22}H_{19}BrN_2O_3 \cdot 1/4H_2O$) C, H, N.

*6.2.12.8. 3-Bromo-4-[7-butyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**25d**).* Yield: 0.38 g (0.84 mmol) from 0.56 g (2.0 mmol) of **21d** (42%), red crystals, m.p. 217 °C. IR (KBr): ν (cm^{-1}) = 3365, 1768, 1705, 1613, 1491, 1449, 1331. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.92 (t, 3H, J = 7.3 Hz), 1.35–1.45 (m, 2H), 1.60–1.72 (m, 2H), 2.93 (t, 2H, J = 5.5 Hz), 3.79 (s, 3H), 6.97–7.05 (m, 4H), 7.23 (dd, 1H, J_o = 6.0 Hz, J_m = 1.5 Hz), 7.48 (d, 2H, J = 7.3 Hz), 11.28 (s, 1H), 11.68 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 453 (100) $[M+H]^+$. Anal. ($C_{23}H_{21}BrN_2O_3 \cdot 1/4H_2O$) C, H, N.

*6.2.12.9. 3-Bromo-4-[7-hexyl-2-(4-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**25e**).* Yield: 0.35 g (0.73 mmol) from 0.62 g (2.0 mmol) of **21e** (36%), red crystals, m.p. 217 °C. IR (KBr): ν (cm^{-1}) = 3383, 2930, 1772, 1719, 1612, 1493, 1450, 1331. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.92 (t, 3H, J = 6.8 Hz), 1.30–1.50 (m, 6H), 1.60–1.80 (m, 2H), 2.97 (t, 2H, J = 5.5 Hz), 3.84 (s, 3H), 6.01–7.10 (m, 4H), 7.28 (dd, 1H, J_o = 6.1 Hz, J_m = 1.5 Hz), 7.53 (d, 2H, J = 7.3 Hz), 11.34 (s, 1H), 11.72 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 481 (100) $[M+H]^+$. Anal. ($C_{25}H_{25}BrN_2O_3 \cdot 1/6H_2O$) C, H, N.

*6.2.13. Formation of the 5-alkyl/5-alkyloxy- and 2-methoxyphenyl indoles **26a–h** (Table 4)*

2-Bromo-3′-methoxyacetophenone (**4c**) and the respective aniline (2.5 eq) were dissolved in DMF and heated to reflux for 24 h. After cooling to room temperature, HCl was added and the crude product extracted with EE. The products were purified by CC (DCM) and dried *in vacuo*.

*6.2.13.1. 5-Methoxy-2-(3-methoxyphenyl)-1H-indole (**26a**) [27].* Yield: 1.9 g (7.5 mmol) from 2.05 g (9.0 mmol) of **4c** (83%), yellow crystals, m.p. 143.7 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 3.76 (s, 3H), 3.84 (s, 3H), 6.74 (dd, 1H, J = 2.5, 8.7 Hz), 6.83 (d, 1H, J = 1.6 Hz), 6.87 (m, 1H), 7.02 (d, 1H, J = 2.4 Hz), 7.28 (d, 1H, J = 8.8 Hz), 7.35 (t, 1H, J = 7.9 Hz), 7.41 (dd, 2H, J = 1.5, 7.5 Hz), 11.36 (s, 1H).

*6.2.13.2. 5-Ethoxy-2-(3-methoxyphenyl)-1H-indole (**26b**).* Yield: 1.35 g (5.1 mmol) from 5.1 g (22.2 mmol) of **4c** (23%), yellow crystals, m.p. 155.7 °C. IR (KBr): ν (cm^{-1}) = 3428, 3300, 3064, 1673, 1610, 1478. ^{1}H NMR ($CDCl_3$): δ (ppm) = 1.44 (t, 3H, J = 7.0 Hz), 3.88 (s, 3H), 4.08 (q, 2H, J = 7.0 Hz), 6.74 (m, 1H), 6.86 (dd, 1H, J = 2.4, 8.7 Hz), 6.87 (m, 1H), 7.08 (d, 1H, J = 2.4 Hz), 7.17 (m, 1H), 7.23 (m, 1H), 7.28 (d, 1H, J = 8.8 Hz), 7.35 (t, 1H, J = 7.9 Hz), 8.22 (s, 1H). CI-MS (NH_3) *m/z* (%): 268 (100) $[M+H^+]$. Anal. ($C_{17}H_{17}NO_2 \cdot 1/7MeOH$) C, H, N.

*6.2.13.3. 5-Butoxy-2-(3-methoxyphenyl)-1H-indole (**26c**).* Yield: 2.2 g (7.4 mmol) from 4.9 g (21.8 mmol) of **4c** (34%), yellow crystals, m.p. 82.5 °C. IR (KBr): ν (cm^{-1}) = 3429, 1609, 1579. ^{1}H NMR ($CDCl_3$): δ (ppm) = 0.98 (t, 3H, J = 7.3 Hz), 1.51 (qd, 2H, J = 7.3, 14.5 Hz), 1.79 (m, 2H), 3.84 (s, 3H), 4.00 (t, 2H, J = 6.6 Hz), 6.72 (d, 1H, J = 1.5 Hz), 6.83 (m, 1H), 6.86 (m, 1H), 7.07 (d, 1H, J = 2.4 Hz), 7.15 (m, 1H), 7.20 (m, 1H), 7.23 (m, 1H), 7.31 (t, 1H, J = 7.9 Hz), 8.26 (s, 1H). CI-MS (NH_3) *m/z* (%): 296 (100) $[M+H^+]$. Anal. ($C_{19}H_{21}NO_2 \cdot 1/4H_2O$) C, H, N.

*6.2.13.4. 5-Hexyloxy-2-(3-methoxyphenyl)-1H-indole (**26d**).* Yield: 3.8 g (11.7 mmol) from 4.7 g (20.9 mmol) of **4c** (56%), yellow crystals, m.p. 58.9 °C. IR (KBr): ν (cm^{-1}) = 3435, 3400, 2946, 2923, 1609, 1452. ^{1}H NMR ($CDCl_3$): δ (ppm) = 0.90 (t, 3H, J = 7.0 Hz), 1.34 (m, 4H), 1.47 (m, 2H), 1.79 (m, 2H), 3.83 (s, 3H), 3.99 (t, 2H, J = 6.6 Hz), 6.71 (dd, 1H, J = 0.7, 2.1 Hz), 6.85 (dd, 1H, J = 2.5, 8.8 Hz), 6.83 (m, 1H), 7.07 (d, 1H, J = 2.3 Hz), 7.14 (m, 1H), 7.18 (m, 1H), 7.22 (d, 1H, J = 8.8 Hz), 7.30 (t, 1H,

$J = 7.9$ Hz), 8.21 (s, 1H). CI-MS (NH_3) *m/z* (%): 324 (100) [$M + H^+$]. Anal. ($C_{21}H_{25}NO_2$) C, H, N.

*6.2.13.5. 2-(3-Methoxyphenyl)-5-methyl-1H-indole (**26e**).* Yield: 1.8 g (7.6 mmol) from 7.1 g (31.7 mmol) of **4c** (24%), yellow crystals, m.p. 126.6 °C. IR (KBr): ν (cm^{-1}) = 3436, 1609. ^{1}H NMR (DMSO-d_6): δ (ppm) = 2.37 (s, 3H), 3.84 (s, 3H), 6.82 (dd, 1H, $J = 0.6$, 2.2 Hz), 6.87 (m, 1H), 6.92 (dd, 1H, $J = 1.4$, 8.3 Hz), 7.28 (m, 2H), 7.35 (t, 1H, $J = 8.1$ Hz), 7.42 (m, 2H), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 237 (100) [$M^{+\bullet}$]. Anal. ($C_{16}H_{15}NO \cdot 1/6H_2O$) C, H, N.

*6.2.13.6. 5-Ethyl-2-(3-methoxyphenyl)-1H-indole (**26f**).* Yield: 2.5 g (9.9 mmol) from 5.3 g (23.0 mmol) of **4c** (43%), yellow crystals, m.p. 106.2 °C. IR (KBr): ν (cm^{-1}) = 3431, 2963, 1611, 1544. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.22 (t, 3H, $J = 7.6$ Hz), 2.66 (q, 2H, $J = 7.5$ Hz), 3.84 (s, 3H), 6.84 (d, 1H, $J = 1.5$ Hz), 6.85–6.89 (m, 1H), 6.96 (dd, 1H, $J = 1.6$, 8.3 Hz), 7.28–7.38 (m, 3H), 7.40–7.44 (m, 2H), 11.38 (s, 1H). EI-MS (70 eV) *m/z* (%): 251 (100) [$M^{+\bullet}$], 236 (95) [$M - {}^{\bullet}CH_3]^+$. Anal. ($C_{17}H_{17}NO \cdot 1/4H_2O$) C, H, N.

*6.2.13.7. 5-Butyl-2-(3-methoxyphenyl)-1H-indole (**26g**).* Yield: 5.9 g (21.1 mmol) from 5.3 g (22.9 mmol) of **4c** (92%), yellow crystals, m.p. 50.9 °C. IR (KBr): ν (cm^{-1}) = 3442, 2953, 1667. ^{1}H NMR ($CDCl_3$): δ (ppm) = 0.93 (t, 3H, $J = 7.3$ Hz), 1.38 (qd, 2H, $J = 7.3$, 14.4 Hz), 1.64 (m, 2H), 2.69 (m, 2H), 3.85 (s, 3H), 6.74 (dd, 1H, $J = 0.7$, 2.1 Hz), 6.85 (ddd, 1H, $J = 0.8$, 2.5, 8.2 Hz), 7.02 (dd, 1H, $J = 1.6$, 8.3 Hz), 7.16 (m, 1H), 7.21 (m, 1H), 7.27 (m, 1H), 7.33 (t, 1H, $J = 7.9$ Hz), 7.41 (s, 1H), 8.22 (s, 1H). EI-MS (70 eV) *m/z* (%): 279 (64) [$M^{+\bullet}$], 236 (84) [$M - {}^{\bullet}C_3H_7]^+$, Anal. ($C_{19}H_{21}NO$) C, H, N.

*6.2.13.8. 5-Hexyl-2-(3-methoxyphenyl)-1H-indole (**26h**).* Yield: 7.3 g (21.7 mmol) from 5.5 g (24.0 mmol) of **4c** (90%), yellow crystals, m.p. 76.1 °C. IR (KBr): ν (cm^{-1}) = 3440, 2921, 2852, 1730, 1667, 1609, 1437, 1044. ^{1}H NMR ($CDCl_3$): δ (ppm) = 0.88 (t, 3H, $J = 6.9$ Hz), 1.32 (m, 6H), 1.7 (m, 2H), 2.69 (m, 2H), 3.86 (s, 3H), 6.75 (m, 1H), 6.85 (ddd, 1H, $J = 0.8$, 2.5, 8.2 Hz), 7.03 (dd, 1H, $J = 1.6$, 8.3 Hz), 7.17 (m, 1H), 7.22 (m, 1H), 7.29 (d, 1H, $J = 8.3$ Hz), 7.34 (t, 1H, $J = 7.9$ Hz), 7.41 (s, 1H), 8.23 (s, 1H). EI-MS (70 eV) *m/z* (%): 307 (95) [$M^{+\bullet}$], 236 (100) [$M - {}^{\bullet}C_5H_{11}]^+$. Anal. ($C_{21}H_{25}NO$) C, H, N.

*6.2.14. Condensation of TBS–dibromomaleinimide with indole derivatives (**27a–h**) (Table 5)*

The indole derivatives (**26a–h**) were dissolved in dry THF and cooled under argon to −20 °C. Then LiHMDS (2 eq, 1 M in THF) was slowly added. After stirring the solution for 45 min at −20 °C, TBS–dibromomaleinimide (1 eq) in THF was added within 3 h. The solution was stirred for 15 min, poured into sat. aq. NH_4Cl, extracted with ethyl acetate, dried over Na_2SO_4, concentrated *in vacuo* and processed to **28a–h** without further purification.

*6.2.15. Removal of the sylil-protecting group to give **28a–h** (Table 5)*

The raw silyl-protected indole–maleinimides (**27a–h**) were dissolved in THF under N_2, tetrabutylammonium fluoride trihydrate (1.3 eq) was added, and the mixture was stirred for 2 h at room temperature, poured into ice, mixed with saturated NH_4Cl solution and extracted with ethyl acetate. The extract was dried over Na_2SO_4, the solvent was removed *in vacuo* and the remaining oil was purified by CC (DCM).

*6.2.15.1. 3-Bromo-4-[5-methoxy-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**28a**).* Yield: 0.21 g (0.5 mmol) from 1.9 g (7.5 mmol) of **26a** (6.6%), red crystals, m.p. 105.1 °C. IR (KBr): ν (cm^{-1}) = 3379, 3209, 1779, 1714, 1609, 1577, 1535. ^{1}H NMR (DMSO-d_6): δ (ppm) = 3.80 (s, 3H), 3.84 (s, 3H), 6.90 (dd, 1H, $J = 2.5$, 8.8 Hz), 6.99 (m, 2H), 7.10 (m, 1H), 7.14 (m, 1H), 7.40 (d, 1H, $J = 1.8$ Hz), 7.43 (d, 1H, $J = 2.7$ Hz), 11.39 (s, 1H), 12.05 (s, 1H). EI-MS (70 eV) *m/z* (%): 426 (10) [$M + H^+$]. Anal. ($C_{20}H_{15}BrN_2O_4 \cdot 6/5H_2O$) C, H, N.

*6.2.15.2. 3-Bromo-4-[5-ethoxy-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**28b**).* Yield: 0.1 g (0.2 mmol) from 1.35 g (5.1 mmol) of **26b** (4%), red crystals, m.p. 205.3 °C. IR (KBr): ν (cm^{-1}) = 3390, 3211, 1777, 1714, 1580, 1485. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.34 (t, 3H, $J = 6.9$ Hz), 3.80 (s, 3H), 4.02 (q, 2H, $J = 7.1$ Hz), 6.85 (dd, 1H, $J = 2.4$, 8.7 Hz), 6.94 (m, 2H), 7.06 (m, 1H), 7.09 (m, 1H), 7.35 (m, 2H), 11.98 (s, 1H). CI-MS (NH_3) *m/z* (%): 440 (100) [$M + H^+$]. Anal. ($C_{21}H_{17}BrN_2O_4 \cdot 3/2H_2O$) C, H, N.

*6.2.15.3. 3-Bromo-4-[5-butoxy-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**28c**).* Yield: 0.2 g (0.4 mmol) from 2.2 g (7.4 mmol) of **26c** (5%), red crystals, m.p. 143.0 °C. IR (KBr): ν (cm^{-1}) = 3392, 3239, 2957, 1778, 1719, 1611, 1579, 1484. ^{1}H NMR ($CDCl_3$): δ (ppm) = 0.99 (t, 3H, $J = 7.4$ Hz), 1.50 (m, 2H), 1.81 (m, 2H), 3.83 (s, 3H), 4.01 (t, 2H, $J = 6.5$ Hz), 6.93 (m, 2H), 6.98 (m, 2H), 7.02 (m, 2H), 7.39 (m, 1H), 7.41 (s, 1H), 8.55 (s, 1H). CI-MS (NH_3) *m/z* (%): 469 (75) [$M + H^+$]. Anal. ($C_{23}H_{21}BrN_2O_4$) C, H, N.

*6.2.15.4. 3-Bromo-4-[5-hexyloxy-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrol-2,5-dione (**28d**).* Yield: 0.15 g (0.3 mmol) from 3.8 g (11.7 mmol) of **26d** (3%), red crystals, m.p. 168.7 °C. IR (KBr): ν (cm^{-1}) = 3312, 2918, 1712, 1605. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.88 (t, 3H, $J = 7.0$ Hz), 1.31 (m, 4H), 1.43 (m, 2H), 1.73 (m, 2H), 3.80 (s, 3H), 3.94 (t, 2H, $J = 6.4$ Hz), 6.85 (dd, 1H, $J = 2.4$, 8.8 Hz), 6.94 (dd, 2H, $J = 2.1$, 7.7 Hz), 7.06 (m, 1H), 7.09 (m, 1H), 7.36 (m, 2H), 11.33 (s, 1H), 11.98 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 497 (33) [$M + H^+$]. Anal. ($C_{25}H_{25}BrN_2O_4$) C, H, N.

*6.2.15.5. 3-Bromo-4-[2-(3-methoxyphenyl)-5-methyl-1H-indole-3-yl]pyrrole-2,5-dione (**28e**).* Yield: 0.15 g (0.4 mmol) from 1.8 g (7.6 mmol) of **26e** (5%), red crystals, m.p. 187.3 °C. IR (KBr): ν (cm^{-1}) = 3302, 3174, 3071, 1772, 1712, 1605,

1484. ^{1}H NMR ($CDCl_3$): δ (ppm) = 2.48 (s, 3H), 3.83 (s, 3H), 6.93 (ddd, 1H, J = 0.8, 2.5, 8.2 Hz), 6.99 (m, 1H), 7.03 (m, 1H), 7.12 (dd, 1H, J = 1.5, 8.1 Hz), 7.33 (m, 1H), 7.36 (m, 1H), 7.40 (m, 1H), 8.57 (s, 1H). CI-MS (NH_3) *m/z* (%): 411 (92) [M + H$^+$]. Anal. ($C_{20}H_{15}BrN_2O_3 \cdot 5/3H_2O$) C, H, N.

*6.2.15.6. 3-Bromo-4-[5-ethyl-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**28f**).* Yield: 0.17 g (0.4 mmol) from 5.9 g (9.9 mmol) of **26f** (4%), red crystals, m.p. 211.2 °C. IR (KBr): ν (cm^{-1}) = 3306, 1711, 1606, 1532. ^{1}H NMR ($CDCl_3$): δ (ppm) = 1.29 (t, 3H, J = 7.6 Hz), 2.77 (q, 2H, J = 7.6 Hz), 3.83 (s, 3H), 6.93 (ddd, 1H, J = 0.8, 2.5, 8.3 Hz), 7.00 (m, 1H), 7.03 (m, 1H), 7.16 (dd, 1H, J = 1.5, 8.4 Hz), 7.36 (m, 3H), 7.53 (s, 1H), 8.64 (s, 1H). CI-MS (NH_3) *m/z* (%): 425 (93) [M + H$^+$]. Anal. ($C_{21}H_{17}BrN_2O_3 \cdot 3/2H_2O$) C, H, N.

*6.2.15.7. 3-Bromo-4-[5-butyl-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**28g**).* Yield: 0.11 g (0.3 mmol) from 5.9 g (21.1 mmol) of **26g** (2%), red crystals, m.p. 193.5 °C. IR (KBr): ν (cm^{-1}) = 3301, 3176, 3069, 1711, 1604, 1482. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.90 (t, 3H, J = 7.3 Hz), 1.33 (qd, 2H, J = 7.3, 14.4 Hz), 1.59 (td, 2H, J = 7.4, 15.1 Hz), 2.65 (t, 2H, J = 7.5 Hz), 3.80 (s, 3H), 6.95 (dd, 1H, J = 2.1, 8.0 Hz), 7.05 (m, 1H), 7.08 (m, 1H), 7.10 (m, 1H), 7.25 (s, 1H), 7.37 (d, 1H, J = 3.2 Hz), 7.38 (m, 1H), 11.35 (s, 1H), 12.02 (s, 1H). CI-MS (NH_3) *m/z* (%): 453 (100) [M + H$^+$]. Anal. ($C_{23}H_{21}BrN_2O_3$) C, H, N.

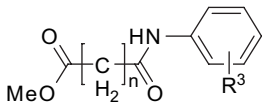
*6.2.15.8. 3-Bromo-4-[5-hexyl-2-(3-methoxyphenyl)-1H-indole-3-yl]pyrrole-2,5-dione (**28h**).* Yield: 0.17 g (0.4 mmol) from 7.3 g (21.7 mmol) of **26h** (2%), red crystals, m.p. 169.7 °C. IR (KBr): ν (cm^{-1}) = 3308, 2924, 1712, 1605. ^{1}H NMR (DMSO-d_6): δ (ppm) = 0.85 (t, 3H, J = 6.8 Hz), 1.29 (m, 6H), 1.60 (m, 2H), 2.64 (t, 2H, J = 7.5 Hz), 3.80 (s, 3H), 6.95 (m, 1H), 7.05 (m, 1H), 7.08 (m, 1H), 7.10 (m, 1H), 7.25 (s, 1H), 7.32–7.40 (m, 2H), 11.35 (s, 1H), 12.02 (s, 1H). CI-MS (NH_3) *m/z* (%): 481 (100) [M + H$^+$]. Anal. ($C_{25}H_{25}BrN_2O_3 \cdot 1/2$TBSH) C, H, N.

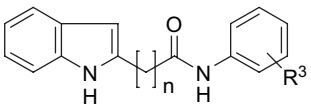
*6.2.16. Formation of ester–amides from carboxylic acids and their chlorides and various anilines (**31a–g**) (Table 6)*

The respective anilines (**30a–d**) and triethylamine (1 eq) were dissolved in dry CH_2Cl_2. The solution was cooled with ice, and the acid chlorides or the acids (1 eq, **29a–e**) were carefully added dropwise. Then the solution was heated to reflux for 12 h, cooled, the precipitated acid chloride was filtered off, and the residue was purified by CC (DCM/EE = 6:1). The products were obtained as colourless powders.

*6.2.16.1. N-Phenylsuccinamic acid methylester [28] (**31a**).* Yield: 5.16 g (25 mmol) from 3.1 g (33 mmol) of **30a** (76%), white powder, m.p. 97 °C. ^{1}H NMR ($CDCl_3$): δ (ppm) = 2.65–2.69 (m, 2H), 2.73–2.78 (m, 2H), 3.71 (s, 3H), 7.09 (t, 1H, J = 7.3 Hz), 7.31 (d, 2H, J = 7.9 Hz), 7.50 (d, 2H, J = 7.9 Hz), 7.60 (s, 1H).

Table 6
Compounds **31a–h** and **32a–h**





Nr.	*n*	R^3	Nr.	*n*	R^3
31a	2	H	**32a**	2	H
31b	3	H	**32b**	3	H
31c	4	H	**32c**	4	H
31d	5	H	**32d**	5	H
31e	6	H	**32e**	6	H
31f	3	4-Me	**32f**	3	4-Me
31g	3	3-Me	**32g**	3	3-Me
31h [5]	3	2-Me	**32h** [5]	3	2-Me

*6.2.16.2. 4-Phenylcarbamoylbutyric acid ethylester [29] (**31b**).* Yield: 12.0 g (51.0 mmol) from 5.2 g (56.0 mmol) of **30a** (91%), m.p. 70 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.18 (t, 3H, J = 7.1 Hz), 2.34 (t, 4H, J = 7.5 Hz), 4.06 (q, 2H, J = 7.1 Hz), 7.01 (t, 1H, J = 6.3 Hz), 7.28 (t, 2H, J = 8.7 Hz), 7.58 (d, 1H, J = 7.5 Hz), 9.88 (s, 1H).

*6.2.16.3. 5-Phenylcarbamoyl pentanoic acid methylester [28] (**31c**).* Yield: 11.8 g (50 mmol) from 5.8 g (62 mmol) of **30a** (81%), m.p. 48 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.57 (m, 4H), 2.31 (t, 2H, J = 7.1 Hz), 2.34 (t, 2H, J = 7.1 Hz), 3.58 (s, 3H), 7.01 (t, 1H, J = 7.5 Hz), 7.28 (t, 2H, J = 8.7 Hz), 7.58 (d, 2H, J = 7.9 Hz), 9.86 (s, 1H).

*6.2.16.4. 6-Phenylcarbamoyl hexanoic acid methylester [28] (**31d**).* Yield: 3.6 g (13.7 mmol) from 3.9 g (41 mmol) of **30a** (33%), m.p. 59 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.16 (t, 3H, J = 7.1 Hz), 1.31 (m, 2H), 1.57 (m, 4H), 2.28 (t, 4H, J = 7.5 Hz), 7.01 (t, 1H, J = 7.1 Hz), 7.27 (t, 2H, J = 8.3 Hz), 7.58 (d, 2H, J = 7.5 Hz), 9.84 (s, 1H).

*6.2.16.5. 7-Phenylcarbamoyl heptanoic acid methylester [28] (**31e**).* Yield: 5.74 g (21.8 mmol) from 2.25 g (24.3 mmol) of **30a** (90%), m.p. 65 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.2–1.35 (m, 4H), 1.45–1.60 (m, 4H), 2.24–2.31 (m, 4H), 3.56 (s, 3H), 7.00 (t, 1H, J = 7.3 Hz), 7.26 (t, 2H, J = 7.9 Hz), 7.57 (d, 2H, J = 8.1 Hz), 9.83 (s, 1H).

*6.2.16.6. 4-p-Tolylcarbamoyl butyric acid methylester [13] (**31f**).* Yield: 11.4 g (45.7 mmol) from 6.0 g (56 mmol) of **30b** (82%), m.p. 95 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.18 (t, 3H, J = 7.1 Hz), 1.82 (quintett, 2H, J = 7.1 Hz), 2.23 (s, 3H), 2.35 (t, 2H, J = 7.5 Hz), 4.05 (q, 2H, J = 7.1 Hz), 7.08 (d, 2H, J = 8.3 Hz), 7.46 (t, 2H, J = 8.3 Hz), 9.79 (s, 1H).

*6.2.16.7. 4-m-Tolylcarbamoyl butyric acid methylester [13] (**31g**).* Yield: 12.3 g (49.3 mmol) from 6.0 g (56.0 mmol) of **30c** (88%), m.p. 55 °C. ^{1}H NMR (DMSO-d_6): δ (ppm) = 1.82 (quintett, 2H, J = 7.5 Hz), 2.26 (s, 3H), 2.33 (t, 2H, J = 7.5 Hz), 2.35 (t, 2H, J = 7.5 Hz), 6.84 (d, 1H,

$J = 7.5$ Hz), 7.15 (t, 1H, $J = 7.9$ Hz), 7.35 (d, 1H, $J = 8.3$ Hz), 7.43 (s, 1H), 9.79 (s, 1H).

*6.2.17. Formation of the indoles according to Smith (**32a–g**) (Table 6)*

Trimethylsilyl-*o*-toluidine (TMSOT) was dissolved in dry hexane. Under N_2 *n*-BuLi (2 eq, 1.6 M solution in hexane) was added dropwise at room temperature. Then the solution was heated to reflux for 4 h. During the reaction a red precipitate occurred, and the solution turned orange. The obtained suspension was cooled to −78 °C, and a solution of the respective ester (1 eq, **31a–g**) in THF was added slowly, so that the temperature did not rise above −70 °C. After stirring overnight, while slowly warming up to room temperature, the solution was refluxed for 2 h, poured into ice and stirred until most of the ice was molten. The mixture was extracted with ethyl acetate, the extract was dried over Na_2SO_4 and concentrated *in vacuo*. The raw material was purified by CC (DCM). We separated the indole–amides as oils and processed them without further purification. References are given for the characterization of the products.

*6.2.17.1. 3-(1H-Indole-2-yl)-N-phenylpropanamide (**32a**).* Yield: 0.81 g (3 mmol) from 3.0 g (14.5 mmol) of **31a** (21%), m.p.152 °C. IR (KBr): ν (cm^{-1}) = 3386, 3319, 2905, 1655, 1597, 1550. ^1H NMR ($CDCl_3$): δ (ppm) = 1.58 (s, 1H), 2.77 (t, 2H, $J = 6.3$ Hz), 3.16 (t, 2H, $J = 6.3$ Hz), 6.25 (s, 1H), 7.01–7.16 (m, 4H), 7.28–7.36 (m, 3H), 7.44–7.54 (m, 3H), 8.8 (s, 1H). EI-MS (70 eV) *m/z* (%): 265 (100) [$M + H^+$]. Anal. ($C_{17}H_{16}N_2O$) C, H, N.

*6.2.17.2. 3-(1H-Indole-2-yl)-N-phenylbutanamide (**32b**).* Yield: 0.7 g (2.5 mmol) from 3.4 g (14.5 mmol) of **31b** (17%), oil. IR (NaCl): ν (cm^{-1}) = 3341, 2963, 1717, 1690, 1597, 1542. ^1H NMR (DMSO-d_6): δ (ppm) = 1.95–2.07 (m, 2H), 2.37 (t, 2H, $J = 7.5$ Hz), 2.77 (t, 2H, $J = 7.5$ Hz), 6.16 (d, 1H, $J = 1.0$ Hz), 6.91 (td, 1H, $J_o = 7.3$ Hz, $J_m = 1.2$ Hz), 6.95–7.04 (m, 2H), 7.25–7.31 (m, 3H), 7.41 (d, 1H, $J = 7.1$ Hz), 7.59 (d, 2H, $J = 7.5$ Hz), 9.9 (s, 1H), 10.9 (s, 1H). EI-MS (70 eV) *m/z* (%): 279 (100) [$M + H^+$]. Anal. ($C_{18}H_{18}N_2O \cdot 1/4H_2O$) C, H, N.

*6.2.17.3. 3-(1H-Indole-2-yl)-N-phenylpentanamide (**32c**).* Yield: 0.87 g (3.0 mmol) from 3.4 g (14.5 mmol) of **31c** (21%), m.p. 100 °C. IR (KBr): ν (cm^{-1}) = 3386, 2940, 1713, 1667, 1599, 1530. ^1H NMR (DMSO-d_6): δ (ppm) = 1.50–1.80 (m, 4H), 2.35 (t, 2H, $J = 6.7$ Hz), 2.74 (t, 2H, $J = 7.1$ Hz), 6.13 (d, 1H, $J = 1.0$ Hz), 6.90 (td, 1H, $J_o = 7.3$ Hz, $J_m = 1.2$ Hz), 6.94–7.04 (m, 2H), 7.24–7.31 (m, 3H), 7.39 (d, 1H, $J = 7.1$ Hz), 7.58 (d, 2H, $J = 7.9$ Hz), 9.90 (s, 1H), 10.90 (s, 1H). EI-MS (70 eV) *m/z* (%): 293 (100) [$M + H^+$]. Anal. ($C_{19}H_{20}N_2O \cdot 1/2H_2O$) C, H, N.

*6.2.17.4. 3-(1H-Indole-2-yl)-N-phenylhexanamide (**32d**).* Yield: 0.87 g (2.8 mmol) from 3.8 g (14.4 mmol) of **31d** (19%), m.p. 118 °C. IR (KBr): ν (cm^{-1}) = 3344, 2940, 1636, 1599, 1532. ^1H NMR (DMSO-d_6): δ (ppm) = 1.33–1.42 (m, 2H), 1.59–1.77 (m, 4H), 2.30 (t, 2H, $J = 7.5$ Hz), 2.71 (t, 2H, $J = 7.5$ Hz), 6.12 (d, 1H, $J = 1.1$ Hz), 6.90 (td, 1H, $J_o = 7.2$ Hz, $J_m = 1.2$ Hz), 6.94–7.04 (m, 2H), 7.24–7.31 (m, 3H), 7.38 (d, 1H, $J = 7.5$ Hz), 7.58 (d, 2H, $J = 8.3$ Hz), 9.80 (s, 1H), 10.90 (s, 1H). EI-MS (70 eV) *m/z* (%): 307 (100) [$M + H^+$]. Anal. ($C_{20}H_{22}N_2O$) C, H, N.

*6.2.17.5. 3-(1H-Indole-2-yl)-N-phenylheptanamide (**32e**).* Yield: 0.67 g (2.1 mmol) from 3.8 g (14.4 mmol) of **31e** (19%), m.p. 90 °C. IR (KBr): ν (cm^{-1}) = 3382, 2923, 1667, 1599, 1532. ^1H NMR (DMSO-d_6): δ (ppm) = 1.30–1.40 (m, 4H), 1.50–1.75 (m, 4H), 2.28 (t, 2H, $J = 7.3$ Hz), 2.69 (t, 2H, $J = 7.5$ Hz), 6.12 (d, 1H, $J = 1.1$ Hz), 6.90 (td, 1H, $J_o = 7.2$ Hz, $J_m = 1.2$ Hz), 6.93–7.03 (m, 2H), 7.23–7.29 (m, 3H), 7.37 (d, 1H, $J = 7.1$ Hz), 7.57 (d, 2H, $J = 7.5$ Hz), 9.83 (s, 1H), 10.85 (s, 1H). EI-MS (70 eV) *m/z* (%): 321 (100) [$M + H^+$]. Anal. ($C_{21}H_{24}N_2O$) C, H, N.

*6.2.17.6. 3-(1H-Indole-2-yl)-N-(4-methyl-phenyl)-butanamide (**32f**).* Yield: 0.82 g (2.8 mmol) from 3.6 g (14.4 mmol) of **31f** (19%), m.p. 133 °C. IR (KBr): ν (cm^{-1}) = 3311, 2932, 1680, 1595, 1524. ^1H NMR (DMSO-d_6): δ (ppm) = 1.96–2.07 (m, 2H), 2.22 (s, 3H), 2.34 (t, 2H, $J = 7.5$ Hz), 2.75 (t, 2H, $J = 7.3$ Hz), 6.14 (d, 1H, $J = 1.1$ Hz), 6.90 (td, 1H, $J_o = 8.7$ Hz, $J_m = 1.6$ Hz), 6.98 (td, 1H, $J_o = 7.5$ Hz, $J_m = 1.5$ Hz), 7.07 (d, 2H, $J = 8.3$ Hz), 7.25 (d, 1H, $J = 7.9$ Hz), 7.39 (d, 1H, $J = 7.1$ Hz), 7.46 (d, 2H, $J = 8.3$ Hz), 9.78 (s, 1H), 10.91 (s, 1H). EI-MS (70 eV) *m/z* (%): 293 (100) [$M + H^+$]. Anal. ($C_{19}H_{20}N_2O \cdot 1/4H_2O$) C, H, N.

*6.2.17.7. 3-(1H-Indole-2-yl)-N-(3-methyl-phenyl)-butanamide (**32g**).* Yield: 0.92 g (3.1 mmol) from 3.6 g (14.4 mmol) of **31g** (22%), m.p. 103 °C. IR (KBr): ν (cm^{-1}) = 3318, 2932, 1688, 1611, 1533, 1490. ^1H NMR (DMSO-d_6): δ (ppm) = 1.93–2.06 (m, 2H), 2.25 (s, 3H), 2.35 (t, 2H, $J = 7.3$ Hz), 2.75 (t, 2H, $J = 7.3$ Hz), 6.15 (d, 1H, $J = 1.1$ Hz), 6.83 (d, 1H, $J = 7.5$ Hz), 6.90 (td, 1H, $J_o = 7.3$ Hz, $J_m = 1.2$ Hz), 6.98 (td, 1H, $J_o = 7.4$ Hz, $J_m = 1.2$ Hz), 7.14 (d, 1H, $J = 7.7$ Hz), 7.26 (d, 1H, $J = 7.9$ Hz), 7.34–7.43 (m, 3H), 9.80 (s, 1H), 10.92 (s, 1H). EI-MS (70 eV) *m/z* (%): 293 (100) [$M + H^+$]. Anal. ($C_{19}H_{20}N_2O$) C, H, N.

*6.2.18. Condensation of TBS–dibromomaleinimide with indole derivatives (**33a–g**, Scheme 5)*

The respective indoles (**32a–g**) were dissolved in dry THF and cooled under argon to −20 °C. Then LiHMDS (2 eq, 1 M in THF) was slowly added. After stirring the solution for 45 min at −20 °C, TBS–dibromomaleinimide (1 eq) in THF was added within 3 h. The solution was stirred for 15 min, poured into sat. aq. NH_4Cl, extracted with ethyl acetate, dried over Na_2SO_4 and concentrated *in vacuo*. The crude products were processed to **33a–g** without further purification.

*6.2.19. Removal of the silyl-protecting group to give **34a–g** (Scheme 5)*

The raw silyl-protected indole–maleinimide (**33a–g**) was dissolved in THF under N_2, tetrabutylammonium fluoride

trihydrate (1.3 eq) was added, and the mixture was stirred for 2 h, poured into ice, mixed with saturated NH_4Cl solution and extracted with ethyl acetate. The extract was dried over Na_2SO_4, the solvent was removed *in vacuo* and the remaining oil was purified by CC (DCM) and in some cases crystallized from EE.

*6.2.19.1. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrole-3-yl)-1H-indole-2-yl)-N-phenyl-propanamide (**34a**).* Yield: 0.15 g (0.34 mmol) from 0.5 g (2.0 mmol) of **32a** (17%), m.p. 194 °C. IR (KBr): ν (cm^{-1}) = 3340, 3226, 1773, 1719, 1626, 1605. ^1H NMR (DMSO-d_6): δ (ppm) = 2.73 (t, 2H, J = 7.5 Hz), 3.0–3.2 (m, 2H), 6.98–7.06 (m, 2H), 7.12 (dd, 1H, J_o = 7.5 Hz, J_m = 1.7 Hz), 7.26 (t, 2H, J = 7.9 Hz), 7.34 (d, 1H, J = 7.9 Hz), 7.37 (d, 1H, J = 7.5 Hz), 7.49 (d, 2H, J = 7.5 Hz), 9.89 (s, 1H), 11.34 (s, 1H), 11.75 (s, 1H). EI-MS (70 eV) *m/z* (%): 439 (5) [M + H^+]. Anal. ($C_{21}H_{16}BrN_3O_3 \cdot 1/6H_2O$) C, H, N.

*6.2.19.2. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrole-3-yl)-1H-indol-2-yl)-N-phenyl-butanamide (**34b**).* Yield: 0.25 g (0.55 mmol) from 0.55 g (1.99 mmol) of **32b** (27%), m.p. 130 °C. IR (KBr): ν (cm^{-1}) = 3359, 2962, 1771, 1723, 1624, 1599. ^1H NMR (DMSO-d_6): δ (ppm) = 2.01 (t, 2H, J = 7.3 Hz), 2.30 (t, 2H, J = 7.3 Hz), 2.74–2.90 (m, 2H), 6.98–7.06 (m, 2H), 7.12 (dd, 1H, J_o = 7.5 Hz, J_m = 1.7 Hz), 7.27 (t, 2H, J = 7.9 Hz), 7.33 (m, 2H), 7.55 (d, 2H, J = 7.5 Hz), 9.85 (s, 1H), 11.36 (s, 1H), 11.75 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 466 (100) [M + H]$^+$. Anal. ($C_{22}H_{18}BrN_3O_3 \cdot 2/3EE$) C, H, N.

*6.2.19.3. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrole-3-yl)-1H-indol-2-yl)-N-phenyl-pentanamide (**34c**).* Yield: 0.2 g (0.43 mmol) from 0.58 g (1.98 mmol) of **32c** (22%), m.p. 100 °C. IR (KBr): ν (cm^{-1}) = 3384, 3060, 2960, 1771, 1725, 1622, 1601. ^1H NMR (DMSO-d_6): δ (ppm) = 1.58–1.72 (m, 4H), 2.29 (t, 2H, J = 7.1 Hz), 2.75 (t, 2H, J = 7.3 Hz), 6.97–7.04 (m, 2H), 7.10 (dd, 1H, J_o = 7.9 Hz, J_m = 1.7 Hz), 7.22–7.37 (m, 4H), 7.55 (d, 2H, J = 7.5 Hz), 9.83 (s, 1H), 11.36 (s, 1H), 11.68 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 464 (100) [M + H]$^+$. Anal. ($C_{23}H_{20}BrN_3O_3 \cdot 5/7EE$) C, H, N.

*6.2.19.4. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrole-3-yl)-1H-indol-2-yl)-N-phenyl-hexanamide (**34d**).* Yield: 0.15 g (0.48 mmol) from 0.61 g (2.0 mmol) of **32d** (24%), m.p. 120 °C. IR (KBr): ν (cm^{-1}) = 3374, 3060, 2932, 1773, 1723, 1625, 1599. ^1H NMR (DMSO-d_6): δ (ppm) = 1.20–1.40 (m, 2H), 1.50–1.80 (m, 4H), 2.26 (t, 2H, J = 7.3 Hz), 2.73 (t, 2H, J = 7.4 Hz), 6.97–7.04 (m, 2H), 7.10 (dd, 1H, J_o = 7.5 Hz, J_m = 1.2 Hz), 7.22–7.37 (m, 4H), 7.55 (d, 2H, J = 7.5 Hz), 9.81 (s, 1H), 11.35 (s, 1H), 11.68 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 480 (100) [M + H]$^+$. Anal. ($C_{24}H_{22}BrN_3O_3 \cdot 1/7$pentane) C, H, N.

*6.2.19.5. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrole-3-yl)-1H-indol-2-yl)-N-phenyl-heptanamide (**34e**).* Yield: 0.22 g (0.44 mmol) from 0.61 g (2.0 mmol) of **32e** (22%), m.p. 145 °C. IR (KBr): ν (cm^{-1}) = 3336, 3062, 2932, 1773, 1719, 1625, 1601. ^1H NMR (DMSO-d_6): δ (ppm) = 1.20–1.40 (m, 4H), 1.50–1.80 (m, 4H), 2.26 (t, 2H, J = 7.3 Hz), 2.72 (t, 2H, J = 7.4 Hz), 6.97–7.04 (m, 2H), 7.10 (dd, 1H, J_o = 7.9 Hz, J_m = 1.2 Hz), 7.23–7.37 (m, 4H), 7.55 (d, 2H, J = 7.5 Hz), 9.81 (s, 1H), 11.36 (s, 1H), 11.68 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 494 (100) [M + H]$^+$. Anal. ($C_{25}H_{24}BrN_3O_3 \cdot 1/3H_2O$) C, H, N.

*6.2.19.6. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrol-3-yl)-1H-indol-2-yl)-N-(4-methyl-phenyl)-butanamide (**34f**).* Yield: 0.15 g (0.31 mmol) from 0.61 g (1.98 mmol) of **32f** (15%), m.p. 145 °C. IR (KBr): ν (cm^{-1}) = 3335, 3060, 2927, 1773, 1723, 1625, 1603. ^1H NMR (DMSO-d_6): δ (ppm) = 1.95–2.01 (m, 2H), 2.22 (s, 3H), 2.26 (t, 2H, J = 7.1 Hz), 2.70–2.85 (m, 2H), 6.99–7.14 (m, 4H), 7.32–7.44 (m, 4H), 9.75 (s, 1H), 11.36 (s, 1H), 11.73 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 466 (100) [M + H]$^+$. Anal. ($C_{23}H_{20}BrN_3O_3 \cdot 1/6$pentane) C, H, N.

*6.2.19.7. 3-(3-(4-Bromo-2,5-dioxo-2,5-dihydro-1H-pyrrole-3-yl)-1H-indol-2-yl)-N-(3-methyl-phenyl)-butanamide (**34g**).* Yield: 0.28 g (0.6 mmol) from 0.58 g (2.0 mmol) of **32g** (30%), m.p. 155 °C. IR (KBr): ν (cm^{-1}) = 3394, 3143, 3066, 2956, 1767, 1717, 1676, 1609. ^1H NMR (DMSO-d_6): δ (ppm) = 1.95–2.01 (m, 2H), 2.24 (s, 3H), 2.27 (t, 2H, J = 7.5 Hz), 2.70–2.85 (m, 2H), 6.81 (d, 1H, J = 7.1 Hz), 6.99–7.14 (m, 3H), 7.31–7.39 (m, 4H), 9.76 (s, 1H), 11.37 (s, 1H), 11.74 (s, 1H). ES-MS (DCM/MeOH + 10 mmol/l NH_4Ac) *m/z* (%): 466 (100) [M + H]$^+$. Anal. ($C_{24}H_{22}BrN_3O_3$) C, H, N.

Appendix A. Additional information: compound number combustion elemental analysis

Table A1 Analysis

2b	Calc. C 81.47, H 7.22, N 5.28	Found: C 81.30, H 7.26, N 5.07
2c	Calc. C 81.68, H 7.58, N 5.01	Found: C 81.42, H 7.95, N 4.75
2d	Calc. C 82.20, H 8.47, N 4.36	Found: C 81.52, H 8.63, N 4.14
2e	Calc. C 82.47, H 8.94, N 4.01	Found: C 82.16, H 9.13, N 3.86.
2f	Calc. C 84.25, H 5.72, N 4.68	Found: C 84.18, H 5.73, N 4.46
2g	Calc. C 85.93, H 5.48, N 4.01	Found: C 85.55, H 5.60, N 3.57
7a	Calc. C 57.43, H 3.27, N 7.05	Found: C 57.55, H 3.59, N 6.87
7b	Calc. C 60.15, H 4.36, N 6.38	Found: C 60.49, H 4.64, N 6.20
7c	Calc. C 60.94, H 4.67, N 6.18	Found: C 60.67, H 4.59, N 5.99
7d	Calc. C 63.03, H 5.49, N 5.65	Found: C 62.77, H 5.32, N 5.50
7e	Calc. C 64.25, H 5.97, N 5.35	Found: C 64.33, H 6.07, N 5.26
7f	Calc. C 63.44, H 3.62, N 5.92	Found: C 63.01, H 3.86, N 5.62
7g	Calc. C 67.11, H 4.10, N 5.17	Found: C 67.20, H 3.80, N 4.96
8a	Calc. C 80.69, H 5.87, N 6.27	Found: C 80.49, H 5.57, N 5.90
8b	Calc. C 80.98, H 6.37, N 5.90	Found: C 80.96, H 6.42, N 5.59
8c	Calc. C 81.24, H 6.82, N 5.57	Found: C 81.56, H 6.78, N 5.41
8d	Calc. C 81.47, H 7.22, N 5.28	Found: C 81.50, H 7.19, N 5.00
8e	Calc. C 81.26, H 7.60, N 4.94	Found: C 81.49, H 7.51, N 4.74
8f	Calc. C 81.87, H 7.90, N 4.77	Found: C 81.74, H 7.96, N 4.48
9a	Calc. C 76.38, H 6.41, N 5.24	Found: C 76.57, H 6.45, N 5.07
9b	Calc. C 76.84, H 6.81, N 4.98	Found: C 76.58, H 6.69, N 4.70
9c	Calc. C 76.10, H 7.23, N 4.67	Found: C 76.43, H 6.96, N 4.38
9d	Calc. C 77.64, H 7.49, N 4.53	Found: C 77.73, H 7.31, N 4.23

Table A1 (*continued*)

9e	Calc. C 77.98, H 7.79, N 4.33	Found: C 77.91, H 7.91, N 4.10
12a	Calc. C 57.45, H 3.30, N 7.05	Found: C 57.39, H 3.60, N 6.91
12b	Calc. C 58.84, H 3.90, N 6.69	Found: C 58.96, H 3.92, N 6.58
12c	Calc. C 60.09, H 4.45, N 6.39	Found: C 60.01, H 4.15, N 6.39
12d	Calc. C 60.15, H 4.36, N 6.38	Found: C 60.02, H 4.50, N 6.22
12e	Calc. C 60.94, H 4.67, N 6.18	Found: C 61.16, H 4.78, N 6.08
12f	Calc. C 61.68, H 4.96, N 5.99	Found: C 61.79, H 4.96, N 5.77
13a	Calc. C 57.16, H 3.88, N 6.35	Found: C 57.23, H 4.08, N 6.35
13b	Calc. C 58.04, H 4.21, N 6.15	Found: C 58.26, H 4.46, N 6.04
13c	Calc. C 58.86, H 4.51, N 5.97	Found: C 58.83, H 4.60, N 5.75
13d	Calc. C 59.64, H 4.80, N 5.80	Found: C 59.68, H 4.92, N 5.64
13e	Calc. C 60.37, H 5.07, N 5.63	Found: C 60.36, H 5.11, N 5.46
14a	Calc. C 86.92, H 6.32, N 6.76	Found: C 86.97, H 6.30, N 6.51
14b	Calc. C 86.84, H 6.83, N 6.33	Found: C 86.78, H 6.75, N 6.22
14c	Calc. C 86.77, H 7.28, N 5.95	Found: C 86.61, H 7.21, N 5.71
14d	Calc. C 86.70, H 7.68, N 5.62	Found: C 86.71, H 7.88, N 5.34
14e	Calc. C 86.65, H 8.04, N 5.32	Found: C 86.44, H 7.73, N 4.91
14f	Calc. C 86.59, H 8.36, N 5.05	Found: C 86.82, H 8.57, N 4.70
15a	Calc. C 80.98, H 6.37, N 5.90	Found: C 81.03, H 6.62, N 5.74
15b	Calc. C 81.24, H 6.82, N 5.57	Found: C 81.24, H 6.84, N 5.50
15c	Calc. C 81.47, H 7.22, N 5.28	Found: C 81.36, H 7.40, N 5.17
15d	Calc. C 81.68, H 7.58, N 5.01	Found: C 81.86, H 7.73, N 4.80
15e	Calc. C 81.87, H 7.90, N 4.77	Found: C 81.79, H 7.57, N 4.37
15f	Calc. C 82.04, H 8.20, N 4.56	Found: C 82.11, H 8.01, N 4.17
18a	Calc. C 59.86, H 3.44, N 7.35	Found: C 59.81, H 3.49, N 7.25
18b	Calc. C 62.65, H 4.91, N 6.49	Found: C 62.60, H 4.62, N 6.42
18c	Calc. C 61.63, H 4.19, N 6.84	Found: C 61.67, H 4.26, N 6.73
18d	Calc. C 60.86, H 4.45, N 6.40	Found: C 61.01, H 4.05, N 6.91
18e	Calc. C 63.17, H 4.84, N 6.41	Found: C 63.13, H 4.98, N 6.17
18f	Calc. C 63.86, H 5.14, N 6.21	Found: C 64.01, H 5.25, N 6.01
19a	Calc. C 58.41, H 3.68, N 6.81	Found: C 58.49, H 3.75, N 6.59
19b	Calc. C 59.31, H 4.03, N 6.59	Found: C 59.23, H 4.00, N 6.21
19c	Calc. C 59.66, H 4.41, N 6.32	Found: C 59.50, H 4.49, N 6.25
19d	Calc. C 60.94, H 4.67, N 6.18	Found: C 60.99, H 4.86, N 6.07
19e	Calc. C 61.68, H 4.96, N 5.99	Found: C 61.55, H 5.00, N 5.82
19f	Calc. C 62.38, H 5.23, N 5.82	Found: C 62.28, H 5.41, N 5.71
20a	Calc. C 86.84, H 6.83, N 6.33	Found: C 86.81, H 6.72, N 5.96
20b	Calc. C 86.92, H 6.32, N 6.76	Found: C 87.12, H 6.53, N 6.68
20c	Calc. C 86.60, H 7.94, N 5.46	Found: C 86.59, H 7.56, N 5.06
20d	Calc. C 85.67, H 8.07, N 5.26	Found: C 85.54, H 8.31, N 5.11
21a	Calc. C 80.98, H 6.37, N 5.90	Found: C 80.85, H 6.43, N 5.74
21b	Calc. C 81.24, H 6.82, N 5.57	Found: C 80.91, H 6.70, N 5.41
21c	Calc. C 81.47, H 7.22, N 5.28	Found: C 81.17, H 7.01, N 5.04
21d	Calc. C 80.01, H 7.45, N 4.59	Found: C 80.40, H 7.23, N 4.69
21e	Calc. C 81.12, H 8.12, N 4.49	Found: C 81.43, H 8.16, N 4.27
24a	Calc. C 59.86, H 3.44, N 7.35	Found: C 59.48, H 3.55, N 7.25
24b	Calc. C 58.13, H 4.14, N 6.78	Found: C 58.23, H 3.96, N 6.72
24c	Calc. C 62.42, H 4.52, N 6.62	Found: C 62.34, H 4.63, N 6.45
24d	Calc. C 57.55, H 4.56, N 5.67	Found: C 57.36, H 4.37, N 6.06
25a	Calc. C 58.41, H 3.68, N 6.81	Found: C 58.08, H 3.81, N 6.64
25b	Calc. C 58.48, H 4.13, N 6.50	Found: C 58.58, H 4.21, N 6.31
25c	Calc. C 59.54, H 4.43, N 6.31	Found: C 59.61, H 4.48, N 6.24
25d	Calc. C 60.34, H 4.73, N 6.12	Found: C 60.34, H 4.75, N 5.93
25e	Calc. C 61.99, H 5.27, N 5.78	Found: C 61.95, H 5.52, N 5.50
26b	Calc. C 75.73, H 6.51, N 5.15	Found: C 76.11, H 6.91, N 4.79
26c	Calc. C 76.10, H 7.23, N 4.67	Found: C 76.42, H 7.31, N 4.29
26d	Calc. C 77.98, H 7.79, N 4.33	Found: C 77.60, H 7.46, N 4.01
26e	Calc. C 79.97, H 6.43, N 5.83	Found: C 80.38, H 6.85, N 5.64
26f	Calc. C 79.81, H 6.89, N 5.48	Found: C 79.82, H 6.54, N 5.18
26g	Calc. C 81.68, H 7.58, N 5.01	Found: C 81.33, H 7.49, N 4.62
26h	Calc. C 82.04, H 8.20, N 4.56	Found: C 81.66, H 8.02, N 4.22
28a	Calc. C 53.52, H 3.91, N 6.24	Found: C 53.47, H 4.08, N 5.86
28b	Calc. C 55.64, H 4.08, N 6.18	Found: C 55.51, H 4.11, N 5.90
28c	Calc. C 58.86, H 4.51, N 5.97	Found: C 59.11, H 4.70, N 5.89
28d	Calc. C 60.37, H 5.07, N 5.63	Found: C 60.13, H 5.54, N 5.21
28e	Calc. C 56.91, H 3.87, N 6.64	Found: C 56.73, H 4.23, N 6.16

Table A1 (*continued*)

28f	Calc. C 58.69, H 4.10, N 6.52	Found: C 58.91, H 4.57, N 6.43
28g	Calc. C 60.94, H 4.97, N 6.18	Found: C 60.80, H 5.38, N 5.83
28h	Calc. C 62.38, H 5.23, N 5.82	Found: C 62.73, H 5.50, N 5.98
32a	Calc. C 77.25, H 6.10, N 10.60	Found: C 77.04, H 6.30, N 10.47
32b	Calc. C 76.43, H 6.59, N 9.90	Found: C 76.66, H 6.41, N 9.64
32c	Calc. C 75.72, H 7.02, N 9.29	Found: C 75.91, H 7.32, N 9.39
32d	Calc. C 78.40, H 7.24, N 9.14	Found: C 78.05, H 7.17, N 8.92
32e	Calc. C 78.71, H 7.55, N 8.74	Found: C 78.53, H 7.56, N 8.60
32f	Calc. C 76.87, H 6.96, N 9.44	Found: C 77.17, H 6.81, N 9.04
32g	Calc. C 78.05, H 6.89, N 9.58	Found: C 77.91, H 6.97, N 9.21
34a	Calc. C 57.16, H 3.73, N 9.52	Found: C 57.12, H 3.96, N 9.31
34b	Calc. C 57.97, H 4.60, N 8.22	Found: C 58.02, H 4.84, N 7.92
34c	Calc. C 58.68, H 4.90, N 7.94	Found: C 58.30, H 4.66, N 8.32
34d	Calc. C 60.50, H 4.87, N 8.56	Found: C 60.11, H 5.20, N 8.16
34e	Calc. C 60.01, H 4.97, N 8.40	Found: C 60.15, H 4.83, N 8.35
34f	Calc. C 59.84, H 4.64, N 8.78	Found: C 59.48, H 4.84, N 8.54
34g	Calc. C 59.24, H 4.32, N 9.01	Found: C 58.93, H 4.34, N 9.01

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