

LABORATORY DIAGNOSTICS IN EMERGENCY ROOMS

# A BABY WITH 40°C FEVER - IS THAT AN EMERGENCY?



**It is an everyday challenge for doctors in the emergency room: worried parents who show up with their feverish baby. It is important to distinguish quickly if the situation is life-threatening or not - because making the diagnosis of a serious bacterial infection such as meningitis too late can result in the death of the child.<sup>1,2</sup> This article will point out important aspects that can help you in making that assessment.**

## **40°C fever, cold extremities, conspicuous drinking behavior**

A mother comes to the ER with her one-month-old child. The infant has 40.3°C fever with no apparent cause, his hands and feet are cold. The woman reports that the child barely drinks and seems drowsy - would you classify such a case\* as a potential emergency?

Doctors frequently see infants with acute fever (defined as rectal temperature  $\geq 38^{\circ}\text{C}$ ) in the emergency room.<sup>4</sup> The distinction between a harmless, mostly viral infection and a serious bacterial infection such as bacteremia, meningitis, urinary tract infection or pneumonia is particularly difficult in this age group because symptoms are often unspecific.<sup>5,6</sup>

## **Consider sepsis and urinary tract infections when it comes to infants**

In principle, experts recommend to assume a high risk for bacterial infection in febrile infants who appear ill - or who are younger than 28 days - and therefore, a detailed diagnosis should be initiated with differential blood count, inflammation parameters, urine analysis, possibly blood and urine cultures as well as cerebrospinal fluid puncture.<sup>3,7</sup>

The probability that a bacterial infection is the cause of a fever attack is greater in infants than in older children, where the cause is usually viral and the infection therefore usually self-limiting. For infants up to the age of 3 months, the risk of a severe bacterial infection is up to 5 %. Sepsis and urinary tract infections are quite common; after the 3rd month of life the risk drops to 0.5 - 1 %.<sup>8</sup>

## **Delayed diagnostics increase mortality risk**

In the example of the one-month-old infant, a serious illness should therefore be assumed, which is why further diagnosis is required. The cause should then be found quickly. In the emergency room, it is crucial that the laboratory results are made available quickly and correctly. Any delays or incorrect diagnoses, e.g. due to defective sample material, can have serious consequences for the patient.<sup>9,10</sup>

**30%** 30% of interviewed doctors do consider delays in laboratory diagnostics the biggest challenges and difficulties in the emergency room

Question: What do you consider the biggest challenges and difficulties in the emergency room? (multiple answers possible; n=181)

To identify those patients who actually represent an emergency among the large number of patients 151

Low resources (personnel, material, etc.) for large numbers of patients 101

Delays in laboratory diagnostics 54

Inefficient/unstructured or missing workflows 49

patient dissatisfaction 38

Others (please comment below the article) 3

The urine analysis carried out on the infant revealed leukocyturia (500 leukocytes/ $\mu$ l). Therefore, a urinary tract infection can be assumed, which should be treated immediately with antibiotics (intravenously).<sup>8</sup> In order to confirm the diagnosis and, if necessary, to re-evaluate the antibiotic therapy, a urine culture should be created in which E. coli. is to be detected.

### The optimal treatment method is still being debated

But what to do if the situation is less obvious than in this example? Experts are still discussing how to best manage infants with acute fever in order to avoid overdiagnosis and unnecessary antibiotic prescriptions and to prevent parents from worrying for no reason.<sup>3</sup> However, a final consensus has not yet been reached.<sup>3</sup>

### Alarm signs you should be aware of

Physical alarm signs for a bacterial infection are:<sup>5,7,8</sup>

- > Reduced state of consciousness,
- > Seizures,
- > Tachypnea/ dyspnea,
- > Cyanosis,
- > Reduced peripheral blood circulation (e.g. delayed recapillarization time),
- > Meningeal irritations,
- > Petechia,
- > Fever > 40 °C,
- > Impaired mobility and loss of appetite,
- > Weak peripheral pulses,
- > Dehydration,
- > Oliguria,
- > cold extremities
- > Swellings.

### Viral or bacterial?

The detection of biomarkers such as C-reactive protein (CRP) and procalcitonin (PCT) is a way to quickly distinguish between a bacterial, potentially life-threatening infection and a viral infection. 3,4 High probability of bacterial infection is to be assumed when encountering the following limit values:<sup>4,7</sup>

- > PCT value:  $\geq 2,0$  ng/mL or
- > CRP value:  $\geq 100$  mg/L.

However, these markers should always be interpreted in the context of the child's physical appearance and other laboratory parameters. 4 European pediatricians have developed a step-by-step approach to identify infants with a low risk of bacterial infection that do not require further diagnosis for this reason (Fig. 1). Compared to earlier criteria, this approach has a high sensitivity (92.0 %), but the specificity is relatively low (47.0 %).<sup>4,11</sup>

Even though infections are the most common cause of fever in infants, other rare causes should also be considered for differential diagnosis purposes. These include neuroblastoma, acute leukemia, Kawasaki syndrome and juvenile idiopathic arthritis.<sup>5,8</sup>

\* Note: This is a hypothetical case.



### Automated System Solutions - Pre-analytics in 3 Seconds

Automated systems can enable medical personnel to make pre- and post-analytical processes in laboratory diagnostics more efficient.<sup>12</sup>

The DxA 5000 is the only automated system capable of evaluating sample material within 3 seconds.<sup>12</sup> The advantages of this system are:<sup>12</sup>

- > Prioritization of samples according to urgency
- > High performance due to fast and optimized sample throughput times
- > High accuracy through automatic identification of poor quality samples
- > Possibility of real-time monitoring
- > Flexibility through scalable and modular systems

Such process optimization can shorten emergency room treatment times, prevent false diagnoses and save costs.<sup>13,14,15</sup>

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