

Alterations of Pulse by Chinese Herb Medicine

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Abstract: Rats were injected with the crude extract of Chinese herbs, *Rhizoma Coptidis*, *Radix Bupleuri* and *Cinnamomum cassia Blume*. The pulse of the tail artery were examined. The results indicated that each drug had a specific effect on the Fourier components of the pulse.

In Chinese medicine, pulse diagnosis is a traditional method to detect the health of patients (1). Since pulse is generated in the artery, it suggests that changes in the physical condition must reflect on the shape of the blood pressure wave.

Chinese herb medicine has been studied to elicit its effect on the regulation of hormones, its effect on anti-inflammation, on fertility, on cardiac muscles etc.,(2,3). However, so far there has been no studies done on the effect of herbs on the pulse. One of the reasons might be due to the fact that we do not fully understand the meaning of the pulse or the mechanism of its genesis (4,5).

Recently, we have found that the Fourier components of the pulse may be related to the resonant condition of the blood distribution to the organs (6-8), we, therefore, decided to use this technique to analyze the effect of herbal medicine on the pulse.

In this report we studied the blood pressure pulse of the rats. Three Chinese medicine extract of *Rhizoma Coptidis*, *Radix Bupleuri* and *Cinnamomum cassia Blume* were injected

into the rats. The pulse shape of the tail artery of the rat was recorded before and after the injection. The periodic blood pressure wave was then decomposed into harmonic components by Fourier analysis method. The results showed that each Chinese medicine had different effect on the harmonic components of the blood pressure pulse.

Materials and Methods

Groups of Sprague Dawley rats (200-300 g) were used. Each animal was anesthetized with urethan and alpha-Chloralose. The tail artery was cannulated with an intravenous catheter (B-D). The cannula was filled with physiological saline and heparin, then connected to a pressure transducer (RP-1500 Nacro-Bio-system). The blood pressure pulse of the tail artery was obtained through the transducer which was in series with a preamplifier, a A/D converter and an IBM PC. The signal was then analyzed by the Fourier analyzer. Similar methods have been applied to rats and human to study the relationship between pulse and internal organs (6-8).

One hour was lapsed after the operation to allow an equilibrium and stability as judged by the pulse shape which resembled those that had been recorded before the treatment.

The extracts of Rhizoma Coptidis, Radix Bupleuri and Cinnamomum cassia Blume in alcohol and water (1:1) were liphilized and stored in a refrigerator. Just before use, these

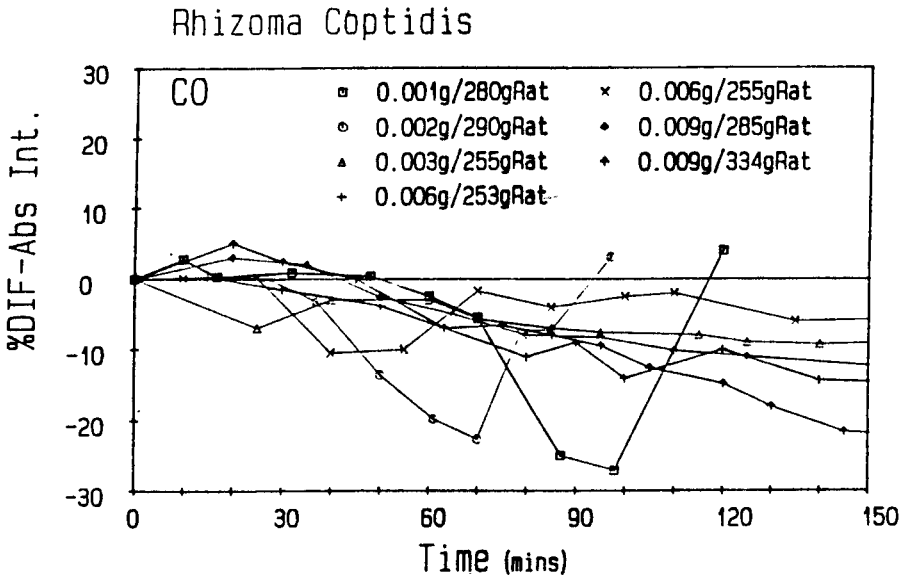


Fig. 1. Changes in the Fourier component C_0 of the blood pressure pulse due to the injection of Rhizoma Coptidis. The horizontal axis is the time after injection. Injection was done at $T=0$ min. The vertical axis shows the absolute intensity difference in %. Up means increase; down means decrease. The doses injected are shown in the figures as crude dry weight of the drug over the weight of the rat used.

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alcohol and water extracts of the herbs were dissolved in normal saline and injected intraperitoneally into the rats. Recordings, of the pressure pulse was done about every 10 minutes for about 2.5 hours. All data were an average of six consecutive pulses. Standard deviation was kept below 5%. Control group administered with saline were recorded the same way as the experimental groups.

Results and Discussions

The Fourier components of the pulse generated by the blood pressure were obtained through a Fourier analyzer. The difference between post and pre-treatment of the zeroth order component C_0 , first harmonic component C_1 , and the second harmonic C_2 were calculated and time response curves were constructed.

The experimental results showed that these three drugs used in this experiment had different effect on the Fourier components of the pulse generated by the blood pressure.

There was a considerable decrease of C_0 and C_1 components and almost no difference on C_2 component for the groups of rats treated with *Rhizoma Coptidis* (Figures 1, 2, and 3). Small change of C_0 was observed for the group of rats administered with *Radix Bupleuri* (Figure 4). However, the C_1 component had significant increased (Figure 5) and C_2

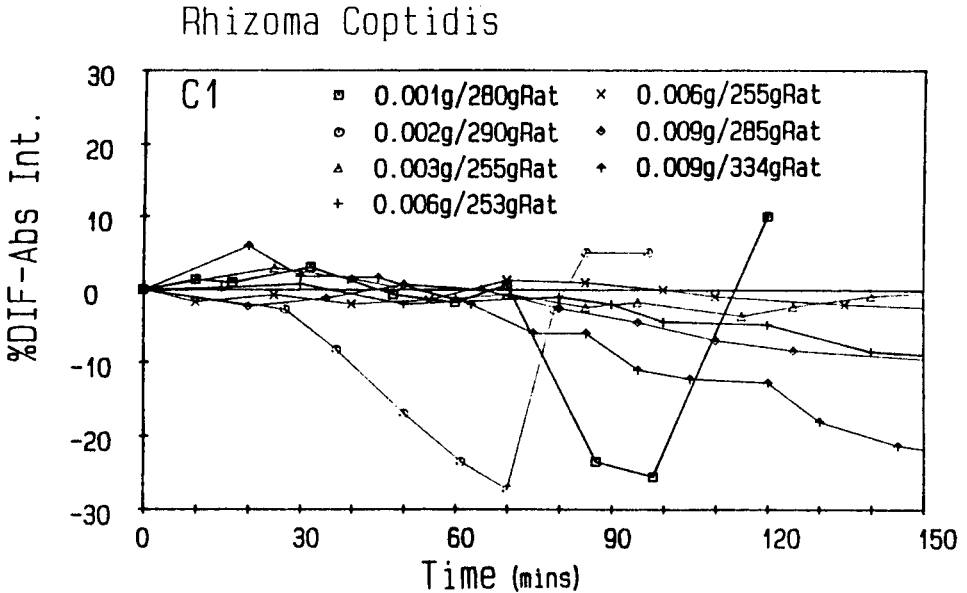


Fig. 2. Changes in the Fourier component C_1 . Designations are the same as in Fig.1.

Rhizoma Coptidis

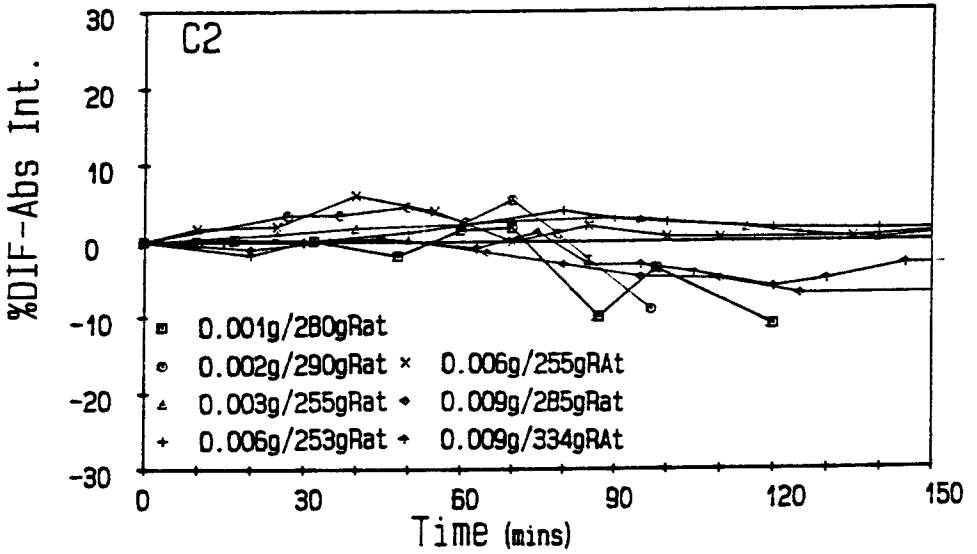


Fig. 3. Changes in the Fourier component C2. Designations are the same as in Fig. 1.

Radix Bupleuri

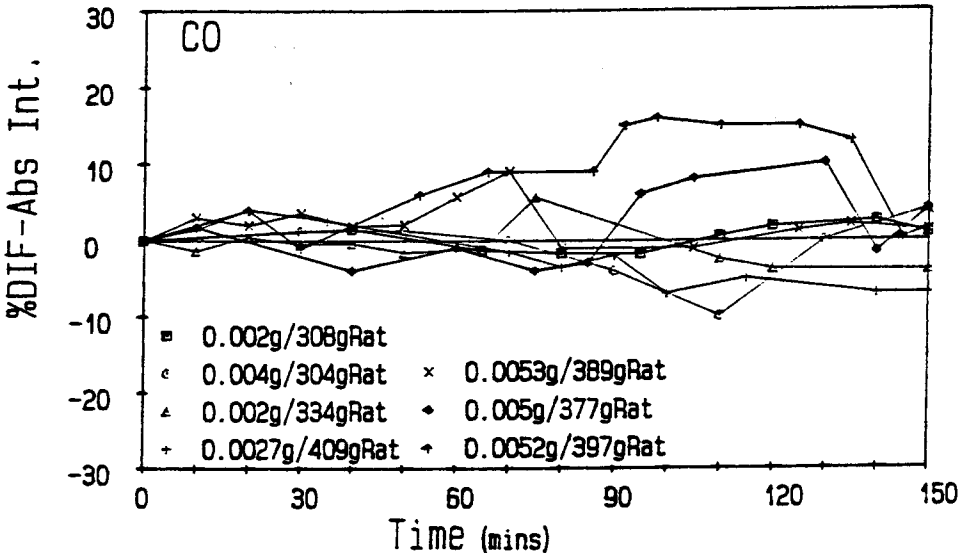


Fig. 4. Changes in the Fourier component Co of the blood pressure pulse de to the injection of Radix Bupleuri. Injection was done at T = 0 min.

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Radix Bupleuri

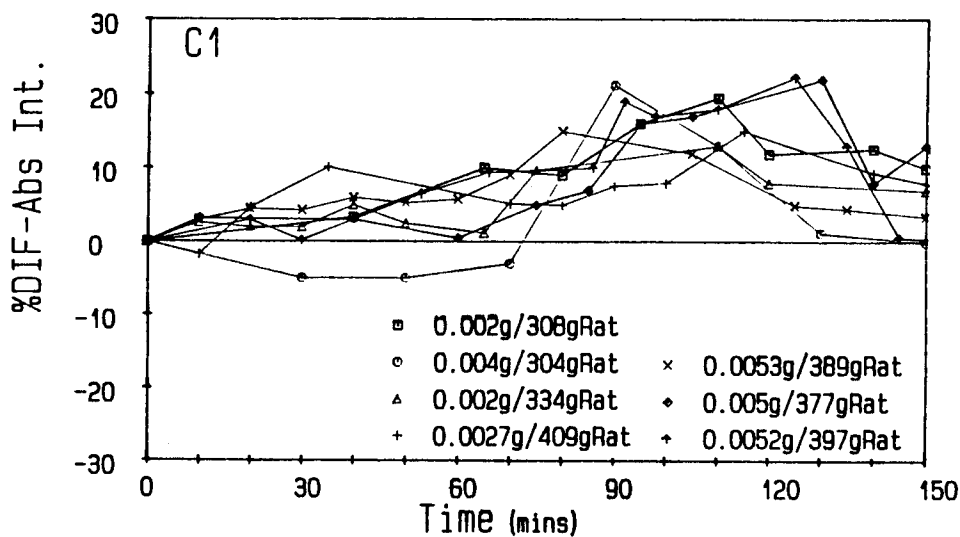


Fig. 5. Changes in the Fourier component C1 in the same study as shown in Fig. 4.

Radix Bupleuri

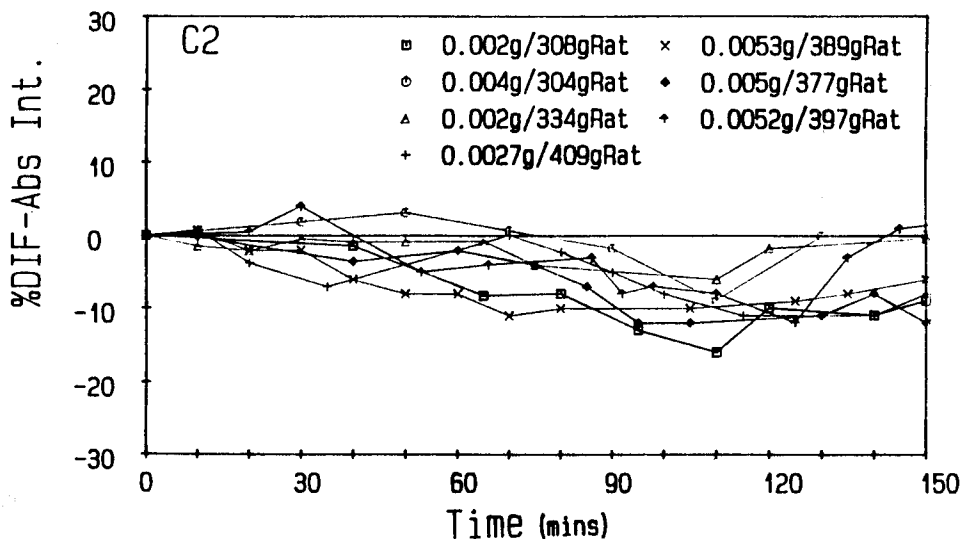


Fig. 6. Changes in the Fourier component C2 in the same study as shown in Fig. 4.

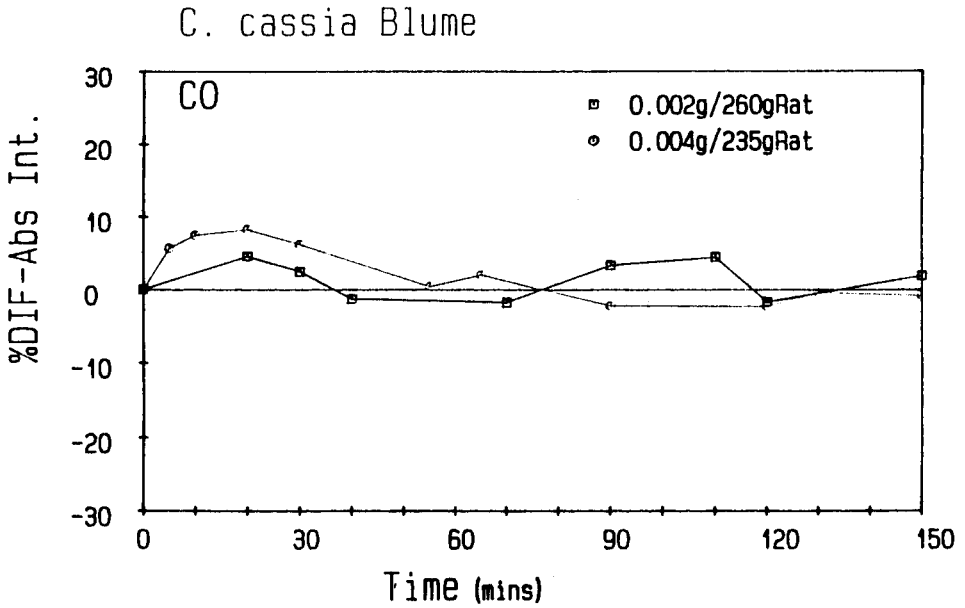


Fig. 7. Changes in the Fourier component C_0 of the blood pressure pulse due to the injection of Cinnamomum cassia Blume. Injection was done at $T = 0$ min.

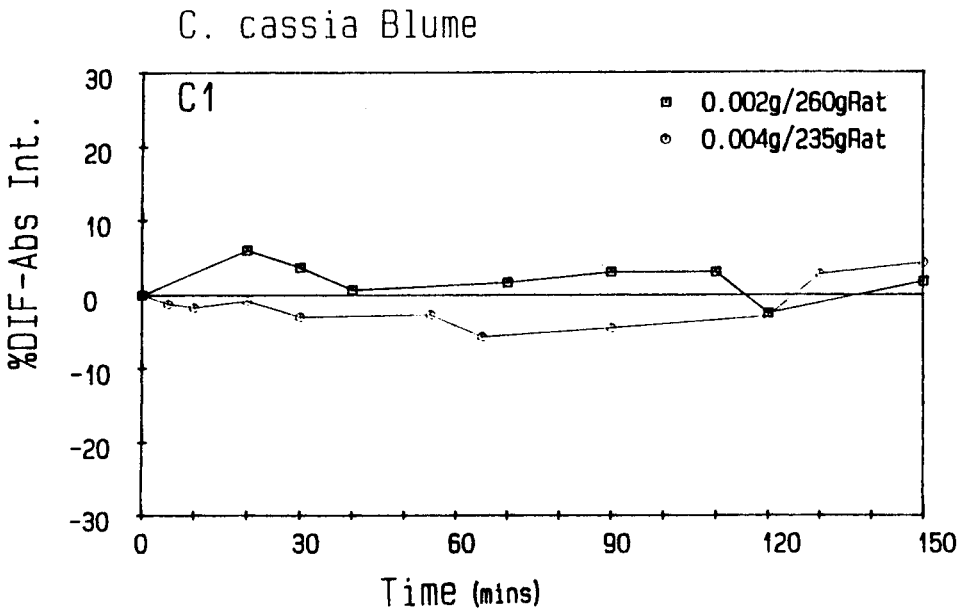


Fig. 8. Change in the Fourier component C_1 in the same study as shown in Fig. 7.

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C. cassia Blume

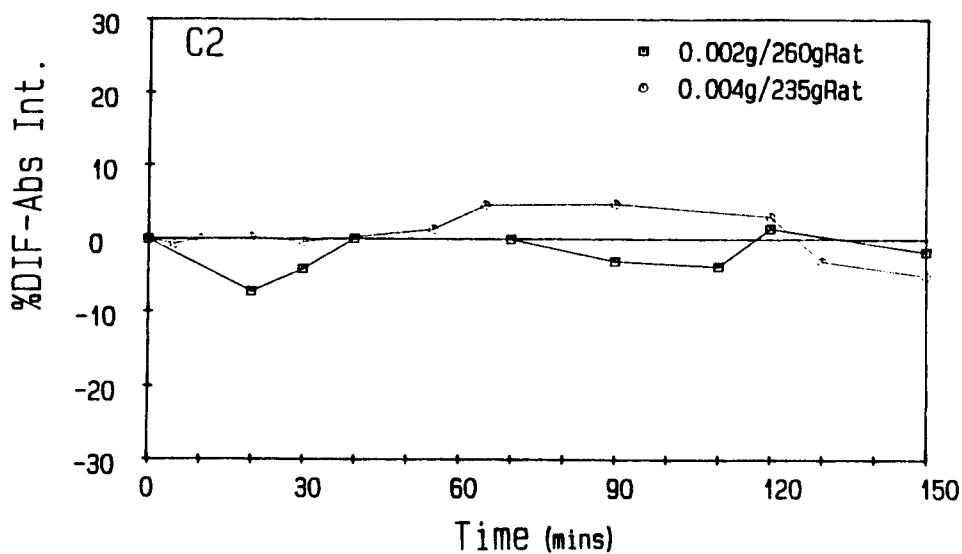


Fig. 9. Changes in the Fourier component C2 in the same study as shown in Fig. 7.

Normal Saline

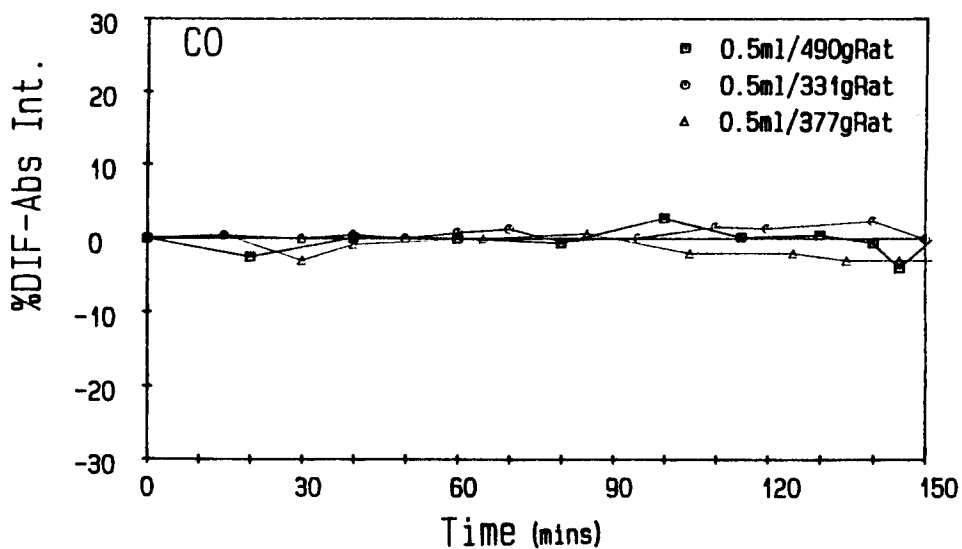


Fig. 10. Control experiment. Changes in the Fourier component Co of the blood pressure pulse after the injection of saline. Injection was done at T=0 min.

Normal Saline

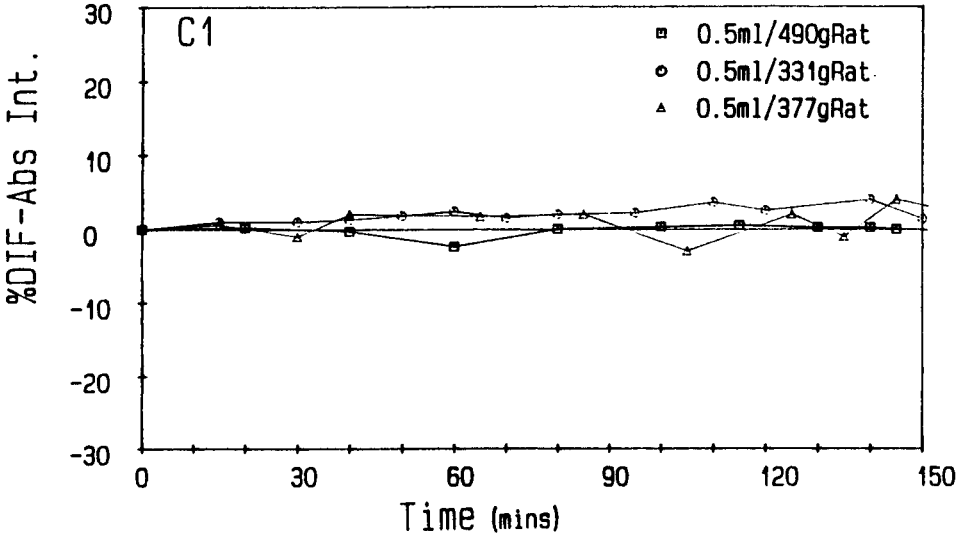


Fig. 11. Changes in the Fourier component C1 in the same study as shown in Fig. 10.

Normal Saline

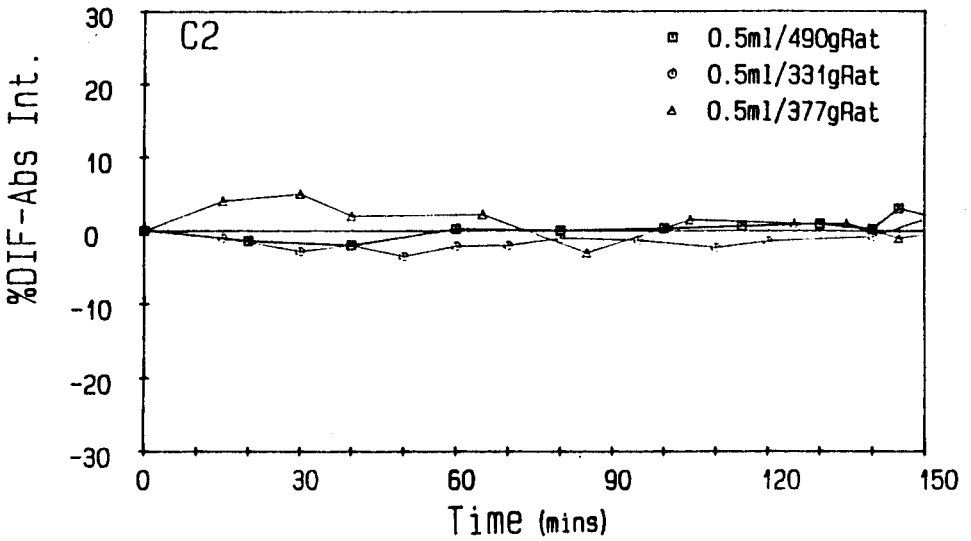


Fig. 12. Changes in the Fourier component C2 in the same study as shown in Fig. 10.

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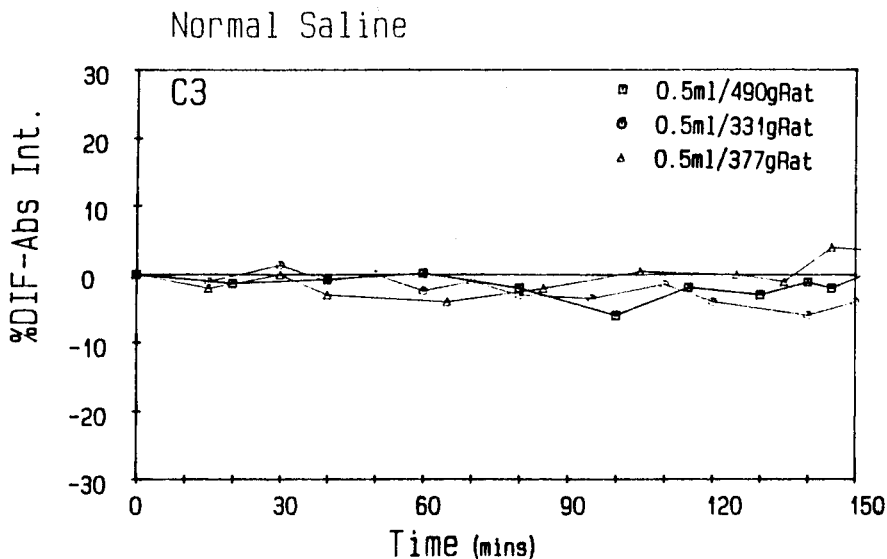


Fig. 13. Changes in the Fourier component C3 in the same study as shown in Fig. 10.

somewhat decreased (Figure 6). We observed no change on all the three components for rats in the Cinnamonmum cassia Blume group (Figures 7, 8, and 9) and the control group (Figures 10, 11, 12, and 13).

These observations suggest that different drug contributes to different Fourier components redistribution of the pulse. Previous studies have showed that harmonic components may be related to energy distribution in different meridian. An increase or decrease of a component may be equivalent to tonification or depletion of that particular meridian (9). A further study on other herbal medicine in line with traditional Chinese medicine literature is necessary to better understand the pharmacology of Chinese medicine.

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