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Modulations of molecular signaling mechanisms in smooth muscles excitable cells by titanium dioxide nanoscale material

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Applying isometric contractile measuring system was investigated the influence of titanium dioxide nanoparticles (TiO₂) on spontaneous and histamine-, nicotine- (acetylcholine-nicotine)-stimulated modulations of mechanical activity in rats' *caecum* and *antrum* circular smooth muscles. The nanoparticles of TiO₂ (PlasmaChem GmbH, D-12489 Berlin, Germany) were used in the form of nanopowder (a mixture of rutile and anatase), the average size of particles was (21 ± 5) nm (the measurements were conducted using a scanning electron microscope *Tescan Mira 3 LMU*), specific area – (50 ± 10) sq.m./g; purity > 99.5 %, content of Al₂O₃ < 0.3 % wt; SiO₂ < 0.2 % wt. It was revealed that relaxation of *caecum* smooth muscles stripes (SMS) stimulated by 10⁻⁵ mol/l nicotine on the background of histamine (10⁻⁵ mol/l) contraction was not affected by TiO₂ (10⁻³ mg/ml); under the same conditions TiO₂ reinforced the histamine-induced contractions. The cumulative increase of TiO₂ from 10⁻⁶ to 10⁻⁴ mg/ml range was accompanied by inhibition of SMS contractions stimulated by histamine (10⁻⁵ mol/l) and nicotine (10⁻⁷ mol/l). Similar results were obtained on stomach SMS. The phase component of acetylcholine contraction modulated by nicotine was unaffected to TiO₂, whereas the tonic component was inhibited. Consequently, in cumulative effect conditions the suspension of TiO₂ nanoparticles modulates mechanisms of neurotransmitter release, activated by histamine and nicotine on its background (10⁻⁷ mol/l), from intramural plexuses neurons of gastrointestinal tract circular smooth muscles.