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Impact of chemical sterilization methods on mechanical properties and bacterial load on homemade fishing line nylon sutures

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Despite the evolution of suture materials over the past years, nylon fishing line remains a widely used material in the manufacture of sutures for veterinary and human medicine. Its properties in surgery have been shown to be comparable to commercial sutures and represent 20 to 50 times less cost, making them a practical resource in cost reduction strategies, especially for free mass castration services. There is no bibliography available on the impact that sterilization products have on nylon, since they are produced outside the sphere of regulation of regulatory bodies such as ANMAT. In this work we propose to evaluate the physical characteristics and bacterial load of fishing nylon after being subjected to different chemical sterilization methods. All the studies were carried out using 0.3 mm diameter transparent green nylon threads (Nitanyl, Argentina). Four products were selected: ethylene oxide (OE) (BIOLENE, Argentina) and glutaraldehyde (GLU) (Glutaral IQB, Lab. RODRIGUEZ Y VIDAL, Argentina), chloroxylenol 5% soap solution (CX) (Cloroxylenol IQB) and iodopovidone 10% solution (YOD) (Icubex 10, IQB). At different disinfection times (tD), with 0 <tD <288 days, tensile tests were carried out on an INSTRON 4465 universal testing machine with clamping jaws manufactured at IFIMAT. Tensile tests were performed with 10 samples for each tD, at room temperature, deformation speed 10 mm/min, until breakage. It was observed that with OE and GLU there is no significant change depending on the tD. On the other hand, in the samples treated with CX an increase in the maximum deformation of 30% was observed for tD ≤ 75 days, time from which it reached a plateau, accompanied by a marked decrease in the tensile force (61%). With YOD treatment, the strands gradually lose ductility, enduring 50% less tension after 144 days and losing 80% of their deformation capacity.

To assess bacterial load, five 1-cm pieces of nylon were taken, dried with sterile gauze, and placed in 1 ml of peptone broth (Britain, Argentina). 200µl of 1/10 serial dilutions were vortexed and seeded, in triplicate on Plate Count agar plates (Britannia, Argentina). Incubated at 37°C for 24 hrs. The initial bacterial load of commercial nylon was observed to be very low (9.66×10^2 Colony Forming Units (CFU)/m nylon). No bacterial growth was observed after treatment with any of the products. Based on the results obtained, we can say that OE and GLU remain the best sterilization methods since they did not alter significantly the nylon physical characteristics. GLU represents the advantage of not requiring individual packaging, it is fast and practical. A particular behavior occurs with CX. As soon as 2 days after immersion, an increase in deformation is observed, making it more malleable for securing knots. However, it should be used before 15-20 days of immersion, because at that point it already loses 80% of the tensile strength. As for bacterial loads, since initial CFU counts are very low, any of the products resulted in complete sterilization.