Plasma-Clearing Effect of Gastric Mucin in Healthy and Atherosclerotic Subjects under Basal Conditions

By Baldo Rossi, M.D., and Vincenzo Rulli, M.D.

Other substances, in addition to the heparin clearing factor, exert a plasma-clearing effect under experimental conditions. A mucin compound extracted from the pig gastric mucosa has recently been included among such substances. Its clearing effect, as evaluated by variations in plasma optical density, is as constant and evident as that of heparin, both in normal and atherosclerotic subjects under basal conditions. The resemblance in function between gastric mucin and heparin is accompanied by similarities in molecular structure between the 2 compounds. Gastric mucin may belong among the factors that under physiologic conditions regulate the transport and some phases of the intermediary metabolism of lipids.

The optical density of the plasma is related to the physicochemical state of the colloidal macromolecules and depends especially upon the concentration of the large lipoprotein aggregates (chylomicrons). Both in normal and atherosclerotic subjects the basal optical density shows great variability in different individuals and at different times in the same individual, and cannot therefore be used as a discriminating feature.1 Within certain limits of time, however, it remains fairly constant under basal conditions, so that by following its variations in the course of short experiments it is possible to assess the clearing effect produced by heparin and other substances. Gastric mucins, and especially an acid aminopolysaccharide isolated from hog gastric mucins, has recently been included among the substances having a clearing effect. Such mucins, when administered orally to rabbits, produce a diminution of plasma lipids and enhance, to a small but significant degree, the in vitro plasma-clearing power on lipid substrates.2,8 The last-mentioned phenomenon has been demonstrated also in human beings.4

We report in the present paper variations in plasma optical density observed in a group of healthy subjects and another group of atherosclerotic patients after oral administration of gastric mucin.

Material and Methods

The experiment was carried out on 5 apparently healthy persons (mean age 33 years) and on 10 subjects (mean age 62 years) presumed to be atherosclerotic because of a history of myocardial infarction or of definite anginal symptoms with clear-cut electrocardiographic changes.

Blood specimens were obtained at hourly intervals during a period of 4 hours from the patients who had been fasting for at least 12 hours. Each specimen of blood was mixed with sodium oxalate and centrifuged for 15 minutes at 3,000 r.p.m. The optical density of the plasma thus separated was determined photometrically with a 640 m\(\mu\) filter; the determinations were made immediately and again after 20 hours at room temperature. The same procedure was repeated a few days later on the same subjects, who this time were given 250 mg. of gastric mucin prior to the experiment. The mean photometric readings for every hour in each group with and without gastric mucin are shown in figure 1.

Results

The optical density of fasting subjects, although it varied in the different individuals and at different times, remained unchanged throughout the period of observation. The densitometric curve was higher among the atherosclerotic than among the healthy subjects. Administration of gastric mucin was always followed by a reduction in plasma optical density. In both groups the maximal
Optical density

Fig. 1. Plasma optical density (mean values) in healthy subjects (A and B) and in atherosclerotic patients (C and D), without (A and C) and with (B and D) gastric mucin administration.

reduction occurred at the end of the third hour. The clearing effect was similar to that of heparin. Its magnitude at the end of the experiment, expressed in per cent of the optical density diminution, was 30 per cent for the healthy subjects and 26 per cent for the atherosclerotic patients.

The specimens kept at room temperature for 20 hours showed no significant changes in optical density in either group, whether or not the patient had received gastric mucin.

DISCUSSION

In accord with previous investigations, gastric mucin showed in our experiment a constant and unequivocal effect on the plasma optical density, both in the healthy and the atherosclerotic groups, under basal conditions. The difference between the values (expressed in per cent of the optical density reduction) obtained in the 2 groups was not statistically significant. The clearing effect was similar to that of heparin in regard to constancy and degree, but differed insofar as it lasted longer and did not increase with the passage of time in vitro at room temperature.

The resemblance in the clearing activity of gastric mucin and of heparin is probably based on similarities in chemical constitution between the 2 compounds, such as a high hexuronic acid and glucoseamine content.

We do not understand as yet the mechanism underlying the clearing effect of gastric mucin, nor do we know whether it is related to plasma and tissue factors as is, according to Anfinsen, the heparin clearing factor. It seems likely, however, that the clearing power is not due to an enzymatic effect of the lipoprotein lipase type such as the one that is apparently responsible for the heparin clearing effect. Capraro and Cantone suggest that the finding may be accounted for by an increase in the plasma lipodispersing activity that is enhanced by gastric mucin.

SUMMARY

A plasma-clearing effect was obtained by the oral administration of gastric mucin in a group of healthy subjects and another group of atherosclerotic patients under basal conditions. The magnitude of the clearing effect at the end of 3 hours was 30 per cent for the healthy subjects and 26 per cent for the atherosclerotic patients.

The similarities and differences between the heparin clearing effect and that of gastric mucin are discussed.

'Summario in Interlingua

Un effecto clarificatori in le plasma esseva produciti per le administration de mucina gastric in un gruppo de subjectos normal e in un secunde gruppo de subjectos atherosclerotic sub conditiones basal. Le magnitude del effecto clarificatori al fin de 3 horas esseva 30 pro cento in le caso del subjectos normal e 26 pro cento in le caso del subjectos atherosclerotic.

Es discutite le similaritates e le differentias inter le effecto clarificatori de heparina e illo de mucina gastric.

REFERENCES


An occasional observation of improvement of psoriasis in a patient being treated with Tromexan because of myocardial infarction is reported. In order to learn whether the improvement was coincidental or had other meaning, 17 patients with psoriasis have been treated with Tromexan or with Sintrom or Dicumarol; 3 of these did not respond to treatment, 8 showed regression, 6 became free of lesions. It was noted that the anterior surfaces cleared more rapidly than the posterior, and that the scalp cleared first while the legs were last. The time required for complete regression varied between 2 and 6 months. It was found that the therapeutic effect was obtained when a “threshold” dose was given; lower doses were ineffective, while larger single doses did not produce better results; repeated “threshold” doses (limited in number only by their anticoagulant effect) were more effective. Tromexan was commonly effective in single doses of 300 mg and was better suitable for this purpose than comparably effective doses of Sintrom or of Dicumarol, because of its lower anticoagulant effect. There was no relation between the prothrombin level and the therapeutic result obtained. However, the use of antagonists to the anticoagulant (menaphthone), together with the drug, inhibited its beneficial effect.

Calabresi
Plasma-Clearing Effect of Gastric Mucin in Healthy and Atherosclerotic Subjects under Basal Conditions
BALDO ROSSI and VINCENZO RULLI

Circulation. 1958;18:397-399
doi: 10.1161/01.CIR.18.3.397

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/18/3/397

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org/subscriptions/