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RESEARCH ARTICLE

Chroman-4-one scaffolds as a platform for anticancer and antiviral lead discovery

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Abstract: Chroman-4-one derivatives, a class of oxygen-containing heterocycles commonly found in biologically active natural products, continue to attract significant attention for their potential in anticancer and antiviral drug discovery. In this study, a small library of eight chroman-4-one compounds was synthesized *via* Kabbe condensation and screened for antiproliferative activity against the NCI-60 human cancer cell line panel. Most compounds demonstrated low cytotoxicity at a concentration of 10 μM; however, several derivatives exhibited selective growth-inhibitory effects against specific tumor cell lines, including non-small cell lung cancer and melanoma. In parallel, 7-hydroxyspiro[chromane-2,1'-cyclohexan]-4-one (compound **6**) was evaluated for antiviral activity against a panel of DNA and RNA viruses. While it showed no significant activity against RNA viruses such as herpesviruses, it demonstrated selective antiviral activity against HPV-11 (EC_{50} = 3.35 μM, SI_{50} >45) and moderate activity against BK virus (EC_{50} = 15.88 μM, SI_{50} >9), with low associated cytotoxicity. These findings support the chroman-4-one scaffold as a promising chemotype for the development of biologically active agents and identify compound **6** as a preliminary lead for further investigation of its antiviral potential.

Keywords: oxygen-containing heterocycles; chroman-4-ones; antiproliferative activity; anticancer activity; antiviral activity.

Introduction

Natural products have long served as a prolific source of therapeutic agents and continue to inspire the development of novel molecular architectures with significant biomedical potential. Their structural diversity and biological relevance make them indispensable in the search for new lead compounds for drug discovery. Even in the era of modern high-throughput screening and rational design, nature-derived molecules remain central in the pharmaceutical landscape, contributing to some of the most commercially and clinically successful drugs to date [1].

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Among the diverse families of oxygen-containing heterocycles, chroman-4-ones (2,3-dihydro-1-benzopyran-4-ones) represent a particularly important scaffold. Structurally related to chromones, chroman-4-ones are widely distributed in nature and are integral to many biologically active secondary metabolites found in plants and fungi [2]. These compounds are involved in key physiological processes such as growth regulation, defense mechanisms, and reproduction in plants. More importantly, both natural and synthetic derivatives of chroman-4-ones have demonstrated a broad spectrum of pharmacological activities, including anticancer, antioxidant, anti-inflammatory, antimicrobial, antiviral, antihyperlipidemic, and neuroprotective effects [3, 4].

The chroman-4-one core is considered a privileged scaffold in medicinal chemistry due to its ability to engage in diverse biological interactions. Several chroman-4-one derivatives are under clinical or preclinical investigation for various indications. For instance, hesperetin, a natural flavanone, exhibits cholesterol-lowering, antioxidant, and anti-inflammatory activities; dihydroquercetin (taxifolin)

demonstrates strong antioxidant and antitumor effects and is being explored for cardiovascular and anticancer therapies; and related flavonoids such as naringenin and kaempferol show antidiabetic and anticancer potential. Moreover, well-known drugs containing chroman-based moieties highlight the clinical importance of this scaffold: tocopherols (vitamin E) are potent lipophilic antioxidants; nebivolol is a β_1-selective adrenergic receptor blocker with additional vasodilating and antioxidant properties; troglitazone was used as an antidiabetic agent acting as a PPARγ agonist; and ormeloxifene is a selective estrogen receptor modulator (SERM) with anticancer and contraceptive activity (Figure 1). Collectively, these examples underscore the broad therapeutic relevance of chroman-4-one derivatives across diverse pharmacological domains.

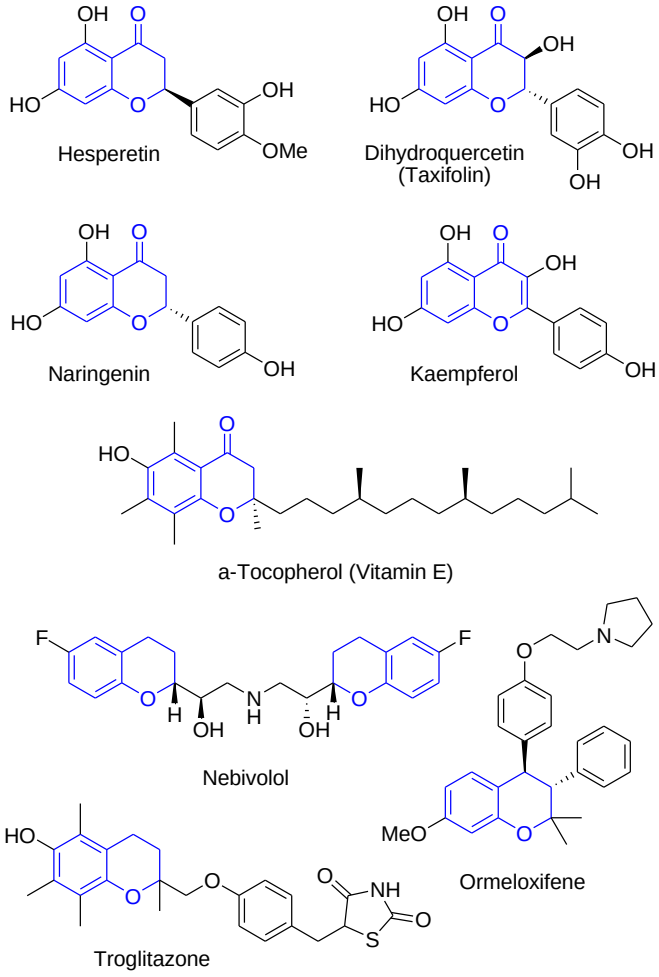


Figure 1. Representative biologically active chroman-4-one derivatives.

The structural versatility of chroman-4-ones allows for targeted modifications to enhance pharmacokinetic profiles, increase selectivity toward biological targets, and overcome limitations of natural analogues. Consequently, chroman-4-ones continue to draw attention not only for their inherent biological activity but also as synthetic intermediates and templates for further derivatization. Despite the well-established significance of chroman-4-ones, further investigation into their biological potential remains crucial, particularly in the context of pressing therapeutic needs such as cancer and viral infections.

In this study, we present the results of comprehensive biological evaluation of a series of chroman-4-one derivatives, with a focus on their anticancer and antiviral activities. The compounds under investigation were synthesized using methodologies previously developed and published by our group. Building upon this synthetic foundation, the current work provides new insights into the pharmacological profile of chroman-4-ones, thereby expanding and complementing our earlier findings. These results contribute to the growing understanding of chroman-4-one scaffolds as promising platforms for the development of bioactive agents with potential clinical relevance.

Results and Discussion

The set of chroman-4-one derivatives evaluated for anticancer and antiviral activities is presented in Figure 2. Compounds **1-8** were synthesized *via* the Kabbe condensation of 2-hydroxyacetophenones with the corresponding carbonyl compounds, as outlined in Scheme 1. The detailed synthetic procedures, physicochemical properties, and spectral data for these compounds have been described in our previous publications [5, 6]. All compounds were obtained with a purity greater than 98%, as confirmed by NMR and LC-MS analyses. Notably, chroman-4-one derivatives **3** and **7** were isolated and investigated in the form of their hydrochloride salts, which were obtained by treating the corresponding *Boc*-protected intermediates with 4 M HCl in dioxane.

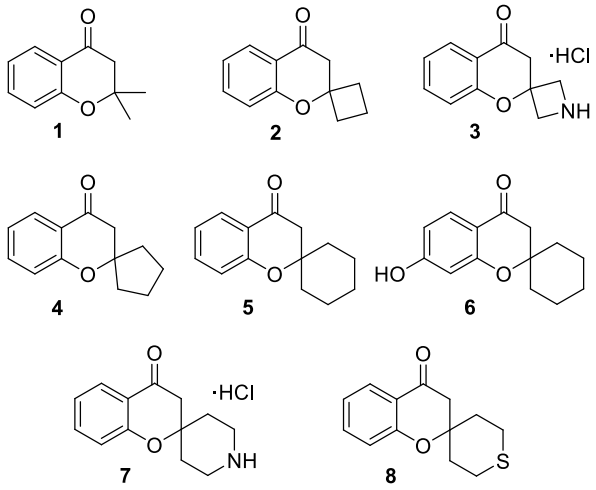


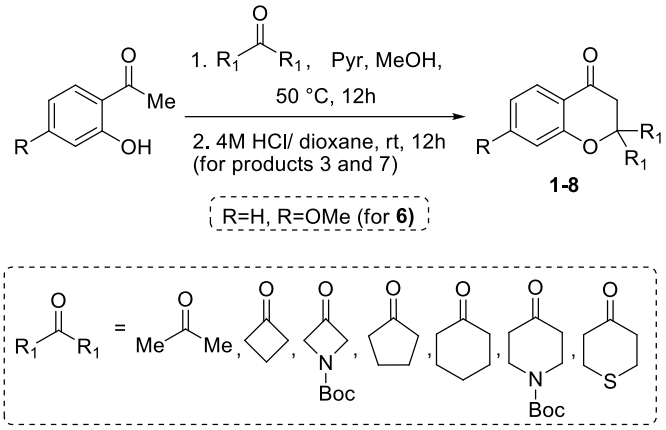
Figure 2. Chemical structures of chroman-4-one derivatives studied for anticancer and antiviral activities.

General cytotoxicity profile of tested chroman-4-one derivatives.

The anticancer activity of synthesized compounds was tested according to the International Program of the National Institutes of Health – DTP (Developmental Therapeutic Program) of the National Cancer Institute

(NCI, Bethesda, Maryland, USA) on 60 cancer cell lines at a single concentration of 1×10^{-5} M [7].

As presented in Table 1, most compounds demonstrated mean growth percentages above 100%, indicating a general



Scheme 1. General synthetic route to chroman-4-one derivatives **1-8**.

lack of significant cytostatic or cytotoxic effects at this screening dose. Notably, compound **2** (NSC 852298) exhibited the lowest mean growth percent (90.67%), suggesting the most promising overall antiproliferative potential within the tested set. In contrast, compounds **4** (NSC 852299) and **8** (NSC 852300) showed elevated growth values (111.80% and 110.52%, respectively), which may reflect not only weak antiproliferative activity but also potential growth-stimulatory effects in specific tumor cell lines. This phenomenon, occasionally observed in NCI-60 single-dose screenings, underscores the importance of cautious interpretation of growth percent data and highlights the need for dose-response follow-up studies. The delta values ranged from 16.03% to 39.58%, and the growth percent range varied between 42.80% and 82.06%, reflecting a high degree of variability across the panel and highlighting the heterogeneity of tumor cell responses. Such variability suggests that certain compounds may exhibit selective activity profiles, warranting more detailed analysis across individual cell lines.

Table 1. Percent of cancer cell growth in 1×10^{-5} M solution of the test compound compared to the control (according to one doses full NCI 60 cell panel assay).

Compound	NSC code	Mean Growth Percent, %	Delta, %	Range, %
1	852296	101.72	39.58	65.45
2	852298	90.67	28.40	51.65
3	852297	99.31	21.84	42.80
4	852299	111.80	32.18	82.06
5	852301	109.44	22.98	47.67
6	846127	104.47	25.50	69.78
7	852302	107.00	28.95	60.20
8	852300	110.52	16.03	45.78

Antiproliferative activity against selected human cancer cell lines.

Table 2 summarizes the most responsive cell lines for each tested chroman-4-one derivative. Several compounds demonstrated selective antiproliferative activity against specific cancer types:

• compound **1** (NSC 852296) showed the most pronounced growth inhibition in the non-small cell lung cancer cell line NCI-H522 with a growth percentage of 62.14%, indicating moderate activity.

• compound **2** (NSC 852298) exhibited selective inhibitory potential against melanoma UACC-257 cells (62.27%), aligning with its favorable mean growth profile reported Table 1.

• compound **7** (NSC 852302) demonstrated a degree of selectivity toward melanoma LOX IMVI cells (78.05%); however, its relatively high mean growth value (107.00%) suggests limited overall cytotoxic efficacy.

• other compounds, such as **6** (NSC 846127), showed only modest growth inhibition against renal cancer UO-31 (78.97%), which may not warrant further investigation at this stage.

Table 2. The best results of each compounds against different cell lines.

Compound	NSC code	Panel Line	Cell Line	Growth Percent, %
1	852296	Non-Small Cell Lung Cancer	NCI-H522	62.14
2	852298	Melanoma	UACC-257	62.27
3	852297	Non-Small Cell Lung Cancer	NCI-H226	77.47
4	852299	Non-Small Cell Lung Cancer	NCI-H522	79.62
5	852301	Melanoma	LOX IMVI	86.46
6	846127	Renal Cancer	UO-31	78.97
7	852302	Melanoma	LOX IMVI	78.05
8	852300	Melanoma	UACC-257	94.49

To better understand the cell line-selectivity, additional analysis revealed the top three most responsive cell lines for each compound based on growth percent values. For instance, compound **2** inhibited UACC-257 (melanoma), HT29 (colon cancer), and MDA-MB-231/ATCC (breast cancer) more strongly than others, while compound **1** was active against NCI-H522, SN12C (renal), and LOX IMVI (melanoma).

These findings suggest that despite the generally low overall cytotoxicity, certain compounds exhibit preferential activity toward specific tumor subtypes. These observations are supported by extended comparative data provided in Supporting Information Table S1.

Although a comprehensive structure-activity relationship (SAR) analysis is beyond the current scope, preliminary observations can be made. Compound **2**, which demonstrated the most favorable overall profile, may contain structural features conducive to melanoma cell inhibition. Conversely, compounds such as **8** and **5**, which exhibited weaker activity across multiple lines including melanoma, suggest that even minor structural variations can significantly influence biological outcomes. While a full SAR analysis is beyond the scope of this study, the observed differences in activity suggest that ring size and substitution pattern may influence tumor-type selectivity, and these aspects warrant more detailed targeted investigation.

Evaluation of antiviral activity against DNA and RNA viruses.

The antiviral activity of chroman-4-one derivative **6** was assessed across a panel of eight viruses representing both DNA and RNA types, including human cytomegalovirus (HCMV), poliovirus type 1 (POV-1), herpes simplex virus 1 (HSV-1), varicella-zoster virus (VZV), BK virus, and three genotypes of human papillomavirus (HPV-11, HPV-18, and HPV-31). No relevant antiviral activity was observed against HCMV, POV-1, HSV-1, or VZV, with EC_{50} values exceeding 100 or even 150 μM in all cases. The reference drugs – ganciclovir, enviroxime, and acyclovir – showed expected levels of potency, validating the assays. In contrast, more promising results were obtained for BK virus, where **6** exhibited an EC_{50} of 15.88 μM, with a selectivity index (SI_{50}) exceeding 9, indicating low cytotoxicity and moderate antiviral potential. This activity is substantially weaker than the control drug cidofovir (EC_{50} = 0.97 μM), but still warrants consideration for further structural optimization. The most notable antiviral effect was observed against HPV-11, where **6** demonstrated an EC_{50} of 3.35 μM and an SI_{50} >45, closely approaching the potency of the reference drug 9-[2-phosphonomethoxy-ethyl]guanine (EC_{50} = 2.56 μM). Encouraged by this result, further testing was conducted against HPV-18 and HPV-31. While the activity was significantly reduced for these genotypes (EC_{50} = 167.87 μM and 128.42 μM, respectively), the compound maintained low cytotoxicity (CC_{50} >250 μM), yielding SI values slightly above 1. Taken together, these findings suggest that **6** exhibits selective antiviral activity, particularly against HPV-11 and BK virus, with a favorable cytotoxicity profile. Although its broad-spectrum efficacy appears limited, the selective inhibition of certain DNA viruses highlights the chroman-4-one scaffold as a viable platform for future development of targeted antiviral agents. Further structural refinement and mechanistic studies are warranted to optimize potency and expand viral selectivity.

Table 3. Evaluation of antiviral activity of chroman-4-one derivative **6** across a virus panel.

Compound	Control Assay Order	Control Assay Name	EC_{50}, μM	EC_{90}, μM	CC_{50}, μM	SI_{50}	SI_{90}
Human cytomegalovirus							
Ganciclovir [a)]	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	1.01	>150.00	>150.00	>148	1
6	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	>150.00	>150.00	>150.00	1	1
POV-1							
Enviroxime [b)]	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	0.082	n/a	7.4	90	n/a
6	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	>100.00	n/a	>100.00	0	n/a
Herpes simplex virus 1							
Acyclovir [c)]	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	3.39	>150.00	>150.00	>44	1
6	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	>150.00	>150.00	>150.00	1	1
Varicella-Zoster virus							
Acyclovir [d)]	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	5.53	145.87	>150.00	>27	>1
6	Primary	CellTiter-Glo (Cytopathic effect / Toxicity)	>30.00	>30.00	124.74	<4	<4
BK virus							
Cidofovir [e)]	Primary	Quantitative polymerase chain reaction (DNA)/CellTiter-Glo (Toxicity)	0.97	83.60	>150.00	>154	>2

Table 3. (*Contd.*)

Compound	Control Assay Order	Control Assay Name	EC_{50}, μM	EC_{90}, μM	CC_{50}, μM	SI_{50}	SI_{90}
BK virus							
6	Primary	Quantitative polymerase chain reaction (DNA)/CellTiter-Glo (Toxicity)	15.88	121.86	>150.00	>9	>1
Human papillomavirus 11							
9-[2-Phosphono-methoxy)ethyl]guanine [f]	Primary	Nano-Glo Luciferase (Nanoluc)/CellTiter-Glo (Toxicity)	2.56	>150.00	>150.00	>59	1
6	Primary	Nano-Glo Luciferase (Nanoluc)/CellTiter-Glo (Toxicity)	3.35	>150.00	>150.00	>45	1
Human papillomavirus 18							
9-[2-Phosphono-methoxy)ethyl]guanine[g]	Secondary	Nano-Glo Luciferase (Nanoluc)/CellTiter-Glo (Toxicity)	2.93	9.06	>250.00	>85	>28
6	Secondary	Nano-Glo Luciferase (Nanoluc)/CellTiter-Glo (Toxicity)	167.87	213.64	>250.00	>1	>1
Human papillomavirus 31							
9-[2-Phosphono-methoxy)ethyl]guanine[h]	Secondary	Nano-Glo Luciferase (Nanoluc)/CellTiter-Glo (Toxicity)	1.57	20.34	>250.00	>159	>12
6	Secondary	Nano-Glo Luciferase (Nanoluc)/CellTiter-Glo (Toxicity)	128.42	226.81	>250.00	>1	>1

[a] Control drug compound. Virus screened: *Human cytomegalovirus*; virus strain: AD169; cell line: HFF; vehicle: DMSO; drug conc. range: 0.048-150 μM; control conc. range: 0.048-150 μM; [b] Control drug compound. Virus screened: *POV-1*; virus strain: Mahoney; cell line: Vero 76; vehicle: DMSO; drug conc. range: 0.1-100 μM; control conc. range: 0.1-100 μM; [c] Control drug compound. Virus screened: *Herpes simplex virus 1*; virus strain: E-377; cell line: HFF; vehicle: DMSO; drug conc. range: 0.048-150 μM; control conc. range: 0.048-150 μM; [d] Control drug compound. Virus screened: *Varicella-Zoster virus*; virus strain: Ellen; cell line: HFF; vehicle: DMSO; drug conc. range: 0.048-150 μM; control conc. range: 0.048-150 μM; [e] Control drug compound. Virus screened: *BK virus*; virus strain: Gardner; cell line: HFF; vehicle: DMSO; drug conc. range: 0.048-150 μM; control conc. range: 0.048-150 μM; [f] Control drug compound. Virus screened: *Human papillomavirus 11*; virus strain: HE611260.1; cell line: C-33 A; vehicle: DMSO; drug conc. range: 0.048-150 μM; control conc. range: 0.048-150 μM; [g] Control drug compound. Virus screened: *Human papillomavirus 18*; virus strain: KC470230.1; cell line: C-33 A; vehicle: DMSO; drug conc. range: 0.001-250 μM; control conc. range: 0.001-250 μM; [h] Control drug compound. Virus screened: *Human papillomavirus 31*; virus strain: HQ53768.1; cell line: C-33 A; vehicle: DMSO; drug conc. range: 0.001-250 μM; control conc. range: 0.001-250 μM;

Conclusions

A series of chroman-4-one derivatives was synthesized and evaluated for their antiproliferative and antiviral activities. Screening against the NCI-60 cancer cell line panel showed that most compounds exhibited low cytotoxicity, with some derivatives demonstrated modest, cell line-specific growth inhibition, particularly against melanoma and non-small cell lung cancer. While these preliminary observations are not sufficient to define a structure-activity relationship, they may serve as a sterting point for future exploration. In the context of antiviral evaluation, 7-hydroxyspiro[chromane-2,1'-cyclohexan]-4-one (compound **6**) emerged as a selective inhibitor of HPV-11 and a moderate inhibitor of BK virus, with favorable selectivity indices and low cytotoxicity. Overall, this study highlights the chroman-4-one scaffold as a valuable platform for the development of both anticancer and antiviral agents, warranting further exploration of structure-activity relationships and biological mechanisms of action.

Experimental section

Chemistry

The synthesis, physicochemical properties, and ^{1}H and ^{13}C NMR data of 2,2-dimethylchroman-4-one (**1**), spiro-[chromane-2,1'-cyclobutan]-4-one (**2**), spiro[chromane-2,1'-cyclopentan]-4-one (**4**), spiro[chromane-2,1'-cyclohexan]-4-one (**5**), and 2',3',5',6'-tetrahydrospiro-[chromane-2,4'-thio-pyran]-4-one (**8**) have been described in detail in our previous publication [5], while those of 7-hydroxyspiro-[chromane-2,1'-cyclohexan]-4-one (**6**) were reported in publication [6]. The synthesis of spiro[azetidine-3,2'-chroman]-4'-one (**3**) and spiro[chromane-2,4'-piperidin]-4-one (**7**) involved the preparation of the corresponding *Boc*-protected chromanone intermediates according to the methodology described in detail in publication [5], followed by acid-mediated *Boc*-deprotection to afford the target compounds.

General procedure for acid-mediated Boc-deprotection.

The corresponding *Boc*-protected chromanone derivative (1 equiv., 500 mg) was dissolved in methyl *tert*-butyl ether (MTBE, 5 mL per 1 equiv.) and cooled to 0 °C. A solution of 4 M HCl in dioxane (3 mL per 1 equiv.) was added dropwise under stirring. The reaction mixture was allowed to warm to room temperature and stirred overnight. After completion, additional MTBE was added, and the resulting precipitate was collected by filtration, washed thoroughly with cold MTBE, and dried under reduced pressure to afford the deprotected product.

*Spiro[azetidine-3,2'-chroman]-4'-one hydrochloride (**3**).*

Yield: 330 mg, 85%. Mp 175 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 3.29 (s, 2H), 4.25-3.95 (m, 5H), 7.08-7.22 (m, 2H), 7.66 (t, J = 7.7 Hz, 1H), 7.76 (d, J = 7.7 Hz, 1H), 9.57 (br s , 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 43.99, 56.00, 77.75, 118.96, 120.85, 123.01, 126.75, 137.4, 158.32, 189.88. MS (ESI$^+$) *m/z*: 190.0 [M+H]$^+$.

*Spiro[chromane-2,4'-piperidin]-4-one hydrochloride (**7**).*

Yield: 360 mg, 90%. Mp 219 °C. ^{1}H NMR (400 MHz, DMSO-d_6) δ 2.04-1.81 (m, 2H), 2.18-2.04 (m, 2H), 2.9 (s, 2H), 2.99-3.27 (m, 5H), 6.95-7.2 (m, 2H), 7.61 (t, J = 7.8 Hz, 1H), 7.74 (d, J = 7.8 Hz, 1H), 9.1 (br s, 2H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 30.59, 39.21, 46.87, 76.44, 118.9, 120.69, 122.02, 126.43, 137.13, 158.59, 191.38. MS (ESI$^+$) *m/z*: 218.0 [M+H]$^+$.

Biology

All test compounds were prepared as 10 μM stock solutions in DMSO (biological assay grade) and submitted for biological screening under the NCI Developmental Therapeutics Program.

One doses full NCI 60 cell panel assay.

The newly synthesized compounds were submitted to National Cancer Institute NCI, Bethesda, Maryland, U.S.A., under the Developmental Therapeutic Program DTP [7]. The cell line panel engaged a total of 60 different human tumor cell lines derived from nine cancer types. The selected compounds **1-8** were assigned with the NCI codes (see *Tables 1-2*), respectively. Primary *in vitro* one-dose anticancer screening was initiated, in which the full NCI 60 panel lines were inoculated onto a series of standard 96-well microtiter plates on day 0 at 5000-40000 cells per well in RPMI 1640 medium containing 5 % fetal bovine serum and 2 mM L-glutamine, and then preincubated in absence of drug at 37 °C, and 5 % CO_2 for 24 h. Test compounds were then added at one concentration of 10^{-5} M in all 60 cell lines (stock solution preparing see in [8]), and incubated for a further 48 h at the same incubation conditions. Following this, the media were removed, the cells were fixed *in situ*, washed, and dried. The sulforhodamine B assay was used for cell density determination, based on the measurement of cellular protein content. After an incubation period, cell monolayers were fixed with 10 % (wt/vol) trichloroacetic acid and stained for 30 min, after which the excess dye was removed by washing repeatedly with 1 % (vol/vol) acetic acid. The bound stain was resolubilized in 10 mM Tris base solution and measured spectrophotometric ally on automated microplate readers for OD determination at 510 nm.

Antiviral and cytotoxicity assays

The antiviral activity of compound **6** was evaluated against a panel of eight viruses representing both DNA and RNA viruses: human cytomegalovirus (HCMV), poliovirus type 1 (POV-1), herpes simplex virus type 1 (HSV-1), varicella-zoster virus (VZV), BK polyomavirus (BKPyV), and human papillomavirus types 11, 18, and 31 (HPV-11, HPV-18, HPV-31). Antiviral assays were performed in monolayers of appropriate host cells under standard conditions. Viral replication inhibition was assessed via quantification of viral genome copies or cytopathic effect, depending on the virus system. For BKPyV, plasmid pMP526 was used as a DNA standard for viral genome quantification by qPCR.

Cell viability and compound cytotoxicity were determined in parallel using the CellTiter-Glo luminescent cell viability assay (Promega, Madison, WI), and the 50% cytotoxic concentration (CC_{50}) was calculated. Selectivity index (SI_{50}) values were determined as the ratio of CC_{50} to EC_{50}. Cidofovir, acyclovir, enviroxime, ganciclovir, and 9-[2-phosphonomethoxyethyl]guanine were used as reference antiviral compounds depending on the virus.

Notes

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Disclaimer. This material should not be interpreted as representing the viewpoint of the U.S. National Institutes of Health, the National Cancer Institute, the National Institute of Allergy and Infectious Diseases, or its Collaborative Antiviral Testing Group.

The authors declare no conflict of interest.

Author contributions. **O.S.T.:** synthesis of compounds, investigation, formal analysis, editing. **V.S.M.**: investigation, formal analysis, writing most of the manuscript, editing. **O.V.K.:** investigation, formal analysis, editing. **K.A.K.:** investigation, formal analysis. **E.A.H.:** investigation, formal analysis. **C.B.H.:** investigation, formal analysis. **S.H.J.:** investigation, formal analysis. **V.S.B.**: conceptualization, supervision, writing - review & editing.

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Хроман-4-онові каркаси як платформа для пошуку протиракових та противірусних сполук-лідерів

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Резюме: Похідні хроман-4-ону – клас оксигеновмісних гетероциклів, що широко представлений біологічно активними природними сполуками, які продовжують привертати значну увагу як перспективні структури у пошуку протиракових і противірусних препаратів. У цьому дослідженні було синтезовано невелику бібліотеку з восьми представників хроман-4-онів шляхом конденсації Каббе та проведено їх скринінг на антипроліферативну активність на панелі з 60 ліній ракових клітин людини (NCI-60). Більшість сполук виявили низьку цитотоксичність при концентрації 10 μM, а окремі похідні проявили вибіркову інгібувальну дію щодо пухлинних клітин, зокрема недрібноклітинного раку легень і меланоми. Паралельно було досліджено антивірусну активність 7-гідрокси-спіро[хроман-2,1'-циклогексан]-4-ону (сполука **6**) проти панелі ДНК- та РНК-вірусів. Попри відсутність значущої активності щодо РНК-вірусів і герпесвірусів, сполука продемонструвала вибіркову противірусну дію проти вірусу папіломи людини типу 11 (HPV-11, EC_{50} = 3.35 μM, SI_{50} >45) і помірну активність проти ВК-вірусу (EC_{50} = 15.88 μM, SI_{50} >9), зі збереженням низької цитотоксичності. Отримані результати підтверджують, що хроман-4-оновий каркас є перспективним хемотипом для створення біологічно активних сполук і виокремлюють сполуку **6** як кандидата для подальших досліджень противірусного потенціалу.

Ключові слова: оксигеновмісні гетероцикли; хроман-4-они; антипроліферативна активність; протиракова активність; противірусна активність.