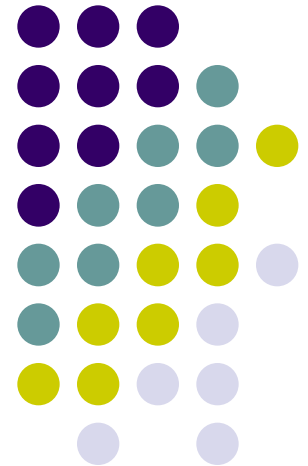


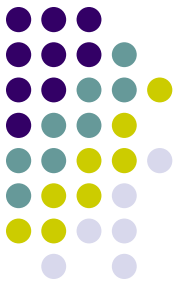
Sepsis

Non-ICU Sepsis Protocol Pilot
4NT, 4SE, 4NE, 4SW, 5SW

Martina Adams, BS, RN, CCRN
May 2011



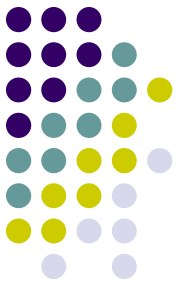
Objectives



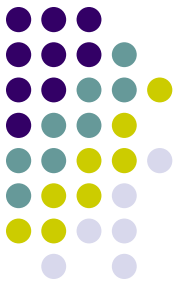
- Define SIRS, simple sepsis, severe sepsis, septic shock
- Describe staff RN role in sepsis screening
- Describe RRT/STAT RN role in use of the Non-ICU Severe Sepsis Pilot Protocol
- Describe perfusion abnormalities related to severe sepsis

Severe Sepsis

Alarming Statistics



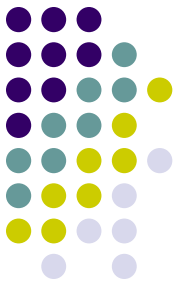
- Mortality rate is 28-45%
- The #1 cause of death in the ICU nationally
- 7-14 days in ICU plus 10-14 days in hospital following ICU stay
- Treatments costs hospitals \$17 billion annually
- Oncology patients with hematologic malignancy are high risk for developing a life-threatening infection



What is sepsis?

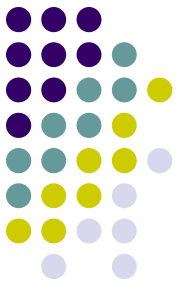
- It is the *response* to an infection
- Evolves in 4 phases
 - Infection
 - Sepsis
 - Severe sepsis
 - Septic shock
- Severity determined by specificity and severity of *host response*, more than causative organism

SIRS: Systemic Inflammatory Response Syndrome



- Widespread inflammatory response to microbial invasion or cell injury
- May or may not be due to an infection
- Signs and symptoms: Fever or hypothermia, tachycardia, tachypnea, leukocytosis or leukopenia
- “Pure” SIRS typical in trauma, pancreatitis, burns, AMI

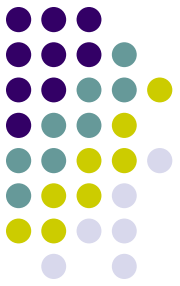
Sepsis



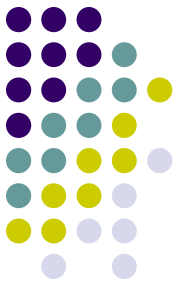
- When SIRS is caused by an infection, the term *sepsis* is used

(Patient has infection **plus** systemic signs of infection)

Severe Sepsis



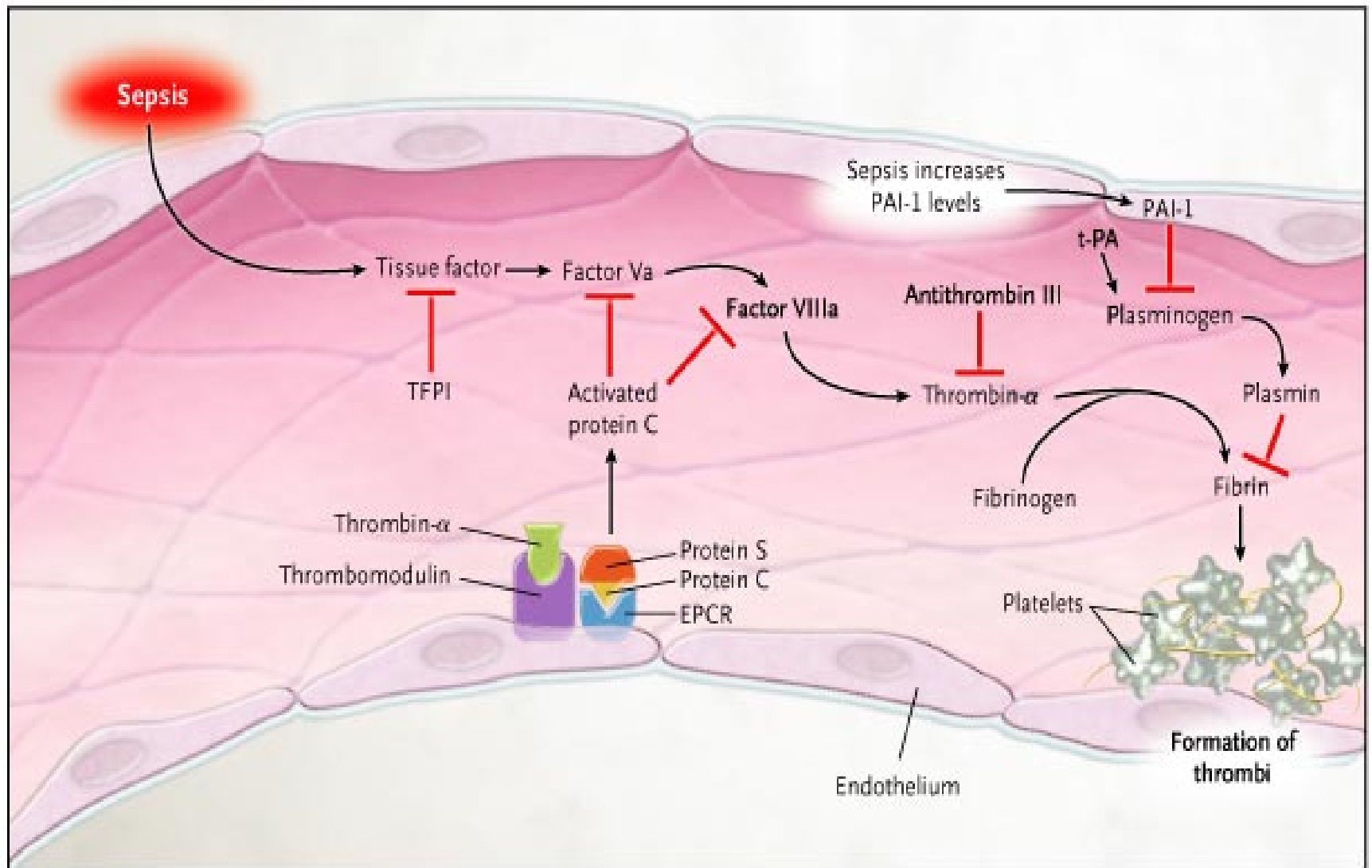
- Sepsis plus acute *organ dysfunction*
or
- Tissue hypoperfusion
 - lactic acid >2.0
(lactate reflects global perfusion)



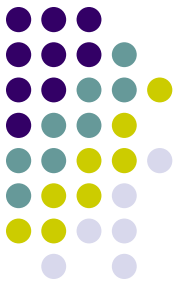
Septic shock

- Severe sepsis with hypotension persisting despite adequate volume resuscitation
- OR**
- Lactic acidosis (patient can have normal BP)
 - Lactate > 4.0

Patients with sepsis who require vasopressor support despite adequate fluid replacement are in septic shock.



Sepsis pathophysiology in a nutshell



- Trigger is often a protein / lipid / carb toxin shed from a microbe
- Systemic inflammation
- Enhanced coagulation
- Impaired thrombolysis
- Vasodilation due to endotoxin

So... walling off of smaller vessels

But.. vasodilation in larger vessels

Result: Global tissue hypoxia, with a distributive shock

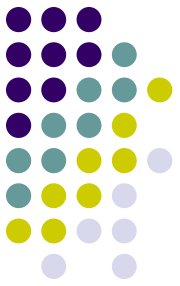
Severe sepsis... a perfusion disorder



- Results in global tissue hypoxia
- Oxygen and nutrients are not being delivered to cells
- Don't be deceived by a “normal” pulse-ox
- Pulse oximetry does not reflect what is happening on a cellular level
 - Often need arterial blood gas

*This is why we fluid resuscitate and
place oxygen!*

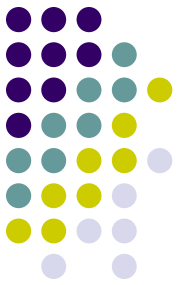
Surviving Sepsis Campaign



- International collaborative effort to improve treatment of severe sepsis, reduce mortality
- A practice improvement program
- Developed evidence-based guidelines for management of severe sepsis and septic shock
- Started in 2004, guidelines last updated in 2008

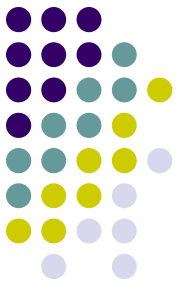
Surviving Sepsis Campaign

Early Goal Directed Therapy



- Bundled care improves outcomes
- Early, routine screening
- Early and aggressive treatment
- NEJM Nov. 2001 published results of study:
Initiating therapy before admission to the ICU
resulted in 16% decrease in mortality
compared to patients receiving standard
therapy

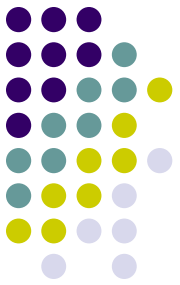
Sepsis is a clinical diagnosis



- Symptoms can be vague
- Many high risk patients already look very ill
- Development of sepsis does not require bacteremia
- >50% of patients with severe sepsis have negative blood culture results
- Patients on antibiotics can become septic

Need to develop a high index of suspicion

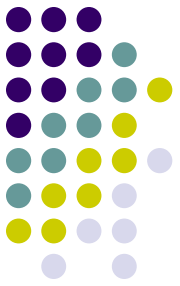
Positive screening for sepsis



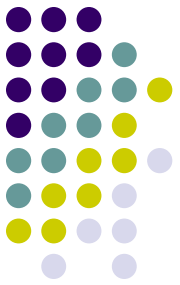
Patient must have 2 of the following symptoms of infection both present and NEW to the patient:

Temp \geq 100.4 °F	Temp \leq 96.8°F
WBC \geq 12,000	WBC \leq 4,000
HR \geq 90 bpm	Altered mental status
RR \geq 20 / min	↑RR = key early indicator, often missed

Patient must *also* have signs and symptoms of infection

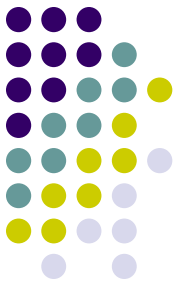


- Pneumonia; empyema
- UTI
- Bloodstream catheter infection
- Acute abdominal infection
- Meningitis
- Skin / soft tissue infection
- Wound infection
- Implantable device infection
- Endocarditis
- Bone / joint infection



Neutropenic patients

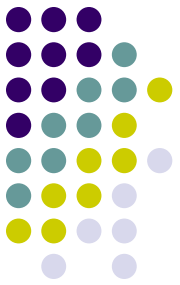
- WBC & differential affected by malignancy or its treatment
- Reduced sensitivity of SIRS criteria
- Mato study showed 3 statistically significant predictors of septic shock for patients with hematologic malignancy
 - Temperature $> 100.4^{\circ}\text{F}$
 - Heart rate $> 90\text{ bpm}$
 - Respiratory rate $> 20\text{ bpm}$



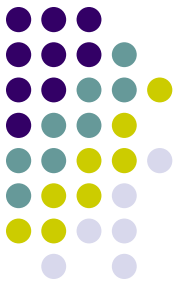
Early Goal Directed Therapy

- Obtain STAT labs – lactate level, blood cxs
- IV fluid resuscitation – critically important
 - **The patient's IV is their lifeline**
 - Fluid bolus technique avoids pulmonary edema
- IV antibiotics STAT - within 1 hour of diagnosis of severe sepsis
- Classify sepsis and determine level of care needed

Early presenting signs and symptoms of sepsis

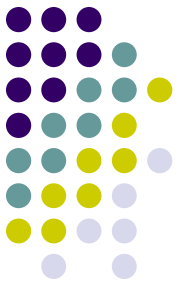


- **Mild** hypotension - BP is almost always the last thing to drop!
- Tachypnea: RR >20* (narcotics suppress RR)
- Altered mental status*
- Tachycardia* (beta blockers prevent tachycardia)
- Fever
- Rising WBC
- Decreased urine output
- Hyperglycemia (body's stress response)
- Ileus



Using the pilot protocol

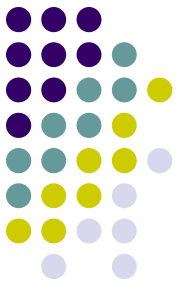
- RN will screen patients on admission, every shift with assessment, and with any change in condition
- RN will notify STAT/RRT nurse (Vocera or page) the patient has screened positive
- The STAT/RRT RN will verify the screening and assess for organ dysfunction (severe sepsis)
- If the protocol is not already in use, the STAT RN will contact the physician to activate the protocol and obtain orders
- The patient either screens positive or they don't – do not try make the patient fit the screening tool



Acute organ dysfunction

- Circulatory
- Respiratory
- Renal
- CNS
- Hematologic
- Hepatic
- GI
- Lactic acid > 2.0

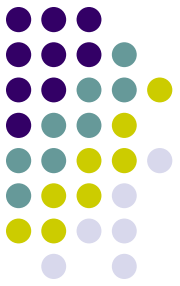
Mean arterial pressure (MAP)



$$\frac{\text{SBP} + (2)\text{DBP}}{3}$$

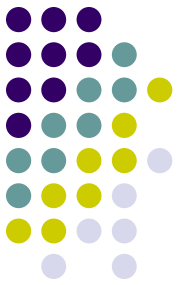
**MAP < 65 indicates inadequate
tissue perfusion**

What if we know the patient has sepsis?



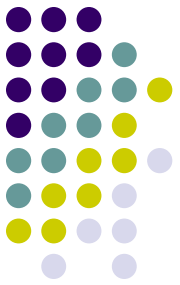
- The patient is admitted with, or develops simple sepsis...
- They are on IV antibiotics
- *Is the protocol / order set being used?*
- *Is the patient receiving adequate IV fluid volume?*
- *What are their other clinical signs?*

Documentation



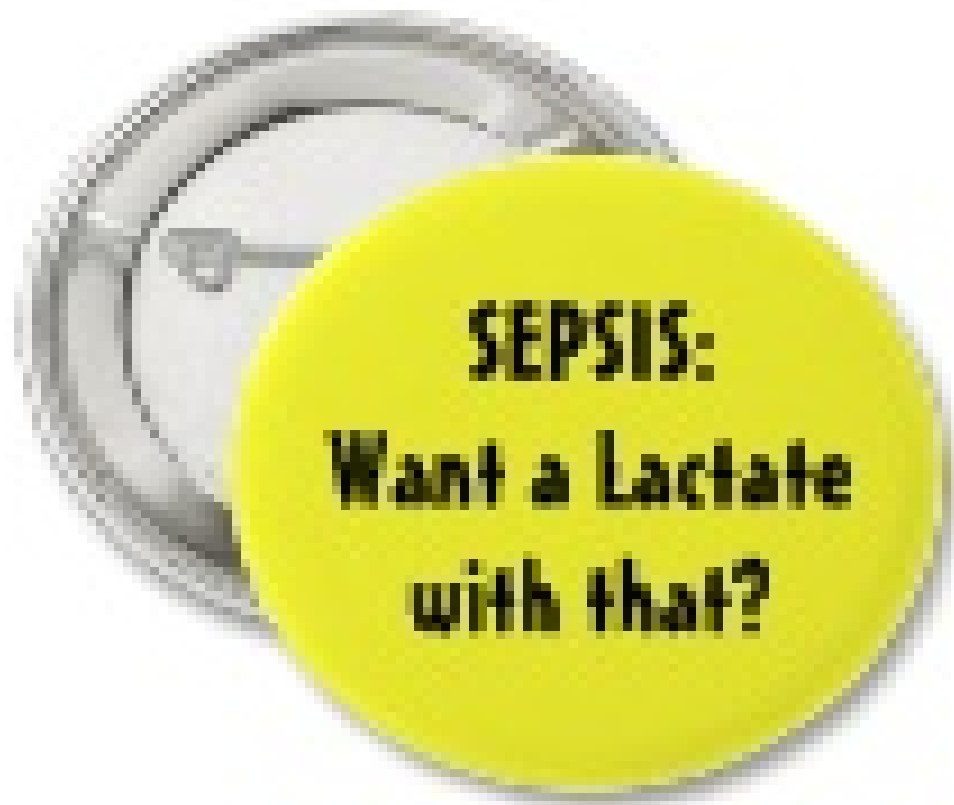
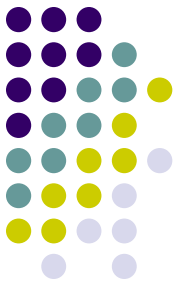
If the patient screens positive for sepsis,
use the Epic SmartText note:

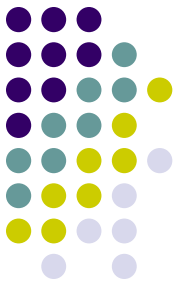
RRT/STAT Non-ICU Sepsis Screening



Patients on non-pilot floors

- Approach like any patient we are called about
- If patient screens positive, offer the standard care for sepsis: Blood cultures, lactate, IV fluids, antibiotics?
- Don't argue
- Do not use protocol or Non-ICU sepsis Epic note
- Follow patient on surveillance list

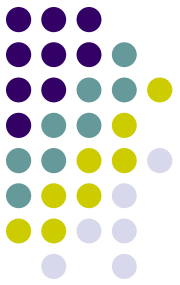


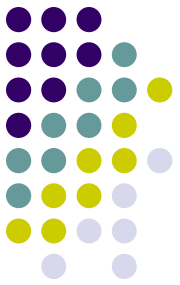


Hyperlactemia

- Generally occurs in people with adequate tissue perfusion...
- with intact buffering systems...
- and adequate tissue oxygenation
- Normal serum lactate in unstressed individuals = 1.0-0.5 mmol/L

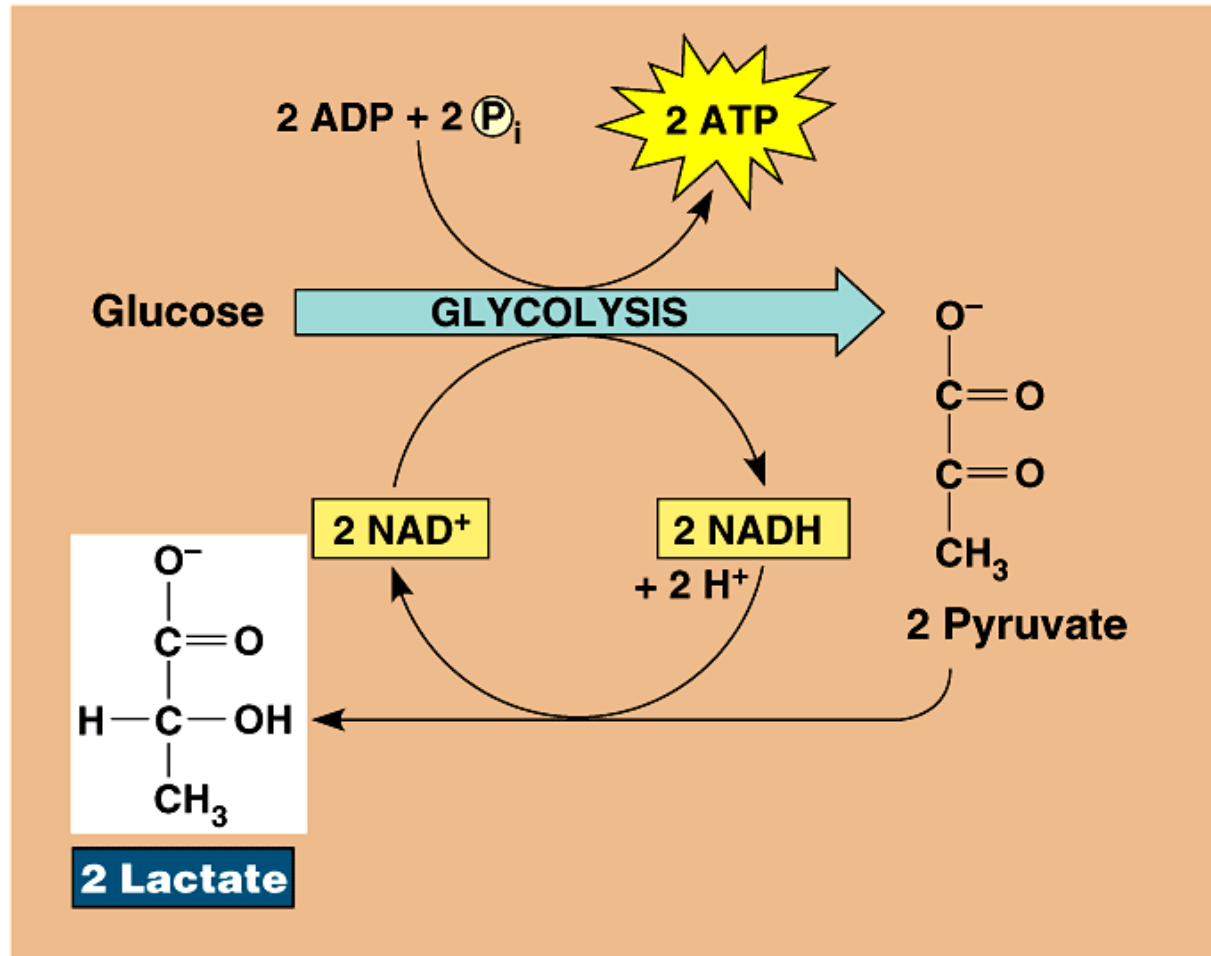
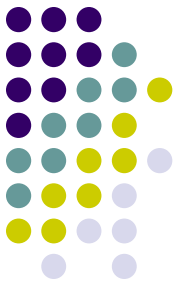
Developed lactic acid tolerance





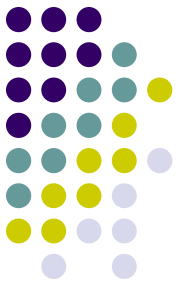
Lactic acidosis

- Associated with major metabolic dysregulation
- Tissue hypoperfusion
- Development of lactic acidosis depends on the magnitude of hyperlactemia, the buffering capacity, and the existence of other conditions that produce tachypnea and alkalosis – like sepsis
- Lactic acidosis may be associated with acidemia, a normal pH, or alkalemia



(b) Lactic acid fermentation

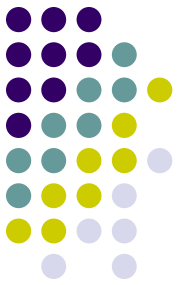
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Lactic acidosis

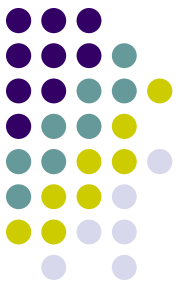
- Impaired oxygen delivery is primary problem
- Increased lactate production during glycolysis (anaerobic metabolism)
- Decreased lactate clearance
- Liver disease – cannot clear lactate during increased production
- For significant increase in blood lactate to occur, rate of production must exceed hepatic, renal, and skeletal muscle uptake

Take home message...

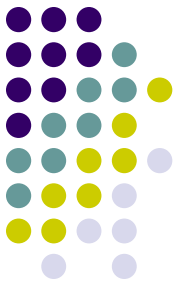


- Regional hypoperfusion of tissues may be present despite *normal* blood lactate concentrations (think: ↑creatinine, AMS, ileus)
- IVF resuscitation prior to lab draw may give a diluted result
- Lactic acid is not a biomarker - we cannot rely on a blood lactate result to show our patient has severe sepsis or septic shock

...had a normal lactate level



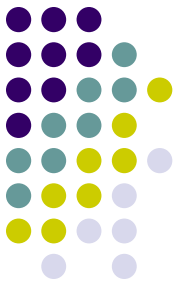
Every nurse can save a life



Early screening

Early and aggressive treatment

Advocate for your patient



References

- Dellinger, RP, Levy MM, Carlet, JM et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008. *Critical Care Med* 2008; 36 (1): 296-327
- Marini, J Wheeler, A. *Critical Care Medicine: The Essentials. 4th ed.* Philadelphia, PA: Lippincott, Williams & Wilkins; 2010
- Steen, C. Developments in the management of patients with sepsis. *Nursing Standard*, 2009. 23(48), 48-54
- Nelson, D, Lemaster, TH, Plost, GN et al. Recognizing sepsis in the adult patient. *Am J Nurs*. 2009; 109(3): 40-45
- Rivers, E. Nyguyen, Havstad, S. Riessler J. Muzzin, A., Knoblitch, B., Peterson, E., Tomlanovich, M. (2001). Early goal directed therapy in the treatment of severe sepsis and septic shock. *NEJM* 345(19), 1368-1377
- Mato, AR, Fuchs, BD et al. Utility of the systemic inflammatory response syndrome (SIRS) criteria in predicting the onset of septic shock in hospitalized patients with hematologic malignancies. *Cancer Biology & Therapy* 8:12, 1095-1100; 15 June, 2009