Haworthia Duval – 74, Gasteria Duval – 23 таксона. Кроме этого в колекции представлены межродовые гибриды – xGasteraloe Guillaumin (Gasteriax Aloe), xGasterhaworthia Guillaumin (Gasteriax Haworthia), xAstroworthia G.DRowley (Astroloba Uitewaal xHaworthia). Большинство растений включены в международные красные списки. В процессе формирования этой части коллекции были проведены исследования морфологии цветов, соцветий и семян; проведены фенологические наблюдения за цветением и плодоношением; разработаны методы вегетативного и семенного размножения представителей семейства. Фенологические наблюдения показали, что основные сроки цветения характерны в весенне-летние месяцы, но для Aloe в условиях оранжерей характерны еще два пика цветения (август, декабрь). Показано, что кроме простой и сложной кисти у большинства видов, для Aloe haworthioides характерно соцветие колос; форма околоцветника трубчатая или цилиндрическая, что,вероятнее всего, выполняет защитную функцию. Цветение одного цветка проходит в три этапа, что предполагает эффект самоопыления, который подтвержден в условиях культуры для некоторых видов Aloe, а жизнеспособность пыльцы тесно связана с температурой окружающей среды. Свежесобранные семена, полученные в результате само- или перекрестного опыления имеют достаточно высокую всхожесть, которая увеличивается через три месяца. Предложен метод увеличения жизнеспособности семян растений семейства Aloaceae в 2,5-3 раза и разработан метод вегетативного размножения представителей родов Haworthia и Gasteria листовыми черенками.

Ключевые слова: семейство Aloaceae, соцветие, цветок, семя, вегетативное и семенное размножение.

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REPRODUCTIVE BIOLOGY OF THE PLANTS OF THE ALOACEAE FAMILY IN THE GREENHOUSE

The article presents the results of the study of the reproductive biology of succulent plants of the Aloaceae family in the introduction. Representatives of the family are part of the collection of succulent plants of the O.V. Fomin Botanical Garden,which contains over 190 species, subspecies and hybrids of plants of three genera: Aloe Linne – 86, Haworthia Duval – 74, Gasteria Duval – 23 taxa. In addition, x Gasteraloe Guillaumin (Gasteria x Aloe), x Gasterhaworthia Guillaumin (Gasteria x Haworthia), x Astroworthia G.D Rowley (AstrolobaUitewaal x Haworthia). Most plant species are included in the international red lists. In the process of forming this part of the collection, the morphology of flowers, inflorescences and seeds was investigated, phenological observations of flowering and fruiting were conducted, methods of vegetative and seed reproduction of family members were developed. Phenological observations have shown that the main flowering period is the spring-summer period, but Aloe under greenhouse conditions is characterized by two more peaks (August, December). We have found that, in addition to simple or complex tics, in the vast majority of species, Aloe haworthioides is characterized by inflorescences of ears; perianth shaped tubular or cylindrical, inherent in the vast majority of species and performs, in our opinion, a protective function. The flowering of a single flower takes place in three stages, providing a self-pollination effect that is characteristic of crop conditions only for certain Aloe species, and the viability of the pollen is closely related to the ambient temperature. Freshly harvested seeds obtained by self-pollination or cross-pollination have a sufficiently large germination, but if stored in any way after three months, the germination increases. We have proposed a method of increasing the viability of seeds of plants of the Aloaceae family 2.5-3 times and developed a method of vegetative propagation of representatives of the genera Haworthia and Gasteria leaf cuttings.

Keywords: Aloaceae family, inflorescences, flower, seeds, seed and vegetative reproduction.

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TEICHOIC ACID DIFFERENTIALLY MODULATES TLR4 EXPRESSION IN SENSITIVE AND RESISTANT TO CISPLATIN SMALL CELL LUNG CARCINOMA H69 CELLS

The Toll-like receptor family plays crucial role in the innate immune system, recognizing the molecular structures associated with pathogens derived from different microbes. TLRs also recognize the molecular structures associated with damage associated with certain diseases, such as cancer. They can either promote tumorigenesis, or suppress it. Besides, the promotion of the tumor cells growth may be associated with the acquisition of drug resistance. The data on the TLR4 expression level changes during this pathological process are controversial. That is why the purpose of our study was to determine the expression level of TLR4 in cisplatin-sensitive and cisplatin-resistant lung cancer cells. Cells line NCI-H69 (human small cell lung carcinoma) and a drug resistant subline of NCI-H69/CPR were used to determine the expression level of TLR4.Incubation of cells with teichoic acid (1 μg / ml) was performed under standard conditions for two days. The level of TLR4 expression in the cell was determined with RT-PCR at 7500 Real-Time PCR Systems ("Applied Biosystems", USA) and specific primers and asymmetric cyan cationic fluorochrom SYBRGreen ($C32H37N4S^+$) with spike of consumption at λ_{max} = 488 nm and fluorescence at λ_{max} = 522 nm. It was shown that TLR4 expression level was almost two times lower in WT H69 cells compared with H69 cells resistant to cisplatin. In contrast, teichoic acid oppositely influenced TLR4 expression level: increased by 1.3-times in WT H69 cells whereas decreased 4-times in H69 cells resistant to cisplatin compared with corresponding control samples without teichoic acid. In cisplatin-resistant lung cancer cells found high expression of TLR4 can be inhibited by addingteichoic acida ligand to TLRs.

Key words: TLR4 expression, NCI-H69 and NCI-H69/CPR cisplatin-resistant cells line, teichoic acid.

Introduction.The Toll-like receptor family (TLR) is a member of the interleukin-1 (IL-1R) / TLR receptor superfamily. This superfamily was described in 1998 as a family of type I transmembrane proteins containing an intracellular TIR domain with common basic structure [1]. TLRs play crucial role in the innate immune system, recognizing the

molecular structures associated with pathogens derived from different microbes. TLRs also recognize the molecular structures associated with damage associated with certain diseases, such as cancer [2].

TLR activation was associated with both tumor suppression and tumor progression. Tumors are infiltrated by different types of immune cells, and immune cells can be the main cell population in the tumor microenvironment. Therefore, it is increasingly recognized that inflammatory processes play key role in tumorigenesis [3].

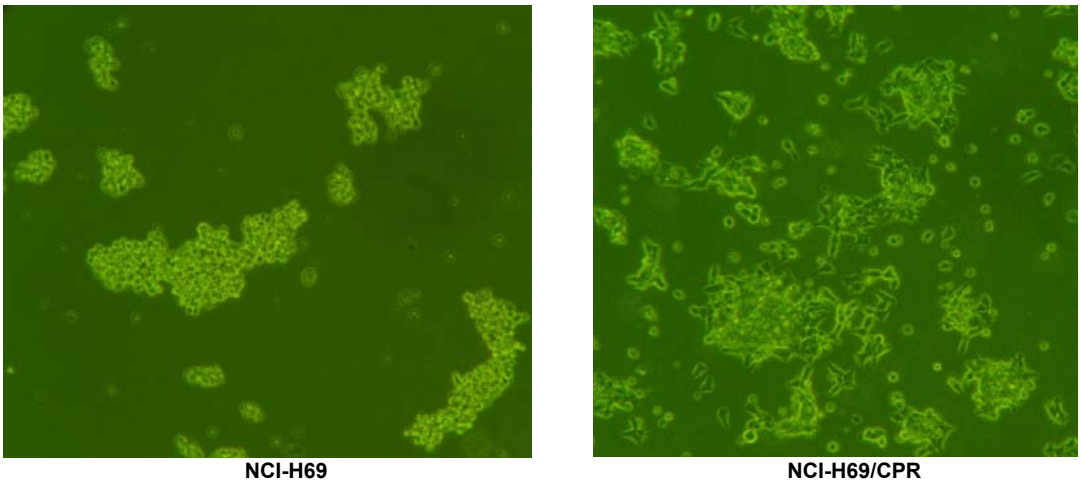
TLR ligands are often used as adjuncts to enhance immunogenicity of vaccines in anticancer therapy [4]. Such ligands are the cell wall biopolymers derived from gram-positive microorganisms *Staphylococcus aureus*, the teichoic acids (TA). Our previous studies have shown that TA in combination with the bimetallic copper and cadmium complex with ethylenediamine (PO244) exacerbated the antitumor activity of the latter. However, incubation of primary Lewis lung carcinoma cells with TA leads to an increase in aneuploidy cell population and a decrease in apoptotic cell levels. But in combination with PO244, TA provided 2-fold increase in the level of LLC apoptotic cells and reduced the population of LLC cells in the proliferative pool (G2 / M + S phase) to 40%, compared to 65% in control [5]. TLR4 expression is characteristic of innate immunity. However, the activation of TLR4 in the tumor process may be associated with tumor initiation and progression. Different types of tumors may have different patterns of TLR4 involvement during tumorigenesis or tumor progression [6]. In addition, in some tumor models, TLR2 and TLR4 polymorphisms are known to affect cancer risk, which means that a genetic difference in specific TLR may be associated with specific tumor behavior [7]. Cisplatin therapy is widely used anticancer treatment for various neoplasms. However, this compound causes side effects in healthy tissues and body systems, and causes drug resistance [8,9]. There is various evidence regarding the involvement of TLRs, in particular TLR4, in the emergence of cisplatin resistance.

Therefore, the purpose of our study was to determine the expression level of TLR4 in cisplatin-sensitive and cisplatin-resistant lung cancer cells

Materials and method. *Cells line* NCI-H69/CPR (human small cell lung carcinoma) is a drug resistant subline of NCI-H69 (Sigma Catalogue number. 91091802) were used to determine the expression level of TLR4. Drug resistance was developed by addition of cisplatin in a stepwise increment to the growth medium of the parental line. The cell line exhibits a 5-fold resistance to cisplatin and is cross resistant to melphalan. The cells were incubated in culture medium RPMI 1640+2mM glutamine + 0.4 μg/ml cisplatin + 10% fetal bovine serum (FBS). Incubation of cells with teichoic acid (1 μg/ml) derived from gram-positive microorganisms *Staphylococcus aureus* was performed under standard conditions for two days.

Total RNA was isolated by phenol–chloroform extraction and the "Ribo-zol" kit ("AmpliSens"). RNA concentration in all samples was measured by Thermo Scientific Nano Drop-1000 (Thermo Fisher Scientific, USA) and samples were diluted to 200 ng/μl. cDNA was obtained from total RNA by RT-PCR using "High Capacity cDNA Reverse Transcription Kit" (Applied Biosystems, USA). The reverse transcription reaction was run under the following conditions: 25 °C – 10 min, 37°C – 120 minand 85 °C – 5 sec. cDNA was diluted in in half with DNA buffer.TLR4 expression level was evaluated by real-time PCR on 7500 Real-Time PCR Systems ("Applied Biosystems", USA) using specific primers and fluorochromeSYBRGreen ("Applied Biosystems", USA). GADPH was used to normalize levels of mRNA for the relative quantification method of analysis. TLR4 sequence (f- CTGTGTCAGTCACGGAGCC, r- GCAGGTAGTGGGAGAAGCC) and GAPDH sequence (f- GCCAAGGTCATCCATGACAACTTTGG, r- GCCTGCTTCACCACCTTCTTGATGTC) were constructed by Primer Express® Software v3.0 (Applied Biosystems, USA). 45 cycles real-time PCR (94 °C – 15 sec, 65 °C – 15 sec and 72 °C – 30 sec) were run on 7300/7500 Real-Time PCR Systems, "Applied Biosystems", USA. Calculations were performed using the ΔΔCt relative quantification method.

Results. Lung cancer cells sensitive (NCI-H69) and resistant to cisplatin (NCI-H69/CPR) differ in a number of morph functional characteristics, especially proliferative and adhesive properties (Fig. 1).

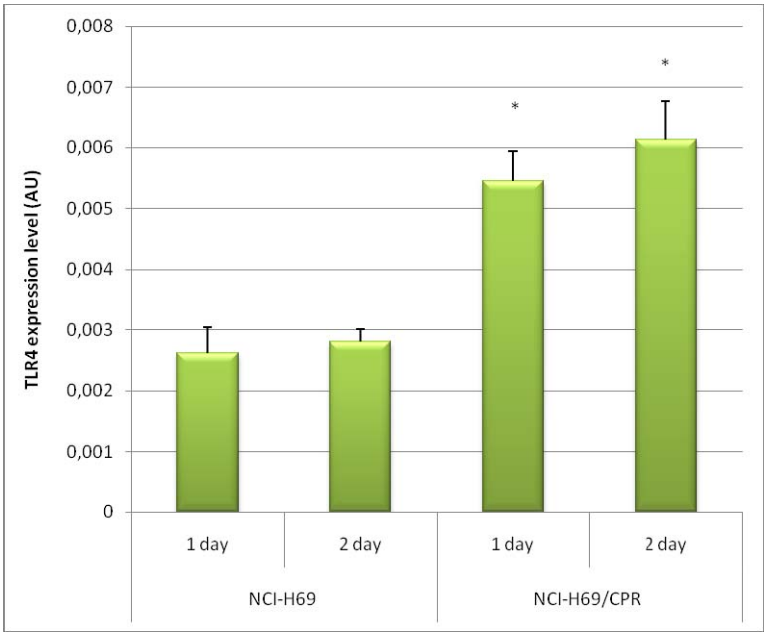


NCI-H69 **NCI-H69/CPR**

Fig. 1. Morphological features of WT (NCI-H69) and resistant to cisplatin (NCI-H69/CPR) small cell lung carcinoma NCI-H69 cells. Cells were imaged under phase-contrast microscopy

Incubation of NCI-H69 and NCI-H69/CPR cells was carried out for one and two days without and with TA at a concentration of 1 μg / ml. Through after day of cultivation, it was found that in the wild typecells, the expression level of TLR4 was 0.002613±0.000432 a.u., whereas on the second day of incubation this indicator increased slightly

and was 0.002814±0.000202a.u. With respect to the cisplatin-resistant cell line, almost twice the expression level of TLR4 was detected compared to the WT cells and this indicator did not change on the second day of incubation of cells under standard conditions (Fig. 2).



Fig/ 2. TLR4 expression level in NCI-H69 and NCI-H69 / CPR cells under standard incubation conditions

*-P<0.05 *vs* control (WT NCI-H69 cells)

Since no differences in the expression of TLRs at 1 and 2 days of incubation were detected, the expression of TLR4 under the action of TA was determined after 2 days of incubation. Preincubation of cells of both lines for two days with TA led to the following results: in WT cells it was possible to observe the increase of expression of TLR4 gene, whereas in the cisplatin-resistant cells we revealed a pronounced inhibitory effect of the TLR ligand (Fig. 3).

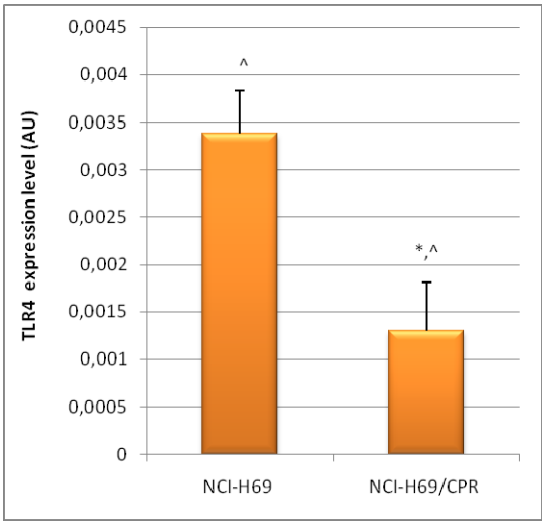


Fig. 3. TLR4 expression level in NCI-H69 and NCI-H69 / CPR cells by adding TA

*-P<0.05 *vs* WT NCI-H69, ^-P<0.05 *vs* cells without TA

Thus, It was shown that the TLR 4 expression level was almost twice lower in the WT cells than in the cisplatin-resistant cells. The effect of teichoic acid resulted in an increase of TLR4 expression in the WT cells line strain 1.3-times compared to control, whereas in cisplatin-resistant cells TLR4 expression level decreased 4-times compared to the sample without the effect of teichoic acid. The research conducted by Lewison carcinogeniclungsindicates a significantrole of TLR4 not only in tumor growth but also in migration [10]. The refore, inhibition of expression of the sereceptors may be considered as a new strategy for antitumorandan time tastaticaction. It is also possible to use inhibition of the expression of TLR by specific ligands in combination with antitumor agents in resistant tumors.

Conclusion.Thus, in cisplatin-resistant lung cancer cells found high expression of TLR4 can be inhibited by adding a ligand to TLRs.

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ТЕЙХОЄВА КИСЛОТА МОДУЛЮЄ ЕКСПРЕСІЮ ТОЛЛ-ПОДІБНИХ РЕЦЕПТОРІВ 4 У ЧУТЛИВИХ ТА РЕЗИСТЕНТНИХ ДО ДІЇ ЦИСПЛАТИНУ ЛІНІЯХ КЛІТИН ДРІБНОКЛІТИННОГО РАКУ ЛЕГЕНІ

Родина Тол-подібних рецепторів (ТПР) відіграє важливу роль у механізмах розвитку вродженої імунної відповіді, розпізнаючи молекулярні структури патогенних мікроорганізмів. ТПР здатні також відігравати певну роль у розвитку протипухлинної імунної відповіді. Вони можуть або сприяти пухлинному генезу, або пригнічувати його. Окрім того, стимулювання росту пухлинних клітин може бути пов'язане з набуттям лікарської резистентності. Дані про рівень експресії ТПР4 за пухлинного росту є суперечливими. Саме тому мета нашого дослідження полягала у визначенні рівня експресії ТПР4 у клітинах раку легені, чутливих та резистентних до дії цисплатину. Клітиниліній NCI-H69 та NCI-H69 / CPR (дрібноклітинний рак легені людини) використовували для визначення рівня експресії ТПР4. Інкубаціюклітин з теїхоєвою кислотою (1 мкг / мл) проводили в стандартних умовах упродовж двох діб. Рівень експресії ТПР4 у клітинах визначали за допомогоюRT-PCR при 7500 ПЛР-системах у реальному часі ("Applied Biosystems", США), специфічних праймерах та асиметричному циано-катіонному фторхромірі SYBRGreen (C32H37N4S +) при λmax = 488 нм флуоресценції при λmax = 522 нм. Було показано, що рівень експресії ТПР4 був майже вдвічі нижчим у клітинах WTH69 порівняно з клітинами H69, резистентними до цисплатину. На відміну від цього, тейхоєва кислота протилежно впливала на рівень експресії ТПР-4. У клітинах WTH69 рівень зріс у 1,3 раза, тоді як у клітинах H69, резистентних до цисплатину, зменшився у 4 рази порівняно з контрольними зразками без додавання тейхоєвої кислоти. Отже, у клітинах раку легені, резистентних до цисплатину з високою експресією ТПР4, можна інгібувати таку, додаючи ліганд до ТПР4.

Ключові слова: експресія ТПР4, лінія клітин резистентна до цисплатину NCI-H69, тейхоєва кислота.

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ТЕЙХОЕВАЯ КИСЛОТА МОДУЛИРУЕТ ЭКСПРЕССИЮ ТОЛЛ-ПОДОБНЫХ РЕЦЕПТОРОВ 4 ЧУВСТВИТЕЛЬНЫХ И РЕЗИСТЕНТНЫХ К ДЕЙСТВИЮ ЦИСПЛАТИНА ЛИНИЙ КЛЕТОК МЕЛКОКЛЕТОЧНОГО РАКА ЛЕГКОГО

Семейство Толл-подобных рецепторов (ТПР) играет важную роль в механизмах развития врожденного иммунного ответа, распознавая молекулярные структуры патогенных микроорганизмов. ТПР способны также влиять на развитие противоопухолевого иммунного ответа. Они могут как стимулировать опухолевый рост, так и подавлять его. Стимулирование роста опухолевых клеток может быть связано с приобретением лекарственной резистентности. Данные экспрессии ТПР4 при опухолевом росте противоречивы. Именно поэтому целью исследования являлось определение уровня экспрессии ТПР4 в клетках рака легкого, чувствительных и резистентных к цисплатине. Клетки линий NCI-H69 и NCI-H69 / CPR (мелкоклеточный рак легкого человека) использовали для определения уровня экспрессии ТПР4. Инкубацию клеток с тейхоевой кислотой (1 мкг/мл) проводили в стандартных условиях в течение двух суток. Уровень экспрессии TLR4 в клетках определяли с помощью RT-PCR при 7500 ПЦР-системах в реальном времени ("Applied Bio systems", США), специфических праймеров и асимметрическом циано-катионном фторхромере SYBR Green (C32H37N4S +) при λmax = 488 нм флуоресценции при λmax = 522 нм. Было показано, что уровень экспрессии ТПР4 был почти в два раза ниже в клетках WT H69 по сравнению с клетками H69, резистентными к цисплатине. В отличии от этого, показано, что тейхоевая кислота имела противоположное влияние на уровень экспрессии ТПР4. В клетках WT H69 уровень экспресии возрос в 1,3 раза, в клетках H69, резистентных к цисплатине – снизился в 4 раза по сравнению с контрольными образцами без добавления тейхоевой кислоты. Итак, в клетках рака легкого с высокойэкспрессией ТПР4, резистентных к цисплатине, можно ингибировать экспрессию, добавляя лиганд к ТПР.

Ключевые слова: екпресия ТПР4, линия клеток, резистентных к цисплатину NCI-H69, тейхоевая кислота.