

MEANS FOR TEMPERATURE CONTROL OF DRUG TRANSPORTATION

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Introduction. One of the main aims for quality preserving of drugs is providing of appropriate temperature regime during all stages of turnover. It's especially important to control it during transportation, because it is performed mainly by non-pharmaceutical personnel, and frequently by outside organizations. Control for temperature regime acquires a special urgency in a case of immunobiological drugs which are the most thermolabile.

So, according to WHO data about 25% of vaccines are delivered spoiled because of violation of transportation and/or storage regimes, moreover, they are not fixed by the control equipment. It is obvious, that application of such drugs can cause direct health hazard and even death for patients.

Aim. The purpose of the given work is study of assortment and working principles of means for controlling temperature regimes at all stages of commodity movement of drugs including transportation (shipping).

Materials and methods. In the work a lot of information sources were used including normative documents, journal articles, Internet sources, concerning assortment of modern means for control of temperature regime and their comparative characteristics.

Results and discussion. For today exists three types of devices for control of temperature regime during delivery of drugs: heat indicators, thermoregistrars and RFID-gauges, i.e. radio-frequency identifiers.

Heat indicators by their action principle are subdivided on capillary, chemical and electronic ones.

Capillary heat indicators allow eliciting the fact of influence of temperature below liquid freezing point.

The chemical heat indicator represents painting substance rendered onto a basis, that irreversible changes its colour under the influence of temperature above a determined threshold during established time.

The working principle of electronic heat indicator is based on measurement of temperature of environment in which there is a heat indicator, and finding time in the specified environment.

To prevent possible falsification of indications each heat indicator should have its own personified number.

The main advantages of heat indicators are simplicity of use and cheapness. The impossibility of determination of the exact moment and duration of negative

temperature influence on controllable product is their basic lack.

Thermal recording devices or electronic recorders are deprived the above-stated lacks and for today are considered as more effective temperature monitors. The most optimal by the sum of parameters are devices ThermoChron made by company Dallas Semiconductor.

ThermoChron provides accumulating in its own memory information about 2048 events within temperature ranges $-40\text{ }^{\circ}\text{C} - +85\text{ }^{\circ}\text{C}$ with relative error not more $\pm 1\text{ }^{\circ}\text{C}$. Value of the minimum gradation of temperature recorded by the device thus constitutes $0.125\text{ }^{\circ}\text{C}$. Obtaining of the results which have been saved up by devices ThermoChron, and also task of new values of adjusting parameters for continuation of their work are performed by means of the usual personal computer or specialized portable microprocessor devices.

Devices ThermoChron are placed in the control points of temperature control, for example, in refrigerators with thermolabile medicines or in thermocontainers, used for delivery of drugs critically sensitive to temperature conditions.

In spite of the fact that wholesale price of heat indicators constitutes 1 dollars, and devices ThermoChron – 20 dollars, advantages of thermo registers are obvious: recurrence of application (heat indicators - basically, are of single use), thermal time lag of heat indicators is 5-10 more, than of ThermoChron devices, depending on their modification sensitivity of operation of thermo registers – $0.125\text{ }^{\circ}\text{C}-0.5\text{ }^{\circ}\text{C}$; it's 10 times above, than for heat indicators.

Now the most perspective technology is RFID (Radio-Frequency Identification) allowing completely to supervise and improve logistic processes. However introduction of this technology in warehouse logistics occurs slowly. The reasons for this are: unwillingness to reconstruct the system which has developed by years of work or fear of introduction economic inefficiency, absence of complete and trustworthy information about technological advantages of RFID technology.

Huge advantages of RFID technology is possibility of remote monitoring of cargo condition, especially temperature regime of transportation.

Conclusions. The choice for means of registration of a temperature regimens is crucial for provision and preserving of quality of medical products not only during transportation, but also and at their storage in warehouses, in drugstores and pharmaceutical enterprises. The optimal for today is application of thermo registers, proceeding from a ratio price/efficiency/availability/easy in use. The radio-frequency labels which are built-in into drug package are the most perspective technology of the near future. Now this approach becomes more and more cheaper and it seems to be the only and the best, easiest way to ensure quality of drugs and other related commodities.