***Ministry of Higher Education and Scientific research***

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 **rickets in domestic animals**

**الكساح في الحيوانات الحقلية**

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***Rickets***

***is a classic metabolic bone disease of humans and animals, first described in the first and second centuries.With the discovery that vitamin D could prevent rickets, the prevalence of this disease in developed countries plummeted; however, it still occurs. In fact, the prevalence of rickets and vitamin D insufficiency is increasing in people of all ages in the developed world, due in part to decreased sunlight exposure and widespread sunscreen usage The disease is well recognized in animals, but published reports are uncommon and sometimes confusing.(1)***

***Pathology of Rickets***

***The characteristics of rickets are similar in all species. Lesions are typically most severe in the fastest-growing bones, including the radius, the tibia, and the metacarpals and metatarsals***

***irregular thickening of the physeal cartilage, erosion of articular cartilage due to collapse of subchondral bone, and spontaneous fractures.Enlargement of costochondral junctions, the so-called rachitic rosary, is also a classic lesion of rickets that may be seen on radiographic or postmortem examination.***

***Impaired provisional calcification of cartilage at sites of endochondral ossification leads to the accumulation of hypertrophic chondrocytes, resulting in thickened and irregular growth plates with islands and tongues of chondrocytes extending into the metaphyses.***

***Similar changes occur beneath articular epiphyseal cartilage complexes in the expanding epiphyses of young animals.200 Other microscopic changes may include thick osteoid seams lining trabeculae and disorganization or absence of the primary spongiosa. One of the early pioneers of research into rickets, Sir Arnold Theiler, regarded the pathognomonic change as “the presence of osteoid tissue in quantities surpassing normal physiological limits.”***

***Hemorrhage and signs of trauma may be seen in the metaphysis and primary spongiosa because of damage to weakened trabeculae of poorly mineralized bone.(2)***

***Symptoms of Rickets***

***Symptoms of rickets include pain or tenderness in the bones of your arms, legs, pelvis, or spinedeformities in your teeth or delayed tooth formation, an increased number of cavities, holes in your enamel, abscesses, or defects in the structure of your teeth.impaired growth and short stature,bone fractures,muscle cramps,skeletal deformities, including:,an oddly shaped skull,,bumps in you ribcage***

***a protruding breastbone***

***pelvic deformities in very severe rickets, patients may develop even more serious signs and symptoms associated with very low levels of calcium or phosphate. These might include tetany (involuntary muscle contractions) or seizures. These are medical emergencies and require immediate treatment.***

***A misshaped skeleton. This can include thickening of the ankles, wrists or knees (‘knock-knees’), legs that curve outwards (‘bow legs’) or a breastbone that sticks out (‘pigeon chest’)***

***Pain. The bones affected by rickets are often sore and painful, so your child may be reluctant to walk or may get tired easily.***

***Fragile bones. The bones become weaker and are more likely to break.***

***Poor growth and development. Your child’s skeleton doesn’t grow and develop properly, so he or she may be short for their age***

***Problems with teeth, including weak tooth enamel and a delay in teeth coming through.*** ***(3)***

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***Diagnosed***

***Your doctor may notice signs of rickets during a physical examination of your child, including signs of tenderness or pain in the child’s bones. Tests to measure blood levels of calcium and phosphate and tests to look at the bones in more depth may help your doctor diagnose rickets.These tests may include:arterial blood gases***

***blood tests of calcium, phosphorus, parathyroid hormone, and other blood tests***

***bone X-rays***

***Rarely, a bone biopsy is performed. This involves using a needle to remove a small section of bone for laboratory analysis.(4)***

***Treatment***

***Rickets can be treated by replacing the missing vitamin or mineral in your body. This will eliminate most of your symptoms. If you are deficient in vitamin D, your doctor will likely tell you to (safely) get more sun and eat foods high in vitamin D, such as:fish.liver.milk.egg***

 ***Replenishment of vitamin D stores requires a total vitamin D dose of 100 000–500 000 IU, depending on age (Box 3).32 Treatment with calcitriol (1,25-[OH]2D) is only indicated for hypocalcaemia (see below). Calcium supplementation is recommended if dietary intake is poor (Box 4).***

***Calcium and vitamin D supplements can also be used to treat rickets. Ask your doctor about the correct dosage, which can vary based on the size of your child. Too much vitamin D or calcium can be unsafe.If skeletal deformities are present, your child may need braces to position his or her bones correctly as they grow. In severe cases, the child may need corrective surgery.For hereditary rickets, a combination of phosphate supplements and a special form of vitamin D is required to treat the disease.*** ***The treatment for rickets depends upon the cause as mentioned above in the discussion of hypophosphatemic rickets and renal rickets. In cases of nutritional rickets and vitamin D deficiency, treatment is simple. The first step is to prevent the complications of calcium and phosphate deficiency by correcting any abnormal levels with supplemental calcium or phosphate as well as the activated vitamin D (calcitriol). Once the diagnosis of rickets is confirmed, initiation of vitamin D supplementation is recommended, as well as a diet rich in calcium. This is especially important for children on vegan diets. The treatment for some of the bony abnormalities depends on the severity of the cases and may require referral to an orthopedic provider for evaluation. (5)***

***Prevented***

***Rickets can be prevented with a diet that includes adequate levels of calcium, phosphorous, and vitamin D, along with moderate sun exposure. According to the National Health Service of England (NHS), you only need to expose your hands and face to sunlight a few times a week during the spring and summer months to prevent rickets (NHS).***

***Most adults get enough exposure to sunlight. It is important to note that too much sunlight can damage your skin, and sunscreen should be applied to prevent burns and skin damage. However, the use of sunscreen can prevent your skin from producing vitamin D. Eating foods that contain vitamin D or that are fortified with vitamin D or taking vitamin supplements can also prevent the disease.(6)***

***References***

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