

**euvg** Noviembre 2023

**URGENCIAS Y CUIDADOS INTENSIVOS**

**DEFINICIONES: SHOCK, SEPSIS, SIRS, MODS**

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**Raquel Francés**  
 Medicina de urgência e cuidados intensivos  
 Mestrado em medicina interna de animais de companhia / mestrado integrado em medicina veterinária

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**URGENCIAS Y CUIDADOS INTENSIVOS**



*Raquel Francés Borrell y Carles Mengual Riera*  
 Urgencias y Cuidados Intensivos

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**URGENCIAS Y CUIDADOS INTENSIVOS**

**DEFINICIONES: SHOCK, SEPSIS, SIRS, MODS**



*Raquel Francés Borrell*  
 Urgencias y Cuidados Intensivos

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**URGENCIAS Y CUIDADOS INTENSIVOS**

- ✓ Especialidad veterinaria que engloba la atención de urgencias y el manejo de pacientes críticos.



- ✓ Pacientes graves donde su vida pelagra y necesitas tomar decisiones rápidas.

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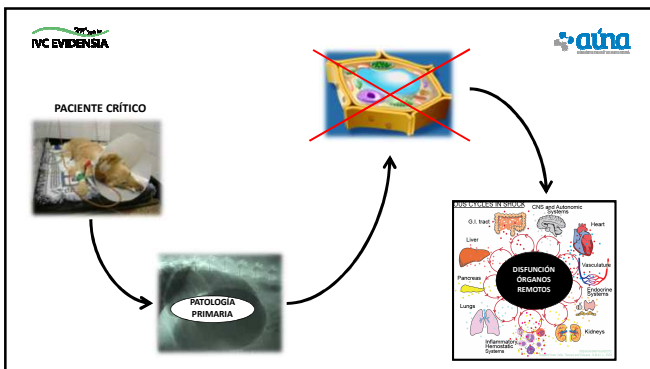
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SHOCK

SIRS

MODS (CID, ARDS, AKI...)

SEPSIS

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SHOCK

SIRS

MODS (CID, ARDS, AKI...)

SEPSIS

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INCEVIDENCIA 

# SHOCK

Déficit de energía celular.  
La demanda de oxígeno tisular excede su absorción y su uso.




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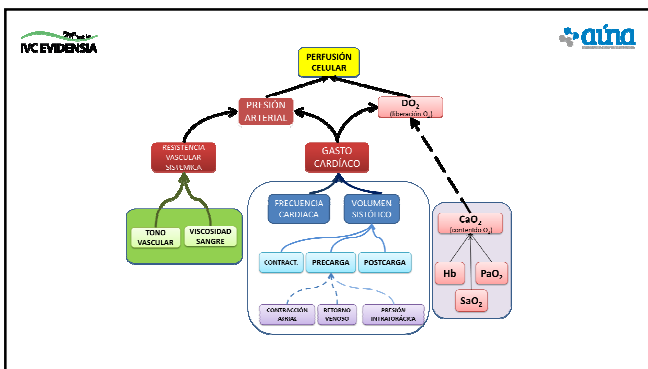
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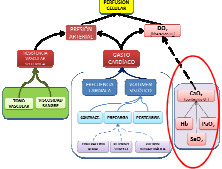
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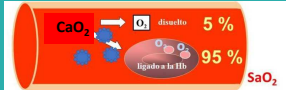
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INCEVIDENCIA 



$$CaO_2 = (1.34 \times Hb \times SO_2) + (0.003 \times PaO_2)$$




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**GC = FC X VS**

FRECUENCIA CARDIACA X VOLUMEN LATIDO = GASTO CARDIACO  
 70 latidos/min x 70ml/latido = 4900 ml/min

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- o Vasoconstricción: ↑ RVS
- o Vasodilatación: ↓ RVS

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**Hemorragia** → ↓ retorno venoso  
 ↓ Hb

**Contusión pulmonar** → ↓ PaO<sub>2</sub>

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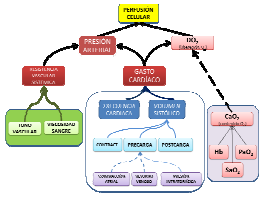
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**Anemia** → ↓ Hb

**TEP** → ↓ PaO<sub>2</sub>  
↓ volumen sistólico ventrículo izq

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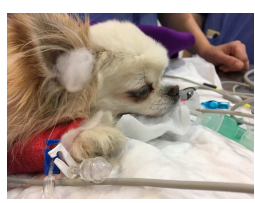
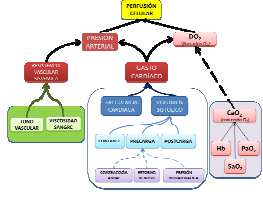
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**ICC izquierda** → ↓ PaO<sub>2</sub>  
↓ contractibilidad  
↑ retorno venoso

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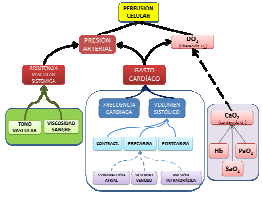
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**Vasodilatación** → ↓ RVS

**↓ contractibilidad** → ↓ volumen sistólico

**Hipovolemia** → ↓ retorno venoso

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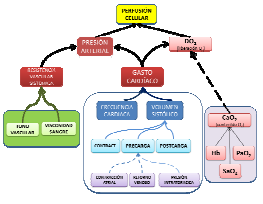
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**Hipoglucemia** → ↓ sustrato para energía celular

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### TIPOS DE SHOCK

CIRCULATORIO	NO CIRCULATORIO
<ul style="list-style-type: none"> <li>CARDIOGÉNICO</li> <li>HIPOVOLÉMICO</li> <li>OBSTRUCTIVO</li> <li>DISTRIBUTIVO</li> </ul>	<ul style="list-style-type: none"> <li>↓ CaO<sub>2</sub></li> <li>METABÓLICO</li> </ul>

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### TIPOS DE SHOCK

**CIRCULATORIO**

CARDIOGÉNICO	HIPOVOLÉMICO	OBSTRUCTIVO	DISTRIBUTIVO
<ul style="list-style-type: none"> <li>✓ Fallo ventricular izq</li> <li>✓ Fallo ventricular dcho</li> </ul>	<ul style="list-style-type: none"> <li>✓ Absoluta                             <ul style="list-style-type: none"> <li>- hemorragia.</li> <li>- deshidratación.</li> </ul> </li> <li>✓ Relativa</li> </ul>	<ul style="list-style-type: none"> <li>✓ DTG.</li> <li>✓ Tamponamiento cardiaco</li> <li>✓ Enf. Pleural</li> <li>✓ TEP</li> </ul>	<ul style="list-style-type: none"> <li>✓ SIRS/sepsis</li> <li>✓ Anafilaxis</li> <li>✓ Addison</li> <li>✓ Neurogénico</li> </ul>

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### TIPOS DE SHOCK NO CIRCULATORIO



**↓ CaO<sub>2</sub>**

- ✓ ↓ PaO<sub>2</sub>
  - ↓ FIO<sub>2</sub>
  - hipoventilación
  - V/Q desequilibrio
  - shunt anatómico
- ✓ ↓ capacidad transporte O<sub>2</sub>
  - Anemia
  - Dishemoglobinemia



**METABÓLICO**

- ✓ Hipoglucemia
- ✓ Disfunción mitocondrial
  - Intoxicación
  - Ciertas enfermedades

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### PATOFISIOLOGÍA DEL SHOCK



Activación simpática    Circulación periférica    Hipoperfusión    Circulación central    Shock irreversible

SHOCK COMPENSADO    SHOCK DESCOMPENSADO TEMPRANO    SHOCK DESCOMPENSADO TARDIO    SHOCK DESCOMPENSADO FINAL

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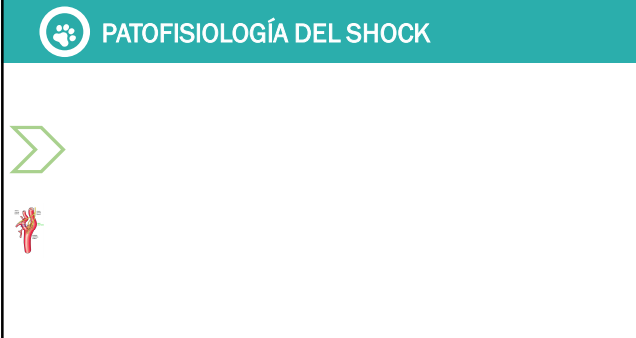
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### PATOFISIOLOGÍA DEL SHOCK



SHOCK COMPENSADO



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### PATOFISIOLOGÍA DEL SHOCK

**Activación simpática**

Taquicardia  
Contractibilidad  
Vasoconstricción

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### PATOFISIOLOGÍA DEL SHOCK

**SHOCK COMPENSADO**

Circulación periférica  
Perfusión ok  
Circulación central ok

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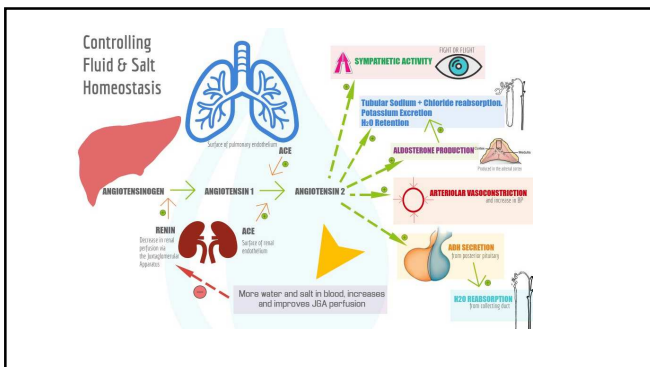
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**PATOFISIOLOGÍA DEL SHOCK**

<p><b>Activación simpática</b></p> <p>Taquicardia Contractibilidad Vasoconstricción</p>	<p><b>Circulación periférica</b></p> <p>Mucosas pálidas TRC &gt; 2" Pulso débil No sonidos intestinales</p> <p>Gradiente temperatura Capnometría sublingual Pulsioxímetro - plestigrafía</p>
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**PATOFISIOLOGÍA DEL SHOCK**

<p><b>SHOCK COMPENSADO</b></p> <p>Circulación periférica</p> <p>Perfusión ok</p> <p>Circulación central ok</p>	<p><b>SHOCK DESCOMPENSADO TEMPRANO</b></p> <p>Circulación periférica ++</p> <p>Hipoperfusión</p> <p>Circulación central ok</p>
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**PATOFISIOLOGÍA DEL SHOCK**

<p><b>Activación simpática</b></p> <p>Taquicardia Contractibilidad Vasoconstricción</p>	<p><b>Circulación periférica</b></p> <p>Mucosas pálidas TRC &gt; 2" Pulso débil No sonidos intestinales</p>	<p><b>Hipoperfusión</b></p> <p>Lactato &gt; 2.5 mmol/L S<sub>v</sub>O<sub>2</sub> &lt; 70%</p>
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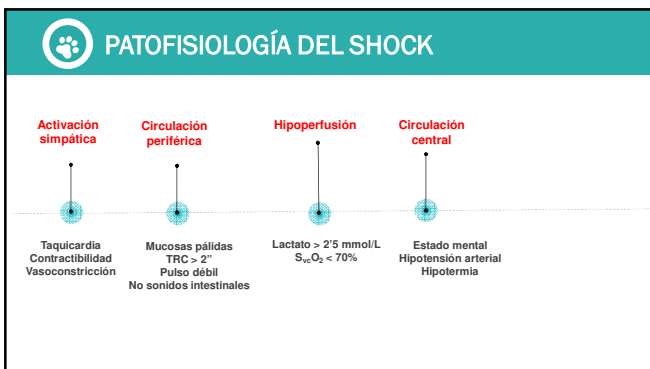
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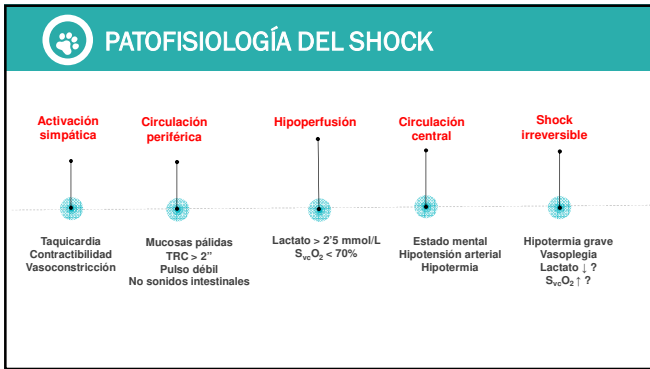
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**PATOFISIOLOGÍA DEL SHOCK**

**Evaluation of the shock index in dogs presenting as emergencies**

Adam F. Porser, DVM, DACVECC; Elizabeth A. Rozanski, DVM, DACVIM, DACVECC; Claire R. Sharp, BVMS, MS, DACVECC; Kirsten L. Dixon, BS, CVT; Lori Lyn Price, MAS and Scott P. Shaw, DVM, DACVECC  
*Journal of Veterinary Emergency and Critical Care* 23(5) 2013, pp 538-544

**FC / PAS > 1**

Alta S y E de shock

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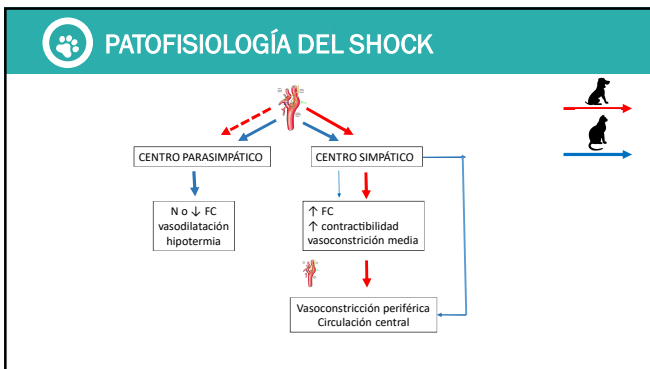
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**CONSECUENCIAS DEL SHOCK**



- SIRS
- coagulopatías
- disfunción mitocondrial
- lesiones de reperfusión
- disfunción microcirculación
- MODS

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- SHOCK
- SIRS
- SEPSIS
- MODS (CID, ARDS, AKI...)

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**SIRS**

Estado proinflamatorio sistémico junto con un control inadecuado de la respuesta antiinflamatoria sistémica.

Secundario a un insulto inicial: infeccioso o no infeccioso.



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**SIRS** Patofisiología

Origen infeccioso:  
bacteriano, vírico, fúngico, parasitario...

Origen no infeccioso:  
Pancreatitis, politrauma, golpe de calor, GDV...



**PAMP**  
pathogen-associated molecular pattern



**DAMP**  
damage-associated molecular pattern

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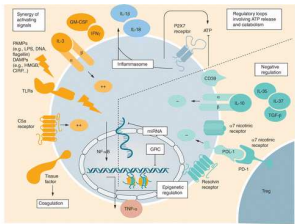
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**SIRS** Patofisiología



**SIRS** **CARS**

**CARS = compensatory antiinflammatory response syndrome**

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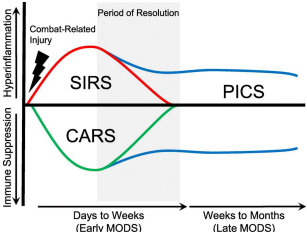
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**SIRS** Patofisiología



Immune Suppression  
Hypoinflammation

Combat-Related Injury

Period of Resolution

SIRS

CARS

PICS

Days to Weeks (Early MODS)

Weeks to Months (Late MODS)

**PICS:**  
persistent inflammation/immunosuppression catabolism syndrome

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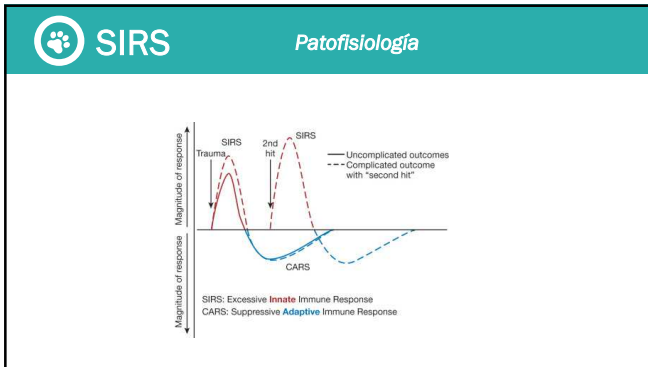
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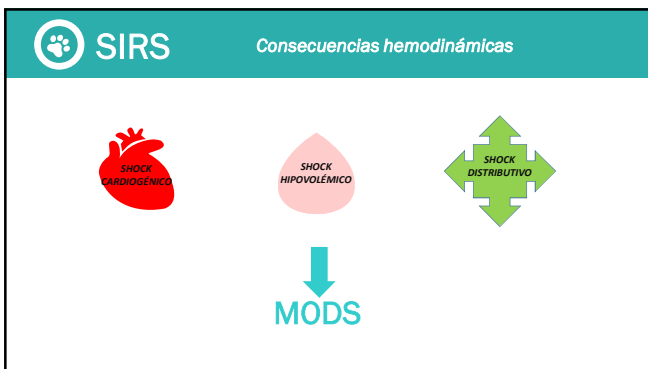
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**SIRS Criterios**

PERROS = 2 o más de:	GATOS = 3 o más de:
FR > 40 rpm	FR > 40 rpm
FC > 160 lpm	FC > 225 lpm o < 140 lpm
> 39'7º C o < 37'8 º	> 39'7º C o < 37'8 º
> 12000 WBC O < 4000 neutrófilos	> 19500 WBC O < 5000 neutrófilos

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SHOCK

SIRS

MODS (CID, ARDS, AKI...)

SEPSIS

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**MODS**

Estado de disfunción multiorgánica.

Se define cuando hay 2 o más disfunciones orgánicas en pacientes con SIRS.

MODS

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**MODS** Criterios

COAGULACIÓN

ENDOCRINO

DIGESTIVO

HEPÁTICO

NEUROLÓGICO

PULMONAR

RENAL

VASCULAR

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**CARDIOVASCULAR**



<p><b>Shock séptico</b></p> <p>↓ contractibilidad o disfunción miocárdica.</p> <p><b>Arritmias cardíacas.</b></p>	<p>PAM &lt; 65 mmHg a pesar de resucitación con fluidos. Dependencia de vasopresores</p> <p>Disminución de la fracción de acortamiento/fracción de eyección. Dilatación biventricular. Incremento de las troponinas</p> <p>Identificación en el ECG.</p>
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**COAGULACIÓN - CID**



<p><b>Estado hipercoagulable:</b></p> <p>Accidentes tromboembólicos.</p>	<p>Evidencia de hipercoagulabilidad en las pruebas viscoelásticas. Disminución de anticoagulantes endógenos (AT, aPC) Aumento de los d-dímeros.</p>
<p><b>Estado hipocoagulable:</b></p> <p>Posibles sangrados.</p>	<p>Tiempos de sangrado prolongados (TP, TTPA). Trombocitopenia (&lt;100.000/<math>\mu</math>l). Evidencia de hipocoagulabilidad en pruebas viscoelásticas.</p>

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**ENDOCRINO**



<p><b>Hipoglucemia</b></p>	<p>Glucemia &lt; 60 mg/dl</p>
<p><b>Hiperglucemia</b></p>	<p>Glucemia &gt; 180 mg/dl</p>
<p><b>CIRCI</b> (critical illness-related corticosteroid insufficiency)</p>	<p>Test estimulación con ACTH.</p>

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**DIGESTIVO**



Vómitos	Incremento de los volúmenes gástricos residuales.
Diarreas	
Úlceras gastrointestinales	

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**HEPÁTICO-BILIAR**



Ictericia	Tbil > 0'5 mg/dl
Aumento de la ALT	
Funciones de síntesis comprometidas	

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**NEUROLÓGICO**



Convulsiones	
Encefalopatía/ estado mental alterado.	
Delirio	

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PULMONAR



ARDS (acute respiratory distress syndrome).

A-a gradient > 10 mmHg

SpO<sub>2</sub> < 95% (FIO<sub>2</sub> 0'21)

PaO<sub>2</sub>/F<sub>2</sub>O<sub>2</sub> ratio < 300 mmHg

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RENAL



AKI (acute renal injury)

Oliguria, anuria

Aumento de la creatinina de 0'3-0'5 mg/dl en ausencia de causas prerrenales y postrenales.

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VASCULAR-ENDOTELIAL



Daño del glicocalix endotelial.

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-  SHOCK
-  SIRS
-  MODS (CID, ARDS, AKI...)
-  SEPSIS

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### SEPSIS

Veterinaria:  
SIRS + Infección demostrada o sospechada.

Humana:  
MODS + Infección demostrada o sospechada.



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### SEPSIS

- ✓ Enfoque basado en consensos globales.
- ✓ ↓ mortalidad 2025 al 20%.



Global Sepsis Alliance



Surviving Sepsis Campaign

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**SEPSIS**

- ✓ Grave problema a nivel mundial.
- ✓ Definiciones en movimiento.

WORLD SEPSIS DAY INFOGRAPHICS

A GLOBAL HEALTH CRISIS

47 000 000 - 50 000 000 cases per year

At least 11 000 000 die - 1 death every 20 seconds

Survivors may face lifelong consequences

1 in every 5 deaths worldwide is associated with sepsis

Global Sepsis Alliance [www.worldsepsisday.org](http://www.worldsepsisday.org) [www.global-sepsis-alliance.org](http://www.global-sepsis-alliance.org)

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**SEPSIS**

SEPSIS 1 1991

SEPSIS 2 2001

SEPSIS 3 2016

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**SEPSIS 1**

**SEPSIS 2**

SEPSIS:  
SIRS + infección

SEPSIS GRAVE:  
sepsis + disfunción orgánica

SHOCK SÉPTICO:  
Sepsis con hipotensión que no responde a fluidos.

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### SEPSIS 3

Respuesta anómala del huésped frente a una infección, que pone en riesgo la vida del paciente.

JAMA. 2016 February 23; 315(8): 801-810. doi:10.1001/jama.2016.0287.

#### The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Mervyn Singer, MD, FRCP, Clifford S. Deutschman, MD, MS, Christopher Warren Seymour, MD, MSc, Manu Shankar-Hari, MSc, MD, FFICM, Djillali Annane, MD, PhD, Michael Bauer, MD, Rinaldo Bellomo, MD, Gordon R. Bernard, MD, Jean-Daniel Chiche, MD, PhD, Craig M. Coopersmith, MD, Richard S. Hotchkiss, MD, Mitchell M. Levy, MD, John C. Marshall, MD, Greg S. Martin, MD, MSc, Steven M. Opal, MD, Gordon D. Rubenfeld, MD, MS, Tom van der Poll, MD, PhD, Jean-Louis Vincent, MD, PhD, and Derek C. Angus, MD, MPH

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### SEPSIS 3

Respuesta anómala del huésped frente a una infección, que pone en riesgo la vida del paciente.

#### SEPSIS:

infección con  $\geq 2$  fallos orgánicos

#### ~~SEPSIS GRAVE~~

#### SHOCK SÉPTICO:

Sepsis con hipotensión que no responde a fluidos o lactato  $> 2$  mmol/l

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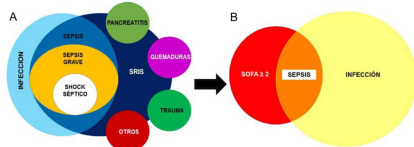
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SEPSIS 1, 2



SEPSIS 3



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## SEPSIS 3

Respuesta anómala del huésped frente a una Infección, que pone en riesgo la vida del paciente.

Criterio: **INFECCIÓN** + **Sequential Organ Failure Assessment**  
 variación ≥ 2 puntos en la escala




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## SEPSIS 3

**Escala SOFA (Sepsis related Organ Failure Assessment)**

CRITERIOS	0	1	2	3	4
<b>SNC</b> Escala de Glasgow	15	13-14	10-12	6-9	<6
<b>Renal</b> Creatinina (mg/dl) Diuresis (ml/día)	<1,2	1,2-1,9	2-3,4	3,5-4,9 ou <500	>5 ou <200
<b>Hepático</b> Bilirrubina (mg/dl)	<1,2	1,2-1,9	2-5,9	6-11,9	>12
<b>Coagulación</b> Plaquetas 10 <sup>9</sup> /mm <sup>3</sup>	≥150	<150	<100	<50	<20
<b>Respiratorio</b> PaO <sub>2</sub> /FIO <sub>2</sub> (mmHg)	≥400	<400	<300	<200 y soporte ventilatorio	<100 y soporte ventilatorio
<b>Cardiovascular</b> TAM (mmHg) Drogas vasopresivas (µg/kg/min)	≥70	<70	Dopamina a <5 o dobutamina a cualquier dosis	Dopamina 5-15 Noradrenalina o adrenalina ≤ 0,1	Dopamina >15 Noradrenalina o adrenalina > 0,1

SNC: sistema nervioso central; PaO<sub>2</sub>: presión arterial de oxígeno; FIO<sub>2</sub>: fracción de oxígeno inspirado; TAM: tensión arterial media.

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## SEPSIS quick-SOFA

Criterio: **INFECCIÓN** + presencia de ≥ 2 de los 3 puntos en la escala quick-SOFA

- Alteración del nivel de consciencia  
**Escala Glasgow ≤ 13 puntos**
- Tensión arterial sistólica  
**≤ 100 mmHg**
- Frecuencia respiratoria  
**≥ 22 lpm**




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**SEPSIS**

Intensive Care Med  
<https://doi.org/10.1007/s00135-021-06056-y>

**GUIDELINES**

**Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021**

**Recommendation**

2. We **recommend against** using qSOFA compared to SIRS, NEWS, or MEWS as a single screening tool for sepsis or septic shock  
*Strong recommendation, moderate-quality evidence*

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**SEPSIS**

Sequential organ failure assessment score in ill dogs 395

Application of the Sequential Organ Failure Assessment Score to predict outcome in critically ill dogs: Preliminary results

In conclusion, evaluation of the SOFA score in ICU hospitalized dogs appears to be a good prognostic indicator and it could be used to quantify the degree of organ dysfunction present on admission or that develops during hospitalization without any information about the reason for admission. However, these results are preliminary and further studies are needed to determine the applicability of the SOFA score in predicting the outcome of critically ill dogs.

Variables	SOFA score				
	0	1	2	3	4
Respiration * PaO <sub>2</sub> /F <sub>i</sub> O <sub>2</sub> (mmHg)	> 500	≤ 400	≤ 300	≤ 200*	≤ 100*
Coagulation * Platelets (x 10 <sup>9</sup> /L)	> 150	≤ 150	≤ 100	≤ 50	≤ 20
Liver * Bilirubin (mg/dL)	< 0.6	0.6–1.4	1.5–3.0	3.1–11.0	> 11.1
Cardiovascular Hypotension	no hypotension	MAP = 40 mmHg	*Saps ≤ 3 or Delta	*Saps > 3 or Saps ≤ 3.1 or Saps ≤ 3.1	*Saps > 3 or Saps > 3.1 or Saps > 3.1
Central nervous system * Glasgow-Like Score	15	13–14	10–12	6–9	< 6
Renal * Creatinine (mg/dL)	< 1.4	1.4–1.9	2.0–3.4	3.5–4.9	> 5.0

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**SEPSIS**

Evaluation of the quick sequential organ failure assessment score plus lactate in critically ill dogs

**CLINICAL SIGNIFICANCE:** In this study, quick sequential organ failure assessment was not able to predict survival in a general population of critically ill patients. The addition of lactate to the quick sequential organ failure assessment score slightly increased the predictive ability of the score.




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### Conclusiones

-  Patofisiología shock y tipos de shock (árbol de la vida)
-  SIRS-CARS, PICS, *second hit*, diagnóstico
-  MODS: identificación fallos orgánicos
-  SEPSIS definiciones y diagnóstico



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# euvg

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