Serum Xanthine Oxidase
An Experience With 2000 Patients

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Serum xanthine oxidase (SeXO) determination was performed on the sera of 2000 patients. SeXO elevations of 10 international milliunits (ImU) and above were noted only in acute liver disease. In viral hepatitis or toxic liver injury the magnitude of elevations of SeXO to the upper limit of normal is 50 times greater than the magnitude of elevation of the transaminases above normal. The enzyme level in obstructive or hemolytic jaundice remains normal or slightly elevated, not exceeding 10 ImU/liter. For this reason serum xanthine oxidase determination is valuable in differentiating jaundice due to acute liver disease from that due to obstructive jaundice or hemolysis, as there is almost no overlap in the enzyme values. On the other hand, SeXO determination had no diagnostic or prognostic value in liver cirrhosis, amebic abscess, or hydatid cyst of liver. Significant elevations of SeXO were noted in infectious mononucleosis but in none of the other viral infections studied.

The measurement of serum xanthine oxidase (SeXO) activity was reported to be a sensitive indicator of acute liver injury in our preliminary report in 1965 (1). We have now extended our studies to include over 2000 patients with various illnesses.

Our observations, extending over 3 years, indicate that SeXO is a more sensitive and specific test for acute liver injury than the transaminases. We also found it to be more useful as an aid in the differential diagnosis of jaundice.

MATERIALS AND METHODS
SeXO activity was determined as described previously by Al-Khalidi et al (2). This method involves the incubation of xanthine-14C with 1 ml of serum. In the presence of xanthine oxidase in the serum, uric acid-C14 is formed. The radioactive uric acid is separated by passage through a small Dowex-50 column and counted. Activities are expressed in international milliunits (ImU) per liter. One ImU is the amount of enzyme which catalyzes the oxidation of one millimicromole of xanthine per minute at 25°C at saturation levels of the substrate.

The methods for serum glutamic oxalo-acetic-acid-transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) determinations were based on the procedure of Karmen (3) and Wroblewski and La Due (4), respectively. The bilirubin and alkaline phosphatase determinations were performed at the Clinical Chemistry Laboratory of the American University Hospital, using standard methods. The alkaline phosphatase was expressed in Shinowara units.

Twenty medical students and laboratory personnel served as healthy control subjects. The other subjects were patients on the hospital wards and from the outpatient clinics of the American University of Beirut.
RESULTS

Normal Subjects

Of 20 normal controls, 17 had SeXO levels below 0.1, 1 had a level of 0.2, and 2 had levels of 0.5 ImU/liter (Figure 1). The SGOT activity in the same subjects ranged from 7 to 33 Karmen units, with a mean of 19.4 ± 6.3. The SGPT activity ranged from 6 to 28, with a mean of 15.1 ± 6.1.

Pathologic Controls

Ninety-three patients suffering from various illnesses, but with no clinical or laboratory evidence of liver or small intestine involvement, were studied. In this group we excluded the pediatric age group as well as patients with anemia due to acute or chronic kidney disease. These served as pathologic controls to determine the serum enzyme variations in illnesses not involving these organs. The SeXO activity in this group (Figure 1) ranged from 0 to 1.8 ImU/liter, with a mean of 0.48 ImU/liter. Forty-two patients in this group had levels below 0.5 ImU. Two ImU/liter was adopted as the level above which elevations become significant in the diagnosis of liver disease. The SGOT activity in these patients ranged between 7 and 53 units, with a mean of 32 ± 8.3. The SGPT activity ranged between 7 and 46, with a mean of 29 ± 7.8. Values above 50 units for SGOT and above 45 units for SGPT (mean ± 2 SD) were considered significant elevations.

Viral Hepatitis

There were 222 measurements of SeXO, SGOT, and SGPT recorded in 127 patients with viral hepatitis at different stages of the disease. The diagnosis of viral hepatitis was made on the basis of a typical history and consistent laboratory data including elevated serum transaminases. When there was doubt, patients were not included. During the period of jaundice, 94.5% of the patients showed elevated SeXO measurements, as compared to 81.8% with elevations of SGOT and 90.4% with elevations of SGPT. SeXO levels rose sharply during the first few days of jaundice, peaking earlier than the serum bilirubin, decreasing rapidly, and then approaching normal levels as the jaundice subsided. Ninety-five patients were studied during the first week of jaundice. Significant elevations of SeXO ranging from 9 to 1412 ImU/liter were noted in all cases. Simultaneously determined SGOT levels ranged from 21 to 1400 units, with 2 patients in this group having normal levels. The SGPT was elevated in all cases and ranged from 55 to 2200 units.

The serum enzymes were determined in 53 of our patients during the second week of jaundice. SeXO was still significantly elevated in all. The transaminase activities were markedly lower than in the first week; 5 patients in this group had normal SGOT and 1 had a normal SGPT level.

During the third week, SeXO levels re-