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THE THERMOGRAPHIC STUDY OF SUPPOSITORIES WITH THE ANDROGENIC EFFECT

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Physical transformations of medicinal substances included in the composition of suppositories with the androgenic affect have been studied with the help of the thermographic method. According to the research results the absence of active substances interation has been found and the optimal temperature conditions for preparation of suppositories have been determined.

Male infertility treatment is exceedingly urgent question for medics and pharmacists of the whole world, inasmuch as in a half of cases the reason of impregnation impossibility is caused by the problems of male health [1, 14].

Male infertility can be stipulated by number of factors, such as: anatomical abnormality of genital organs, systematic diseases, intoxication of organism, mental disorders, taking of various medicaments, endocrine deviations and others.

Absence of treatment of genital organs' infectious-inflammatory diseases as well as erectile dysfunction can be the reason of male reproductive function disorder appearance [13].

Modern medicine proposes different methods of MI treatment (surgery, additional reproductive methods, medical therapy), however, the effectiveness of infertile patients therapy is very low for now. For this reason searching and creation of new medicine, that have the necessary biological activity remains a perspective direction in the field of andrology [14, 19].

At the chair of pharmaceutics of National pharmaceutical university (Kharkov) the elaboration of complex specimen in the form of suppositories of androgenic action is being conducted. The chose of current pharmaceutical is the most expedient at treatment of males' reproductive system disorder. Moreover the pharmaceuticals that are injected rectally to organism, omitting hepatic barrier, are absorbed immediately into bloodstream, thus stipulating the most immediate therapeutic effect [6, 11].

The objective of current investigation is valuation of thermostability of pharmaceuticals and additives at its' conjoint presence as well as substantiation of suppositories' preparation temperature conditions. That would afford to procure a product of needed quality, which would have homogeneity of aggregate, hardness, that provides usability, moreover that would afford to reduce the processing duration, which would positively affect on product cost [7, 20].

Every substance has typical thermal behavior, which depends on chemical structure of the substance, therefore it is possible to investigate the properties of individual substances as well as multicomponent systems by means of thermogram [10, 12, 18].

The change of chemical structure of pharmaceutical and additive begins, as a rule, after its heating up to definite temperature (narrow temperature interval) [8, 9, 15].

Materials and methods

The following substances were subjected to thermogravimetric analysis: arginine, zinc sulfate heptahydrade, lipofilic pollen load extract (LPLE) (LPLE, ТУ 2010936-002-95) and pharmaceutic of androgenic action, that was generated [2-4, 17].

The analysis of the substances was held on the derivatograph Q-1500 D, with "MOM" register, manufactured in Hungary. For derivatograms origination the optimum conditions were selected: weight 200±20 mg, temperature interval from 24 to 250°C, interval rate 2,5 s/min. The following curves were registered: T, TG, DTG, DTA. T curve — temperature variation, TG curve — mass variation, DTG curve — differential curve of mass loss variation, DTA curve — differential curve of heating effects. The sensitivity of derivatograph for TG curve — 50 mg, for DTG curve — 2,5 mV, for DTA curve — 100 mcV, paper travel speed — 2 mm/min [5, 16].

With a view to recognize the mass loss in the course of proportional increase of temperature the weight was placed into firepot and heating stove of derivatograph at a heating turned on. The data achieved in that way was graphically registered by derivatograph in the following coordinates: x-coordinate — time, y-coordinate — temperature increase, temperature difference — mass variation. Derivatogram represented the summation of simple $T=f(\tau)$ and differential heating curve $dT/d\tau=f(\tau)$ registered at the same time as well as simple $m=f(\tau)$ b differential mass loss curve $dm/d\tau=f(\tau)$. Comparison of the curves made it possible to fix the constitutional changes in the system (extraction of volatiles, thermal decompounding of substances etc). The temperature of thermal effect's finish in the system was accepted as a comfort temperature. The thermal effect's finish related to moisture abstraction and the moment during which melting and decompounding of substances didn't take place [21, 22].

Pursuant to fig. 1, arginine is characterized by sufficient thermostability: the process of thermal decom-

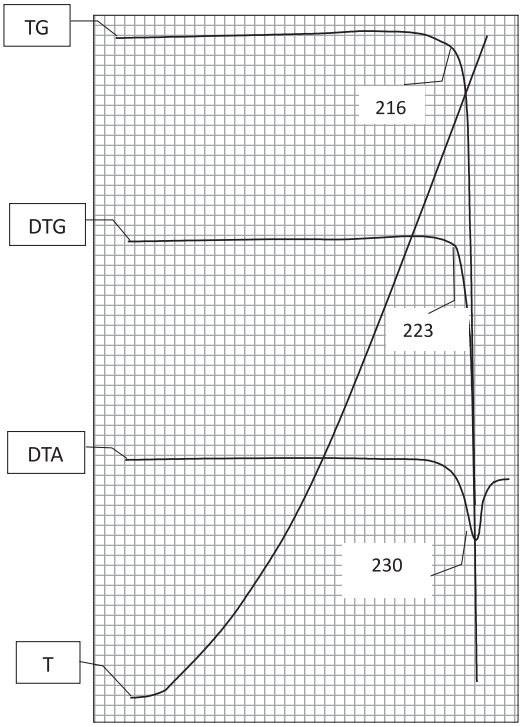

Fig. 1. Derivatogram of arginine.

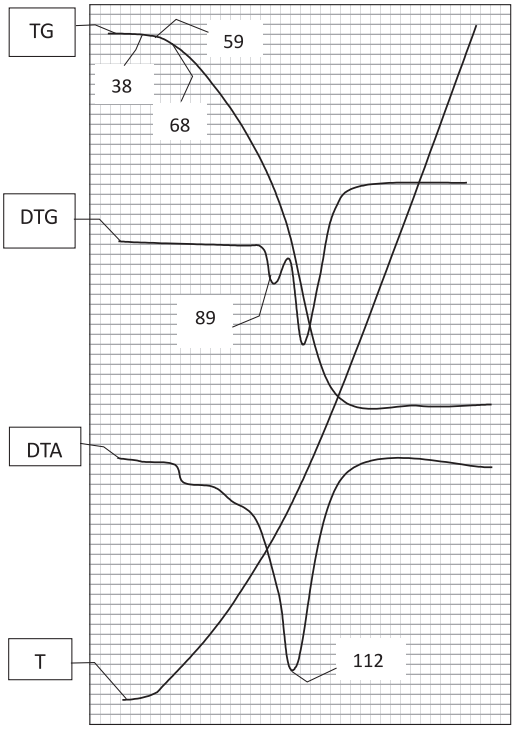

Fig. 3. Derivatogram of LPLE.

pounding begins at 216°C. Within the temperature limits from 216°C to 230°C the mass loss reaches 6%. The peak speed of substance decompounding is observed at a temperature of 230°C with endothermal effect occurrence.

Derivatogram of zinc sulfate (fig. 2) indicates the presence of individual decomposition process. The destruction with 14% mass emission of substance tested is observed within the temperature limits from 102°C to 250°C. The peak speed of substance decomposition is observed at a temperature of 230°C with endothermal effect occurrence.

Pursuant to fig. 3 the process of thermal decompounding of lipofilic extract of pollen load sample takes place within the temperature of 50-112°C with the presence of endothermal effect. Thermoanalitical curves show us that the thermal destruction of substance runs through two stages. The first stage is characterized by decompounding within the temperature from 50°C to 89°C with the peak separation speed at a temperature of 89°C. The mass losses reach 11%. The second stage of thermal destruction runs with intensive decompounding with more essential mass losses (within the temperature

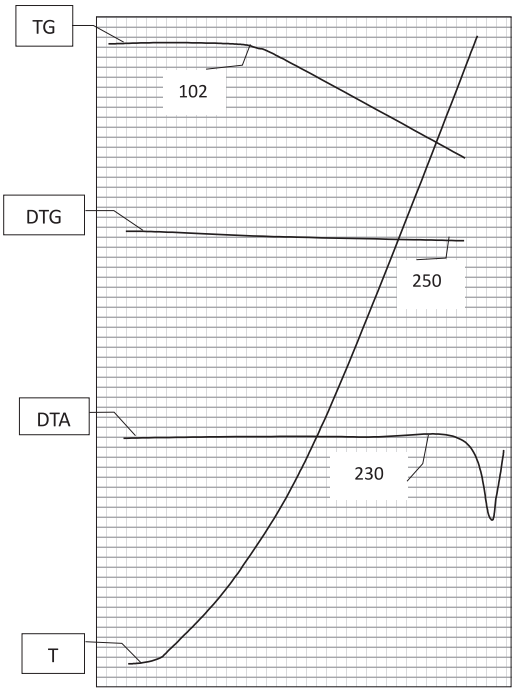

Fig. 2. Derivatogram of zinc sulfate heptahydrade.

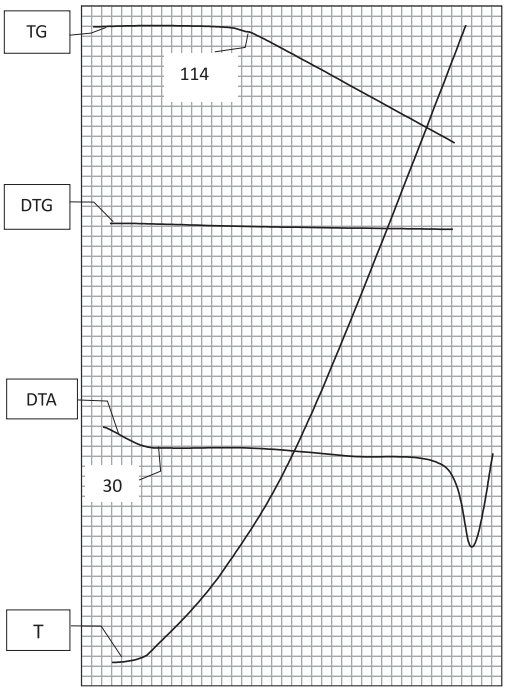

Fig. 4. Derivatogram of suppositories.

from 89°C to 112°C the mass loss is 31%). The peak speed of substance separation is observed at a temperature of 112°C.

On fig. 4 we can observe an insignificant endothermal effect at a temperature of 30°C. Decompounding of the substance with a 6% mass loss begins at a temperature of 114°C.

Among the studied suppositories' substances LPLE is the least temperature stabile. Its initial stage of decompounding begins at a temperature of 50°C. Considering the fact that vitamin complex included as a part of lipofilic extract of pollen load comes to destruction at that temperature, we may conclude that the most rational temperature for suppositories preparation is 40°C. The other substances do not change their physicochemical properties at that temperature.

CONCLUSIONS

1. Physical and chemical transformations under the heating influence of actve substances and additives were investigated by means of derivatograms.

2. The absence of pharmaceuticals and additives interaction in the suppositories of androgenic effect was proved.

3. In accordance with the findings of thermogravimetric analysis the rational temperature of suppositories preparation was proved.

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ТЕРМОГРАФИЧЕСКИЙ АНАЛИЗ СУППОЗИТОРИЕВ АНДРОГЕННОГО ДЕЙСТВИЯ

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Термографическим методом изучены физические превращения лекарственных веществ в составе суппозиториев андрогенного действия. По результатам исследования установлено отсутствие взаимодействия действующих веществ и определен оптимальный температурный режим приготовления суппозиториев.

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ТЕРМОГРАФІЧНИЙ АНАЛІЗ СУПОЗИТОРІЇВ АНДРОГЕННОЇ ДІЇ

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За допомогою термографічного методу вивчені фізичні перетворення лікарських речовин у складі супозиторіїв андрогенної дії. За результатами дослідження встановлена відсутність взаємодії діючих речовин та визначений оптимальний температурний режим виготовлення супозиторіїв.