Br. J. exp. Path. (1981) **62**, 526

EMBLICA OFFICINALIS GAERTN AND SERUM CHOLESTEROL LEVEL IN EXPERIMENTAL RABBITS

M. MISHRA, U. N. PATHAK AND A. B. KHAN

From the Darbhanga Medical College and Hospital, Laheriasarai, Bihar, India

Received for publication June 15, 1981

Summary.—Twelve albino rabbits of either sex weighing 1·0–1·25 kg were fed a standard laboratory diet of green grass and *sattu* (roasted Bengal gram). After a 2-week run-in period their serum cholesterol levels were estimated. All animals were now fed 0·5 g cholesterol and 1·0 g clarified butter daily and were now divided into 3 groups of 4 animals each.

While all received the standard cholesterol-rich diet, Group A animals received no additional substances, animals in Group B were each fed 10 mg vitamin C daily, while those in Group C were each given 1·0 g fresh Amla (*Emblica officinalis* Gaertn).

Mean serum cholesterol levels in all three groups rose to significantly higher levels by the end of the second week. There was a further rise by the end of the third and fourth weeks in Groups A and B.

However, animals in Group C (*i.e.* those given Amla) showed significantly lower mean serum cholesterol levels at the end of the second week than their counterparts in Groups A and B. At the end of the third and fourth weeks the differences were even more pronounced.

AMLA (*Emblica officinalis* Gaertn) is a deciduous tree found throughout tropical and subtropical India. Its fruit is very rich in ascorbic acid. It has been claimed to be useful in a number of conditions including heart disease (Jain, 1975).

Four varieties of this fruit are available in the Indian market. They are *satna* or *desi amla*, *pratapgarhi* or *surmai amla*, *pera* or *thipa amla*, and *banarasi amla*. *Desi amla* is the cheapest and the smallest. Its fruit is fleshy; each fresh fruit weighs 10–16 g and has a diameter of 2–3 cm (Qadry, Banga and Atal, 1962). This was the variety used in our study.

Apart from ascorbic acid, various alkaloids and other substances have been isolated from this fruit (Dhar, Shrivastava and Shreenivasaya, 1956; Jamwal, Sharma and Chopra, 1959; Khanna and Bansal, 1975; Khanna and Jain, 1973; Soman and Pillay, 1962; Rao and Siddiqui, 1964), but we are not aware of any reports about their action on serum cholesterol levels. We set out to test the hypothesis that if this fruit was to have any beneficial action on the heart, it might have some effect on serum cholesterol levels as well.

MATERIAL AND METHODS

Twelve healthy albino rabbits of either sex (weight range 1–1·25 kg) were studied. All were kept on a standard laboratory diet consisting of green grass and *sattu* (roasted Bengal gram).

Animals were kept in the animal house and fed the usual laboratory diet for 2 weeks. At the end of this period their serum cholesterol levels were determined. They were now fed 0·5 g cholesterol (Cholesterol extra pure, Loba chemie Indoaustranal) and 1 g clarified butter daily in addition to the standard laboratory diet. The animals were now divided into 3 groups:

Group A—fed the high-cholesterol diet described above.

Group B—fed 10 mg vitamin C (East India Pharmaceutical Works Ltd, Calcutta) daily in a glycerine base in addition to the usual high-cholesterol diet.

Group C—fed 1 g fresh *Amla* daily in addition to the usual high-cholesterol diet.

Serum cholesterol levels were measured at the start of the study (Week 0), *i.e.* before the

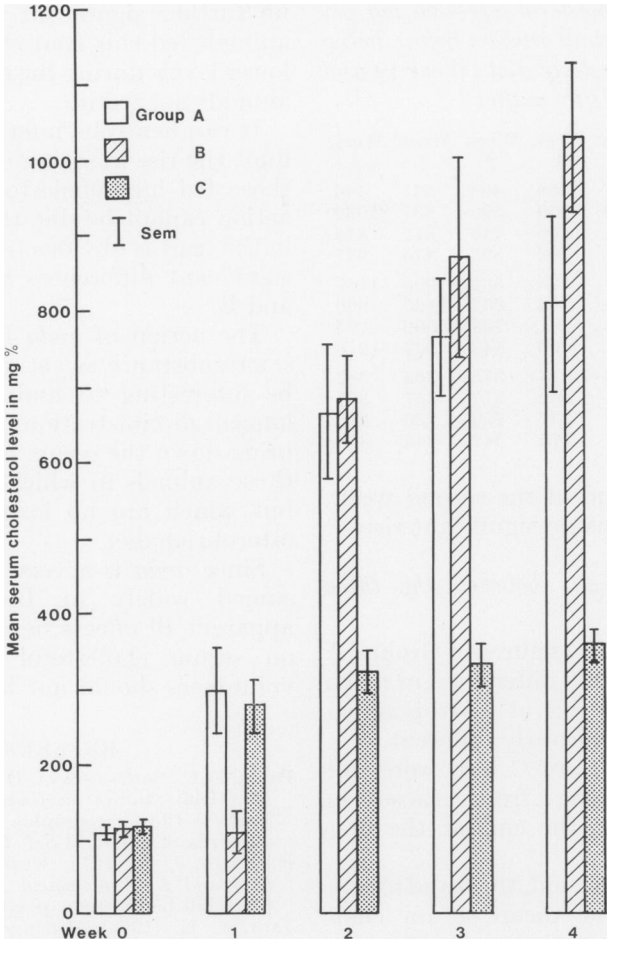

FIGURE.—Mean serum cholesterol levels in different groups at weekly intervals.

animals were put on the high-cholesterol diet. Then they were fed the supplements according to the groups to which they had been allocated, and blood samples were collected at the end of the first, second, third and fourth weeks for measurement of serum cholesterol levels.

Blood was obtained in the fasting state by cardiac puncture. Serum cholesterol levels were determined by the method of Sackett (Varley, 1976).

RESULTS

Group A

The mean serum cholesterol level continued to rise throughout the period of study. At the end of the second week it was significantly higher than the basal level ($P < 0{\cdot}01$). There was a further rise in these levels at the end of the third and fourth weeks.

Group B

The story here was similar to that in Group A. The mean serum cholesterol level rose to a significantly higher level ($P < 0{\cdot}01$) at the end of the second week. The levels at the end of the third and fourth weeks were higher still.

Group C

Here again the mean serum cholesterol level rose to a significantly higher level

TABLE.—*Serum cholesterol levels in mg per 100 ml in individual rabbits before being given a high-cholesterol diet (Week 0) and at weekly intervals thereafter*

Group	Rabbit No.	Week 0	Week 1	Week 2	Week 3	Week 4
A	1	93	468	468	531	406
	2	110	250	595	837	1062
	3	106	206	718	812	818
	4	137	262	895	875	937
B	1	100	125	562	906	1187
	2	125	119	637	1125	906
	3	112	231	700	500	793
	4	112	200	843	937	1218
C	1	94	343	375	362	382
	2	121	262	317	357	387
	3	112	337	250	250	312
	4	125	175	342	343	348

($P < 0.01$) at the end of the second week. Thereafter there was no significant rise.

Comparison of results between the three groups

A comparison of the figures in Groups A and B showed that the differences in mean serum cholesterol levels at corresponding times were not significantly different.

The figures in Group C also were not significantly different from those in Groups A and B at the end of the first week.

At the end of the second, third and fourth weeks, however, the mean serum cholesterol levels in Group C were significantly lower ($P < 0.05$) than those in Groups A and B.

Data analysis

We used the paired *t* test (England, 1975) for statistical analysis. The mean serum cholesterol levels in the 3 groups were compared with each other at appropriate intervals. Within a given group the figures were analysed to see whether these changed with the passage of time.

DISCUSSION

Although animals fed with *amla* showed a rise in the mean serum cholesterol level at the end of the second week, there was no further significant rise. Furthermore, animals fed this fruit showed significantly lower levels during the ensuing weeks than animals not fed it.

It can hence be inferred that *amla* does limit the rise in serum cholesterol levels in those fed high-cholesterol diet. That this action cannot be due to the ascorbic acid in the fruit is obvious from the lack of any significant differences between Groups A and B.

The action of *amla* is probably due to some substance as yet unstudied. It would be interesting to find out whether prolonged administration of this fruit would bring down the serum cholesterol levels in those animals in which it is already high but which are no longer taking a cholesterol-rich diet.

Since *amla* is a very popular fruit consumed widely in India without any apparent ill effects, a study of its effects on serum cholesterol levels in human volunteers should not be out of place.

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