

# Significance of Morphological and Entomological Studies for Establishing the Remoteness of Death in the Conditions of a Hot Arid Zone

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**Abstract** It is shown the relevance of carrying out morphological and entomological studies to establish the remoteness of offensive of death in a hot arid zone. It is emphasized that a comprehensive assessment of the dynamics of the development of cadaveric changes, supravital reactions and entomofauna with the results of morphological and morphometric studies of the brain and some other organs in certain groups, taking into account the climate of the seasons of the year in Uzbekistan, can become the basis for solving this problem.

**Keywords** Remoteness of offensive of death, Hot arid zone

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## 1. Actuality of the Problem

The problem of establishing remoteness of offensive of death (OD) up to the present time around the world remains a very actual task of forensic medicine and methods for determining OD are constantly being improved.

The OD is determined on the basis of the dynamics of the development of cadaveric changes, reactions of organs and tissues for chemical, mechanical and electrical irritations (supravital reactions). They are complemented by the results of biochemical, biophysical, immunological and other laboratory methods of studies, by the methods of mathematical modeling of postmortal processes, as well as entomological studies [1,4,7,12,21]. Unfortunately, none of the listed methods give absolutely accurate results.

Among the problems of geographical forensic medicine in addition to determining regional characteristics in the structure of mortality, differences in the etiology, patho- and tanatogenesis of pathological conditions are important as well as the definition of OD [17]. The hot arid climato-geographical zone is characterized by high temperatures and low relative humidity air. It covers significant private space of the globe including based territory of Uzbekistan. One cannot be disregarded to

consider the fact that global warming is occurring all over the world. Research in this topical field of forensic medicine was carried out over many decades, but they are not numerous.

## 2. Aim of Research

To determine the relevance and further morphological and entomological studies for establishing of OD in the conditions of a hot arid zone.

The world scientific literature data of the last decades on the problem of establishing of OD has been studied and analyzed.

Currently, morphological methods are widely used in the assessment of OD. Within 72 hours after death, the thickness corneal stroma of the rabbit and the thickness of the entire cornea have been increased by 12 hours after death and reached a peak of 54 hours after death. These two corneal parameters showed a positive correlation with the postmortal interval and can be used to assess of OD [11]. Studying the degree of postmortal destruction of articular cartilage can also be useful for estimating the supposed postmortal interval [18]. There is a high correlation between the human skeletal muscle myofibrillae fragmentation index and the postmortal interval, it is believed that this method can be used to estimate the early postmortal interval (especially in the first 12 hours) [19]. With *invivo* altered protein metabolism in skeletal muscles, tropomyosin was stable over a period of all studying the postmortal interval. In contrast, significant postmortal changes occurred in the band patterns of desmin and vinculin proteins [24]. It was determined a

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Published online at <http://journal.sapub.org/ajmms>

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certain regularity in increasing a number of destructively changed cortical neurons and brain vessels in various date of the postmortal period after massive blood loss and hemorrhagic shock [9]. The dynamics of morphological manifestations of autolysis in brain tissue are described [2].

The duration of the period of ultrastructural changes in the organs of male Wistar rats occurring posthumously *in situ* was organ-specific. First of all, ultrastructural changes most commonly occur in the kidneys. In hepatocytes morphological degeneration occurs later than in the epithelium of the renal tubules, and earlier than in the myocardium. Skeletal muscles show the greatest delay in postmortal changes. Two forms of nuclear changes were found in the epithelium of the distal tubules and acinar cells of the pancreas: one looked like a necrotic, and the other - apoptotic [20]. Before using the ultrastructure for the evaluation of OD in practical terms, further research is needed. They must be carried out on human samples obtained at regular intervals after death at decreasing temperatures [8].

Necrobiota is the main factor causing decomposition of the corpse. The study of microbial succession is based on monitoring the composition of the community and changing diversity at each stage of decomposition. Hot points of researches in forensic microbiology was the identification of microbial sequences in the process of decomposition of the corpse and interpretation of the essence of various phenomena of decomposition using high-throughput sequencing, which can provide a new reference for the evaluation of postmortal interval [7]. Most forensic-medicinal studies that are used to better understand how to estimate the postmortal interval, involve the study of the physical and chemical characteristics of decomposition and the influence of environmental factors on the decomposition process. Forensic entomology uses the life cycles of arthropods such as Diptera (flies) and Coleoptera (beetles) deposited on a decomposing corpse to determine the postmortal interval [5]. The rate and type of postmortal processes also vary under different climatic conditions and biocenosis different composition. The entomofauna of corpses are influenced by climate, soil and other regional conditions [10,13,15]. Data on insect ecology and bionomics in tropical countries are still scarce, despite their relevance for forensic-medicinal research. It was carried out diversity and temporal pattern of colonization of necrophagic beetles on pig carcasses in dry forest areas in North-Eastern Brazil [14].

Using pig carcasses, initial data on the rates and patterns of land decomposition in the summer and winter in two different places in the criminally significant area of Cape Town were established. The results of the study show that it is not appropriate to apply models developed for one region to any other and confirm the importance of establishment regional specific indicators for assessing the postmortal interval in a forensic-medicinal context. Alternatively, it seems that more complex models should be developed using a more complete set of variables affecting to the rate and

nature of decomposition [6]. Experiments were developed in which domestic pigs were buried and then excavated and observed for 15 months in Edmonton, Alberta. Data recorded after 2, 5 weeks, 3 months, 1 year and 15 months correlated with decomposition stages, as well as time after death, climatic data, type of grave, clothes, burial depth, and other factors. Pigs buried in June were skeletonized after about 3-5 weeks, while pigs buried in May were skeletonized between 5 weeks and 3 months. Climate data, insects, and the type of grave contributed the most to progressive decomposition, mainly in the form of mummification and skeletonization [22].

Regional researches in forensic medicine are becoming increasingly important. Gender, race, and weight can be significant indicators in forensic studies. In general, organs from African and colored corpses weigh less than organs from white corpses [16]. At the same time, the study of the influence of individual factors such as gender, age, and *in vitro* tissues on the postmortal interval using a Fourier transform IR spectrometer (FTIR) in experiments on animal from zero to 48 hours in all experimental groups revealed no significant changes compared with control. Gender, age, and *in vitro* tissues cannot be used as factors contributing to postmortal interval estimation using FTIR spectroscopy [23].

A thorough understanding of physical and chemical changes occurring in the body after death is crucial for the accurate interpretation of gross and microscopic pathologies in autopsy. In addition, knowledge of postmortal processes and the factors influencing them will help in assessment of the postmortal interval.

Despite of numerous studies, the accuracy in estimating the time of death has not improved significantly, and no method can be reliably used to accurately estimate the time of death. In formulating such an assessment, great care should be taken, since it depends on many indirect and environmental factors, and the accuracy of the assessment decreases as the postmortal interval increases [3].

Adducted data indicate the relevance of further targeted morphological studies of organs (tissues), as well as studies of the entomofauna cycles at different times of the postmortal period, with the aim of establishing of OD in the conditions of a hot arid zone, for example, with regard to the regions of Uzbekistan. We believe that a complex assessment of the dynamics of cadaveric changes, supravital reactions with the results of morphological, morphometric studies of the brain and some other organs, as well as studies of the development of entomofauna in certain groups may allow us to develop additional criteria for establishing of OD in the conditions of a hot arid zone.

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## REFERENCES

- [1] Babkin E. P., Bolotin S. A. About the possibility of the establishment of limitation causing injury and time of death by the dynamics of change of the temperature characteristics of the liver. Forensic medicine. 2017 is No. 4. — Pp. 8-11.

- [2] Bogomolova I. N., Bogomolov D. V. The in Vivo necrosis and postmortem autolysis: the problem of differential diagnostics. *Izbrannyye Voprosy about Sy is judicial-medical examination.* - Khabarovsk, 2012. - No. 12. - P. 25-31.
- [3] Brooks J. W. Postmortem Changes in Animal Carcasses and Estimation of the Postmortem Interval. *Vet Pathol.* -2016. -53 (5), 929-40.
- [4] Buromsky I. V., Sidorenko E. S., Ermakova, Y. V. Modern state and ways of further enhancing the establishment of prescription of death coming Judicial-medical examination.-2018. - No. 4. - p. 59-62.
- [5] Finley S. J., Benbow M. E., Javan G. T. Microbial Communities Associated With Human Decomposition and Their Potential Use as Postmortem Clocks. *Int J Legal Med.* May. -2015. -129 (3), 623-32.  
DOI: 10.1007/s00414-014-1059-0.
- [6] Forbes M. N., Finaughty D. A, Miles K. L., Gibbon V. E. Inaccuracy of Accumulated Degree Day Models for Estimating Terrestrial Post-Mortem Intervals in Cape Town, South Africa. *Forensic Sci Int.*-2019.-296, 67-73.
- [7] Fu X. L., Guo J. J., Liu Z. Y., Shen X., Cai J. F. Application of High-throughput Sequencing in Researches of Microorganisms of three bands: cadaveric and Postmortem Interval Estimation. [Article in Chinese, English]. *Fa Yi Xue Za Zhi.* Oct 2018. -34 (5), 475-481.  
DOI: 10.12116/j.issn.1004-5619.2018.05.004.
- [8] Hostiu C. S., At Rusu M. C., Mănoiu V. S., Vrapciu D. A., Negoiu I. T., Popescu M. V. Usefulness of Ultrastructure Studies for the Estimation of the Postmortem Interval. A Systematic Review. *Rom J Morphol Embryol.* -2017. -58 (2), 377-384.
- [9] Indiaminov S. I., Jumanov Z. E. The Morphology of the cerebral cortex at the point of death from blood loss at different times of postmortem period. *Medical journal of Uzbekistan.* - 2019 - №6. -With 51-54.
- [10] Lavrikova O. S., Popov V. L., Lyabzina S. N., Sidorova N. and Prikhodko A. N. The change in temperature of a corpse in process of decomposition (experimental study). *Forensic medical examination.* - M., 2017. - No. 3. - 19-22.
- [11] Li X. N., Zheng J. L., Hu Z. G., Wang B. J. [the Relationship Between Corneal Thickness and Postmortem Interval in Rabbit]. [Article in Chinese]. *Xue Za Zhi Fa Yi.* -2013. -29 (4), 241-3.
- [12] Madea B. Methods for Determining Time of Death. *Forensic Sci Med Pathol.* 2016.-12 (4), 451-485.  
DOI: 10.1007/s12024-016-9776-y.
- [13] Marchenko M. I. Methodology of the retrospective definition of the beginning of the development of insects on the corpse. *Judicial-medical examination.* - 1989. - No. 9.-S. 17-20.
- [14] Mayer A. C., G. Vasconcelos S. D. Necrophagous Beetles Associated With Carcasses in a Semi-Arid Environment in Northeastern Brazil: Implications for Forensic Entomology. *Forensic Sci Int.* 2013. -226(1-3). -41-5.  
DOI: 10.1016/j.forsciint.2012.11.019.
- [15] Osminin V. A., Semikin Y. V. Issues of entomology in forensic medicine. *Modern problems of forensic medicine and expert practice.* -Vol. 9.- Izhevsk: Examination, 1997.-S. 138-143.
- [16] Peddle L., Kirk G. M. Postmortem Organ Weights at a South African Mortuary. *Am J Forensic Med Pathol.* -2017.-38 (4), 277-282.
- [17] Pigolkin Yi, Balashov M. K., Bogomolova I. N. The importance of studies of regional differences for the theory and practice of forensic medicine. *Examination problem in medicine.* -2003. -№10-2. - P. 26-31.
- [18] Rogers C. J., Clark K., Hodson B.J., Whitehead M. P., Sutton R., Schmerer, W. M. Postmortem Degradation of Porcine Articular Cartilage. *J Forensic Leg Med.* -2011. -18 (2), 52-6.
- [19] Shen L., Rui. R. Z., Bian J, He M., Zhao Z. Q. [the Relationship Between Myofibril Fragmentation Index and Postmortem Interval] [Article in Chinese] *Fa Yi Xue Za Zhi.* -2017, 33 (6), 592-594.
- [20] Tomita Y., Nihira M., Ohno Y., Sato S. Ultrastructural Changes During in Situ Early Postmortem Autolysis in Kidney, Pancreas, Liver, Heart and Skeletal Muscle of Rats. *Leg Med (Tokyo).* -2004. -6 (1), 25-31.
- [21] Vavilov A. Y., Kuzovkov A. V. The Method of determining prescription of person's death the value of the tympanic temperature of the corpse. *Medical examination and the right.* 2017 is No. 3. — S. 42.
- [22] Weitzel M. A. A Report of Decomposition Rates of a Special Burial Type in Edmonton, Alberta From an Experimental Field Study. *J Forensic Sci.* 2005, 50 (3), 641-7.
- [23] Xuan M.-G., Fu G.-W., Liu F., Meng H.-T., Wang Z.-Y. The Impact of Gender, Age and Tissues in Vitro on Estimating Postmortem Interval by FTIR Spectroscopy. *Fa Yi Xue Za Zhi.* -2013. -29 (1), 1-4.