

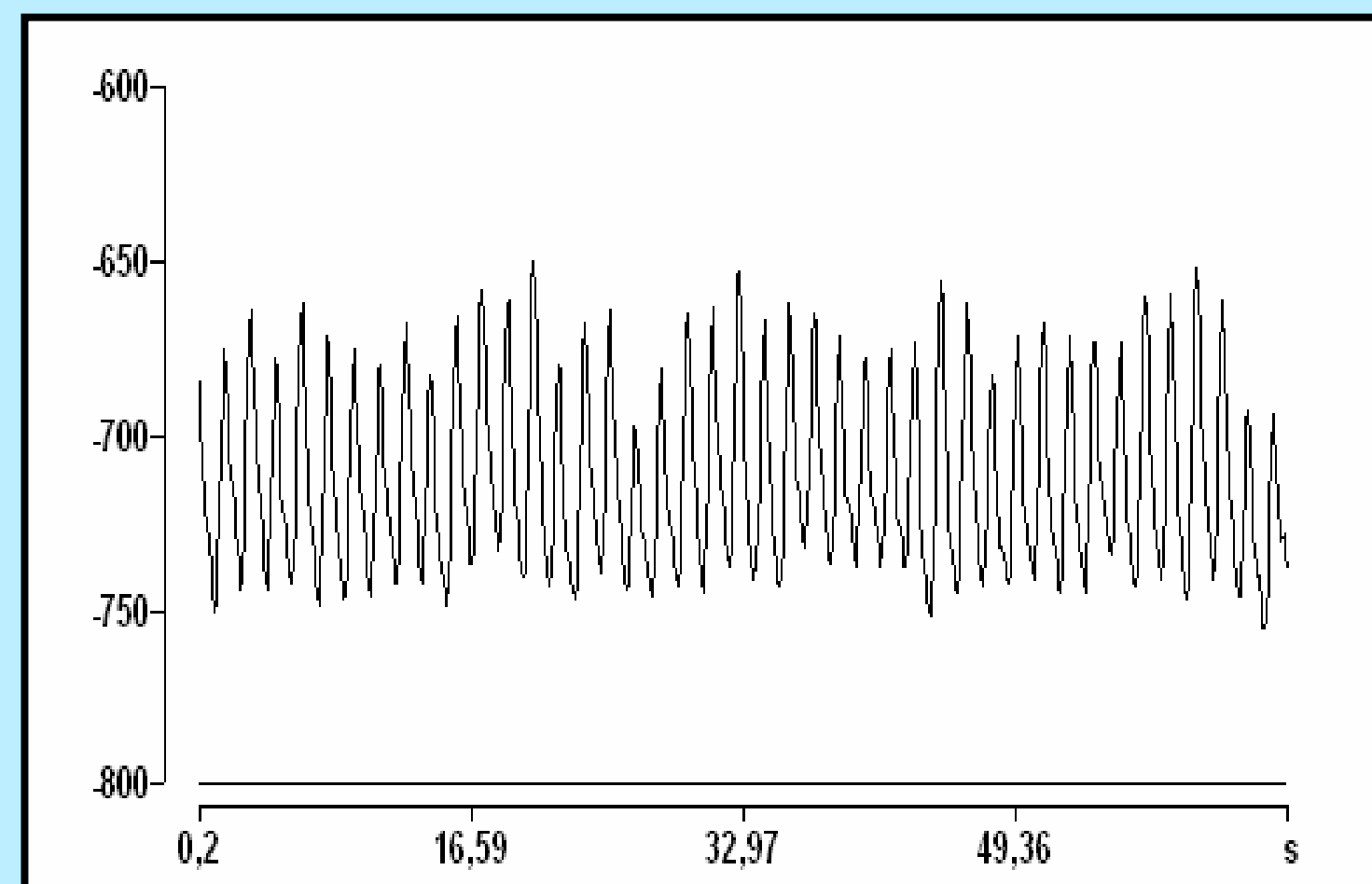
TOLERABLE PESTICIDE CONTAMINATION IN FOOD - MOTILITY CHANGES OF RAT ILEUM AS A NEW BIOMARKER OF TOXICITY TESTING

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Contraction pattern of control ileal segment



There are growing numbers of pesticides on the market, which act on different target tissues in living organisms. Therefore the need for agrochemical analyses with bioscience tools is evident and necessary for a meaningful quality and health risk assessment.

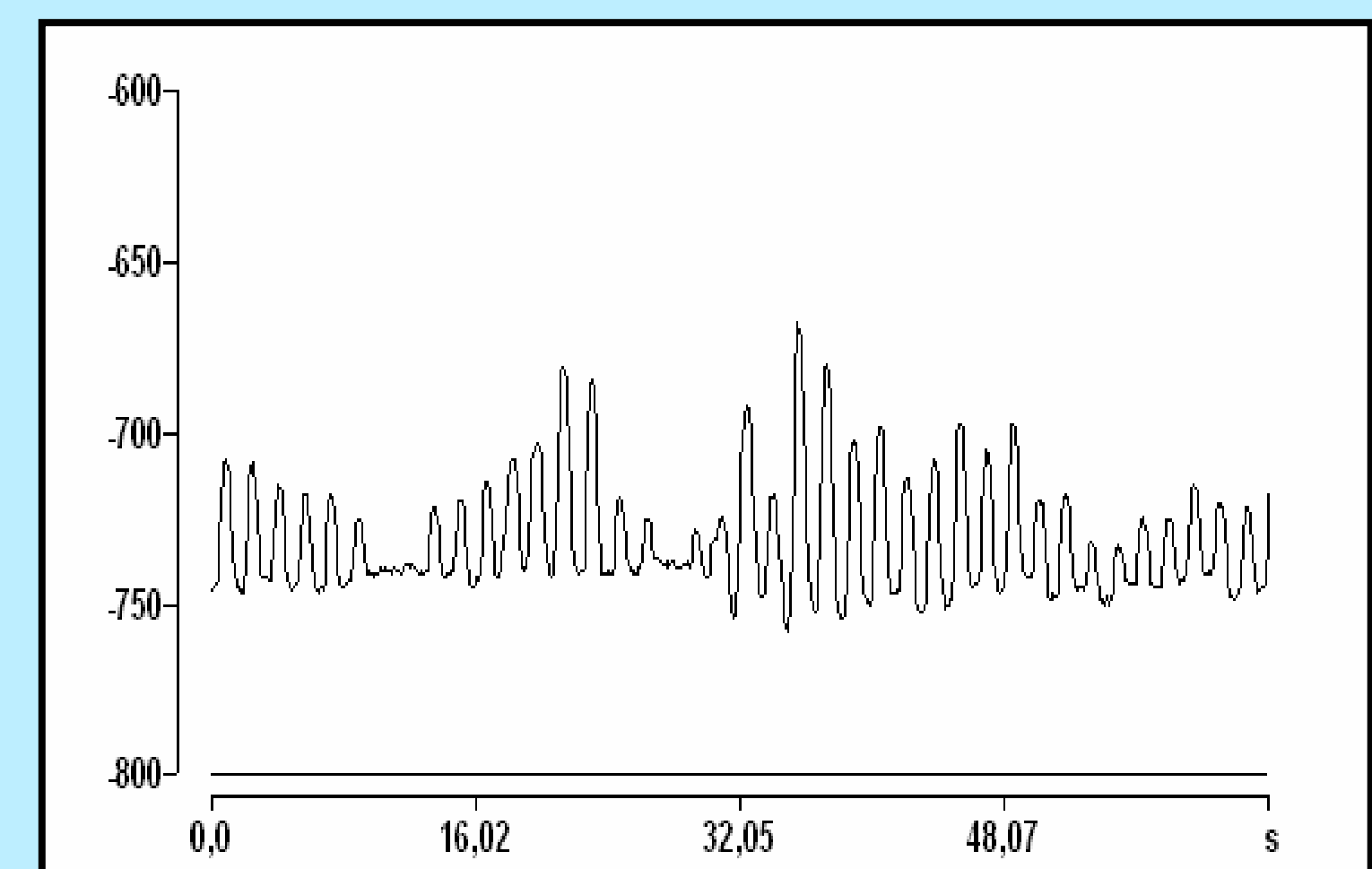
Results obtainable by bio-sensing techniques and life science tools, where living organisms or living tissues are used as biosensors, can be applied directly in food safety regulation and production technologies helping the risk assessment of pesticides under analytical detection limit and to select them with less harmful effect. A new quantitative in vitro bio-sensing method can reveal functional impairment of the ileum in an early, reversible stage of harmful agrotoxic agent exposure.

Among pesticides, insecticidal compounds might be most dangerous to non-target mammals and humans. Many insecticides act on the nervous system but intoxicated persons usually suffer also from gastrointestinal symptoms (nausea, diarrhea, etc.).

Isolated intestinal preparations (so-called Magnus-preparations) display regular peristaltic activity in vitro due to the presence of the autonomic nervous system, but they can be examined without the influence of the central nervous system and the hormonal system

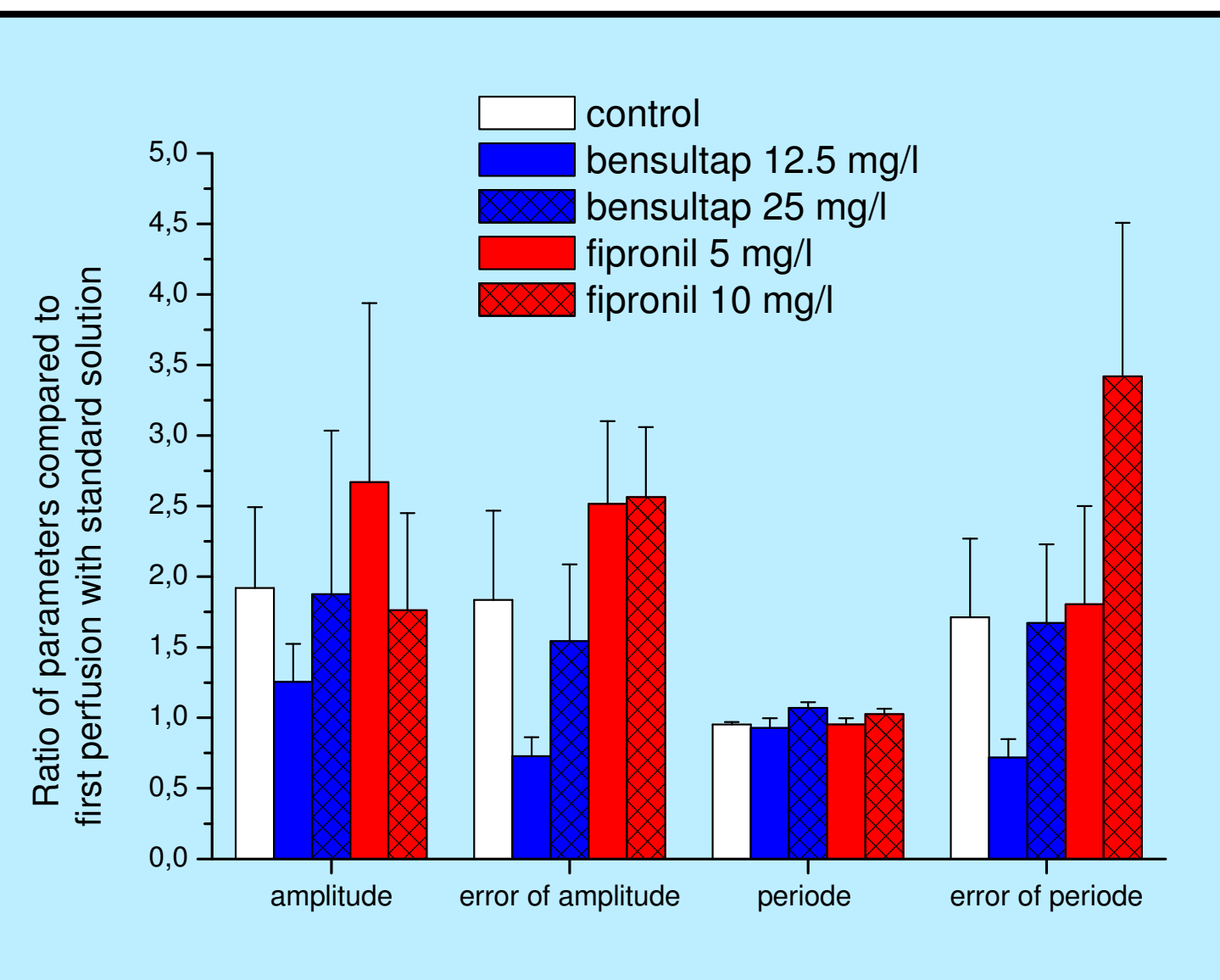
The effects of two insecticides (bensultap, fipronil) were studied on the contraction pattern of rat ileum segments.

Contraction pattern in 10 mg/l fipronil



Contraction pattern of ileal segments in standard solution was regular, the amplitude of contractions was uniform, or regular spindles appeared.

This treatment caused the disruption of the pattern, which became more irregular. The bigger concentration of fipronil, perfused during 45 min, had the most explicit effect among treatments



The value that mostly differed from the starting condition was selected and its ratio to the starting condition was calculated. **Bensultap** treated slices didn't show much difference from the control, although the smaller concentration seemed to reduce the amplitude and the error of amplitude and period of the contractions. **Fipronil** had a more considerable effect: the smaller concentration increased amplitude and both concentrations increased the error of the parameters, which means that the pattern became more irregular.

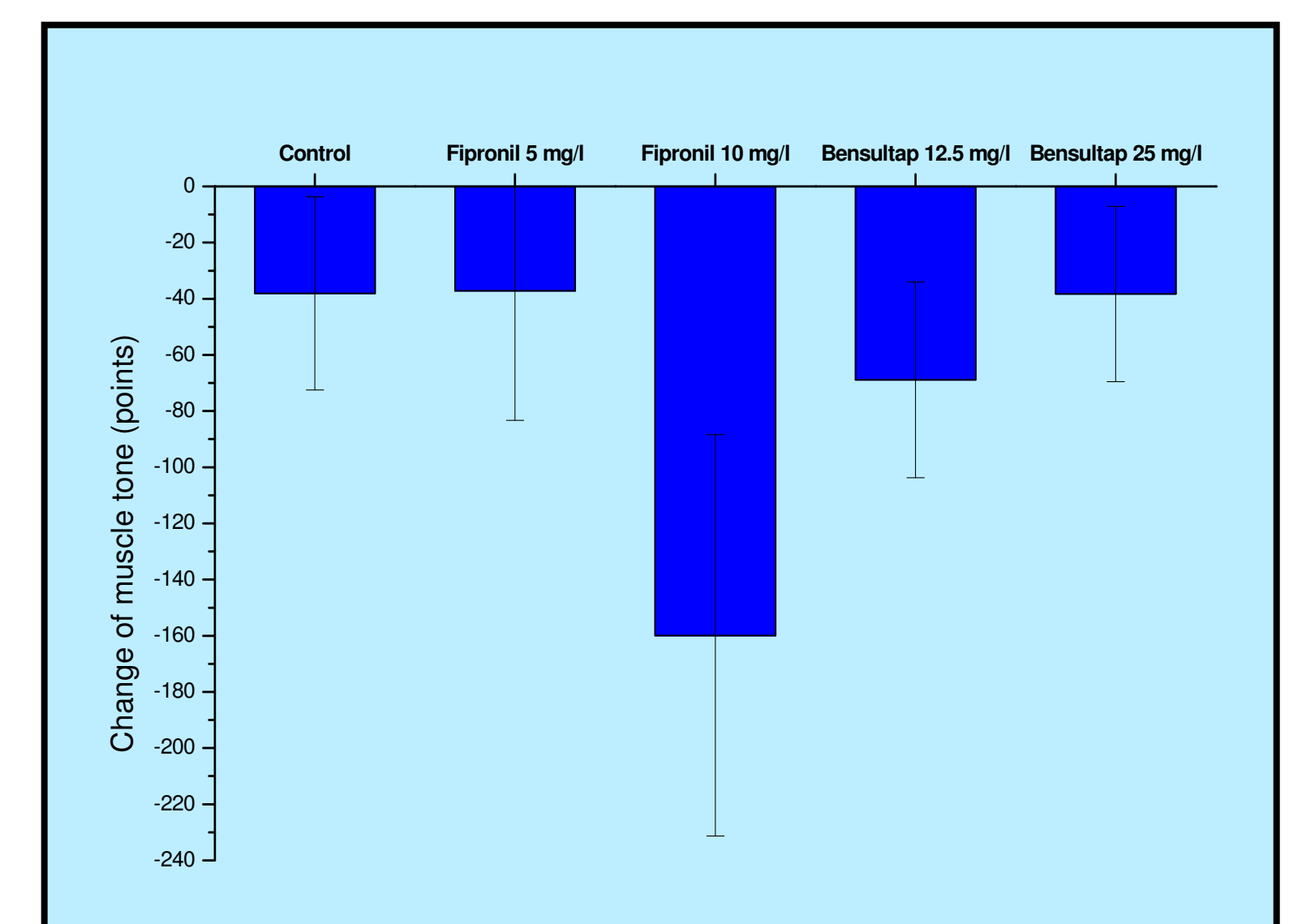
Contraction patterns were recorded and evaluated with a computer software (Analyze). Amplitude, period of the contractions and their dispersions, as well as the tone of the muscle were measured.

1.5 - 2 cm long segments of the distal ileum were removed from Wistar rats

organ bath containing oxygenated Tyrode solution at 39 °C

Perfused after one hour stabilization period :

- control: every fifteen minutes during two hours with fresh Tyrode solution
- treated: twice with standard solution, then three times with insecticide-containing solution and then three times with standard solution (washout).
- concentrations:
 - 12.5 mg/l and 25 mg/l for bensultap
 - 5 mg/l and 10 mg/l for fipronil
- finishing: 60 mM KCl solution was added to produce a maximal contraction



The value of muscle contraction that mostly differed from the starting condition was selected and plotted. In all types of samples we observed a decrease of tone during the experiment. The higher concentration of fipronil produced the greatest decreases, the effect of other treatments didn't differ significantly from the control.

The two insecticides didn't have drastic effects on ileum motility. The possible exception is fipronil applied in 10 mg/l concentration, which produced very irregular contraction patterns, illustrated by the figure.

Based on the results the aim is to devise strategies to minimize the side-effects of certain toxic substances introduced into the food chain on the exposed populations and to identify danger points. It will be possible to determine a physiologically based tolerable level of pesticides and to establish minimum food quality standards for an effective risk assessment and risk management. As far as absolute food safety is unattainable, we are facing with the task of selecting the right balance. Main goals are to achieve environmentally sound agricultural production, to ensure a secure, healthy supply of food, to ensure monitoring of this and to improve the quality of life.