

Кто цитирует и в какой публикации: M.V.Volkenstein
Mechanochemical Processes.
В: General Biophysics, т. 1, гл. 5, стр. 218-298.
Academic Press, INC. Published by Elsevier Inc. (1983)
PDF, 4.34 MB <https://ur.booksc.eu/book/76211799/fcf2ca>

Транслитерация ФИО: *Deshcherevsky*,

Цитируемая работа В.И.Дещеревского в списке литературы цитирующей публикации:

Стр. 296 References

(Следует отметить, что из 144-х ссылок обзора – три на публикации Дещеревского. Но особенность данного обзора в том, что под одним номером приведены ссылки сразу на несколько публикаций! Так что на самом деле в обзоре даны ссылки на шесть публикаций Дещеревского).

[116] – три публикации:

- 1) V.I. *Deshcherevsky*, Biofizika 13, 928 (1968). (In Russian)
[Дещеревский В.И. Две модели мышечного сокращения. Биофизика **13**, № 5, 928—935].
- 2) V.I. *Deshcherevsky*, Biorheology 7, 147 (1971)
[Deshcherevsky V. I. A kinetic theory of striated muscle contraction.—«Biorheology», 1971, 7, 147—170].
- 3) V.I. *Deshcherevsky*, Stud. Biophys. 33 (3), 157 (1972).
[Deshcherevsky V. I. A theoretical approach to muscle contraction.—«Studia biophysica», 1972, 33, Н. 3, 157-165].

[117] V.I. *Deshcherevsky*. "Mathematical Models of Muscular Contraction".
Nauka, Moscow. 1977.

[В.И. Дещеревский. Математические модели мышечного сокращения. Наука. Москва. 1977 г.]

[124] – две публикации:

- 1) V.I. *Deshcherevsky*, Biofizika 15, 53 (1970) (in Russian)
[Дещеревский В. И. Теория сокращения асинхронных мышц. «Биофизика», 1970, 15, № 1, с. 53—61]
- 2) V.I. *Deshcherevsky*, J. Theor. Biol. 64, 517 (1977).
[Deshcherevsky V. I. Kinetic model of regulation of muscle protein activity. «J. Theoret. Biol.», 1977, 64, 517—534].

Цитаты:

Стр. 252-253.

It was A. Huxley [114] who made the very first attempt to elaborate a quantitative physical theory based on the sliding model.

...

A. Huxley's theory was simplified and improved by *Deshcherevsky* [116, 117] who investigated three states of the cross-bridges: closed cross-bridges developing a pull; closed cross-bridges impeding the sliding of the threads; and disconnected cross-bridges. The cross-bridges contact each other independently and pull the threads, thus causing active contraction; then the same cross-bridges brake the movement, since the threads have shifted; and finally, the cross-bridges are disconnected. Denoting as n_0 the total number of active HMM projections in half the thick filament, as n the number of the pulling cross-bridges, and as m the number of hindering ones, we get the following kinetic equations:

$$n = k_1 (n_0 - n - m) - (v/L) n, \quad (5.34)$$

$$m = (v/L) n - k_2 m. \quad (5.35)$$

Here, v/L is the rate constant of the transformation of pulling bridges into hindering ones, which is equal to the velocity of the relative movement of the filaments v divided by the distance L

between the two neighboring active sites of actin on which a bridge can be closed. An expression of Newton's second law is added to these equations:

$$M \dot{v} = f_0 (n - m) - f n_0, \quad (5.36)$$

[В дальнейшем тексте подробно рассматриваются основные положения кинетической теории В.И. Дещеревского без упоминания его фамилии].

Смп. 254.

Consequently, there should be another cycle setting into motion Desscherevsky's cycle. This second cycle is a closed chain of the chemical transformations when ATP is split.

Desscherevsky's theory provides a correct stationary solution for the isotonic contraction.

However, it gives no explanation of the development of the stress during the isometric contractions.

...

Desscherevsky was the first to obtain Hill's equation theoretically. We see that Desscherevsky's cycle includes no reverse processes.

Later Hill gave up this theory, mainly because the force P_0 is not constant but rather depends on the length of the sarcomere (see p. 239) [120]. It is evident that the theory of muscle contraction cannot be elaborated within the framework of equilibrium thermodynamics. This theory requires the consideration of kinetic processes.

Further works by Hill and co-workers are devoted to an improvement of Huxley's theory [121, 122]. However, it proved impossible to examine the problems in these works in such a simple and clearcut form as in the work by Desscherevsky. A paper by Hill *et al.* [106] contains a review of a number of alternative sliding models.

The theory of the non-stationary kinetic behavior of the muscle was also dealt with in numerous publications [108, 113, 116, 117, 123 —125a]. We shall examine these problems in Section 5.10.

Смп. 259-260.

It is quite natural that this theory yields results that are equivalent to Huxley-Desscherevsky theory (see p. 253). Now let us compare the formulas.

...

In the aforementioned theory, friction occurs as a result of the opening and closing of the cross-bridges, inasmuch as these processes require an energy of activation. It is only natural that the friction coefficient proves to be exponentially dependent on temperature. In the macroscopic theory, the molecular model is replaced with the Huxley-Desscherevsky formal model (the bridge either pulls or hampers), although in reality these phenomena are supposed to occur simultaneously. The advantage of this theory is that it is in accordance with the principle of microscopic reversibility and directly expresses the kinetic constants in terms of the molecular parameters L , $\cos \theta$, G , and f_0 . This explains the temperature dependence of b and, as we shall see, of f_0 .

According to the aforementioned theory, the cross-bridges are closed independently of one another. Is this supposition well grounded? Or can we assume that there is cooperativity in the sense that the closing of one cross-bridge exerts an influence on the closing of others? This is not the first time that the concept of cooperative allosteric properties of actin has been suggested.

Смп. 267.

Measurements of isometric stress at a fixed potential are reported by Desscherevsky [134]. The development of stress in time is described by a sum of two exponentials. The temperature dependence of the rate of the process corresponds to the barriers $G_1 \sim 19$ -20 and $G_2 \sim 15$ -16 kcal mol⁻¹. At the same time, the height of the barrier for the diffusion of Ca²⁺ from the reticulum, which is determined by the speed of the saturation of the reticulum with Ca²⁺ [135], amounts to 18-20 kcal mol⁻¹.

[Примечание. В этом абзаце ошибка в цифре ссылки [134]. Правильная цифра, по-видимому, [124], где приведены две публикации В.И.Дещеревского].

Стр. 273-274.

The time to establish the stationary state can be found with the help of the equations of Descherevsky, (5.34) and (5.35), assuming that $m = 0$.

...