Microalbuminuria is the term used to describe urinary albumin concentrations that are greater than normal, but not detectable with conventional urine protein assays (e.g. dipstick or traditional chemistry analyzers.) Coupled with the development of sensitive immunoassays for detecting small amounts of albumin in urine has been an appreciation of the clinical significance of microalbuminuria as a risk factor for developing noninsulin dependent diabetes mellitus, diabetic renal disease, diabetic cardiovascular disease, and hypertensive cardiovascular disease.1-6 Normally only minute amounts of albumin (less than 30 mg/day) are excreted in the urine. (Given that the kidneys filter 7560 g. of albumin daily, this represents an efficiency of 99.9996%.7 Holy productivity Batman!!!)

Microalbuminuria
Excretion rate: 30-300 mg/24 hr (20-200 ug/min)
Albumin/creatinine ratio: 30-300 mg/g
Albumin concentration (Early AM urine): 3.0-30.0 mg/dL

As diabetes is the most common cause of end stage renal disease in the United States, there is great interest in the role of urinary microalbumin in the management of diabetes, both insulin dependent (IDDM or type I) and noninsulin dependent (NIDDM or type II), with the hopes that intervention will prevent both renal and cardiovascular complications.

Urinary Microalbumin Screening:
Several different guidelines for microalbuminuria screening have been published. The algorithm presented in Figure 1 has been adapted from one proposed by the National Kidney Foundation.8,9 Urine testing for microalbumin is recommended for all patients with diabetes 12 years or older. Transient increases in urinary albumin can occur in the setting of urinary tract infection, acute febrile illness, high protein intake, heavy exercise, cardiac failure, and certain medications (e.g. nonsteroidal anti-inflammatory agents). Testing should be deferred if one of these confounding conditions is present. Because of the variability in urine albumin excretion, microalbuminuria detected on an initial screening specimen should be confirmed by a second specimen (or best 2 out of 3) prior to considering intervention.2,8 There is some debate over the preferred specimen for urine microalbumin screening.7 Overnight or 24 hr. specimens are the most sensitive and are generally preferred
(particularly if a semiquantitative assay is to be used - see below.) For some patients where timed urine collections may be inconvenient or subject to collection error, an alternative is the measurement of the urinary albumin/creatinine ratio in a random or first void urine sample. Finally some consider the albumin concentration in a first morning voided specimen to be acceptable.
Diabetes, age 12-70 years no obvious renal disease. Adequate glycemic control

Condition present that may transiently increase urine albumin excretion?

Yes

Wait until condition has resolved

No

Repeat in 1 year

Yes

Urine Alb/Cr <30 mg/g, or albumin excretion <30 mg/d?

No

Repeat urine Alb/Cr or timed albumin excretion twice within 3 months

Yes

At least two Alb/Cr <30 mg/g or Alb excretion <30 mg/d?

No

At least two Alb/Cr 30-300 mg/g or Alb excretion 30-300 mg/d?

Yes

Microalbuminuria

No

Refer to a nephrologist

Figure 1: Urinary microalbumin screening for diabetic nephropathy. (Adapted from references 8 and 9.)

Specimen Handling and Analysis:
Overnight or 24 hour specimens may be collected at room temperature if promptly refrigerated after collection. Specimens are stable for 2 weeks if refrigerated. They should not be frozen as this may produce an artifactual decrease in albumin concentration. Microalbuminuria will not be detected by conventional urine dipsticks or chemistry analyzers. There are some semiquantitative screening assays marketed for detecting small quantities of urine protein (e.g. Albuscreen, Albusure, Micro-bumin) but their sensitivity is borderline. They also do not allow determination of an albumin excretion rate. Quantitative immunoassays are sensitive, allow precise quantitation (for determining progression of disease or response to therapy), and can be used to determine an excretion rate for timed collection specimens. (Rex Healthcare Laboratory uses rate nephelometry with a lower detection limit of 0.7 mg/dL. Order test on chart, Outreach requisition or in Hospital Information System as “Urinary Microalbumin”. Indicate duration of collection period, e.g. 12 hr., 24 hr., or random "spot" sample. Results reported as excretion rate or albumin/creatinine ratio.)

Patient Management Strategies:
Two recent review articles discuss aspects of interventional strategies and goals in
diabetic patients with microalbuminuria.\textsuperscript{1,2} These include glycemic control, use of angiotensin converting enzyme (ACE) inhibitors in both hypertensive and normotensive patients, and regular monitoring of hemoglobin A\textsubscript{1c}, urinary microalbumin, creatinine, potassium, lipids, and blood pressure coupled with retinal and foot examinations. The interested reader is referred to these articles for a fuller discussion. (I would particularly recommend reference (2) a concise review, while reference (1) is more detailed. Both are available in the Rex Library.) Investigations are ongoing with regard to the effect of these interventional strategies, but there is reason to be optimistic about the cost-effectiveness of this approach, given the expense of treating end stage renal disease.

\textbf{Conclusion:}

Urinary microalbumin is a useful test in detecting and managing diabetic nephropathy. There is developing interest in the role of microalbumin as a marker of cardiovascular disease in diabetic and hypertensive patients.

\textit{Thanks to Dr. George T. Gamblin for assistance in beginning this review.}

\textit{John D. Benson, M.D.}

\textbf{References:}


\textbf{Rex Blood Plan new location\textsuperscript{\textregistered}}

\textbf{New laboratory computer}

Effective February 3, the new address for the Rex Blood Plan is 2709 Blue Ridge Road, Suite 150 (Blue Ridge Medical Center II). Please note the new phone number is 785-4750, new fax number is 785-4760. Hours are 8:45 a.m. until 4:30 p.m. on Monday, Wednesday, Thursday and Friday. Tuesday hours are from 11:30 a.m. until 7:30 p.m.

As a result of our implementation of a new laboratory information system, \textit{Citation}, some aspects of Microbiology reports will be different. Microbiology results will be sent to the hospital computer system (HELP) and chart reports will be printed for all positive results every day, but culture negative results will only be displayed on the first reading and on the final reading (i.e. Blood Culture negative reports on day 1 -
**system and microbiology reports**

*INTERIM and day 5 - FINAL, TB Culture negative reports on week 1 and week 8 only, etc.*

Inpatient INTERIM and FINAL reports will be printed on blue paper (*the designation, INTERIM and FINAL will appear at the bottom of the report*). Inpatient Microbiology reports will be printed each day and delivered to the floor for charting. Previous Microbiology reports on the charts will not be discarded.

Only a single **outpatient** FINAL report will be printed on white paper and delivered to the physician office. **As an option, if you use Rex Outreach for your office laboratory work and would like to receive INTERIM microbiology reports, please notify one of the individuals listed at the end of this article.**

Generally, each specimen will be assigned a different accession number and each specimen will be resulted on a separate page, thereby eliminating the repeated printing of reports with a “pending” notation.

If you have any questions, please do not hesitate to contact one of the following laboratory staff.

Sheila McMahon, Citation Microbiology Installation Lead (783-3040)
DuWayne Engman, Lab Information Systems (783-2110)
Sheila Smithey, Lab Information Systems (783-3319)

**Rex Lab recently inspected**

The Rex Hospital Laboratory at Rex Healthcare has recently been awarded a two-year renewal of its accreditation by the Commission on Laboratory Accreditation of the College of American Pathologists (CAP) based on the results of a recent on-site inspection. All laboratory testing performed within Rex Hospital was included in this accreditation inspection. Inspectors examined the records and quality control of the laboratory for the preceding two years, as well as education and qualifications of the total staff, the adequacy of the facilities, the equipment, laboratory safety, and laboratory management to determine how well the laboratory is serving the patient.

The College of American Pathologists is a medical society serving more than 14,500 physician members and the laboratory community throughout the world. It is the world’s largest association composed exclusively of pathologists and is widely considered the leader in laboratory quality assurance as well as an advocate for high-quality and cost-effective medical care. There are more than 50,000 CAP-accredited laboratories nationwide.

Karen Sanderson, MT (ASCP), SC
Laboratory Compliance Specialist

For further information, call the Laboratory (783-3040). Telephone extensions are: Dr. Benson (3059), Dr. Brainard (3056), Dr. Carter (3058), Dr. Chiavetta (3040), Dr. Kanich (3057), Dr. Kleeman (3063), Dr. Nance (3286), Dr. Sorge (3062), Barbara Wetherbee (Director 3055), Robin Ivosic (Core Lab Manager 3053), Linda Lompa (Blood Services Manager 785-4770), Kimberly Skeding (Customer Services Manager 3318), Rex Outreach (783-3040), Karen Sanderson (Lab Compliance Specialist 3396).