The ALPS (Advanced Locking Plate System) fracture fixation system is a novel internal fracture fixation device designed and produced by Kyon Veterinary Surgical Products of Switzerland. Compared to conventional internal fixation systems the ALPS system is designed to reduce the rate of surgical infection, improve the rate of fracture healing, and improve surgical application versatility.

All ALPS implants are titanium or titanium alloy. Compared to surgical stainless steel, titanium has greater biocompatibility, reduced infection rates, and a favorable tradeoff between ductility and strength. The geometry of ALPS plates is computer-optimized to reduce regions of stress-concentration and to facilitate bending/contouring both out-of-plane and in-plane. Screw holes accommodate either conventional bone screws or locking screws. Conventional bone screws may be placed with up to 60 degrees of longitudinal and 10 degrees of transverse swivel and can be used to apply dynamic compression across the fracture or to lag fragments through the plate. Locking screws are placed perpendicular to the plate and compared to conventional screws provide improved construct rigidity even when placed monocortically.

ALPS plates are applied in direct contact with the bone. The bone-plate contact region is a small “point” contact that assures stability of the construct while minimizing the area of compressive damage to periosteal blood vessels. When used with locking screws, monocortical screw placement minimizes damage to the endosteal blood vessels and the trans bone cortex. The reduced iatrogenic impact to periosteal and endosteal bone vascular supply has been shown to reduce infection rate and bone healing time. Compared to internal locking systems and external fixators that are applied at a distance away from the bone, contact of the ALPS plate with the bone reduces interference with overlying soft tissues and, as it is nearer to the axial center of the bone, reduces transferred forces on the plate, screws, and screw-bone interface. A minimum of three points of bone contact for each placed screw ensures construct rigidity.

The point contact design and application of the plate in dynamic compression mode require contouring of the ALPS plate to match the geometry of the bone. The specific bending pliers and bending irons facilitate in-plane and out-of-plane bending of the plate to conform to bone contours. Specific drill guides are provided for placement of locking screws and for placement of conventional screws in neutral and dynamic compression modes.

The point-contact internal fixator design concept of ALPS was initially developed and tested as PC-fix. Although never commercially released, this system was demonstrated experimentally and clinically to have improved rates of infection compared to conventional internal fixation compression plates. A point-contact internal fixator implant design (PC-fix) was shown to have a significantly reduced rate of infection when compared experimentally to a conventional dynamic compression plate in a bacteria-contaminated rabbit experimental model. In 1172 clinical applications of PC-fix, the reported rate of infection was 1.1% overall, 1.6% in open fractures, and 1.0% in closed fractures.¹

The ALPS system has been available for veterinary clinical use since 2007 and is used in over 60 clinics worldwide. ALPS is available in 5 different plate sizes using three different sets of screws and instrumentation. This array of implants accommodates patients throughout the range of body sizes presented in small animal practice. ALPS is exceptionally versatile for use in long bone fractures of all sorts. The low profile of the system allows placement into regions of
the distal extremities and mandible where overlying soft tissue is limited or mobile. Although all of the application principles of a conventional internal compression plate system can be used in ALPS, the locking design results in rigidity of the entire construct independent of the bone. This independent construct rigidity allows adoption of fixator principles of application. Fixator principles that improve the versatility of the system over compression plating principles include placement of fewer screws per bone fragment, spanning large segments of comminuted bone, and allowing orthogonal fixation to improve construct rigidity (analogous to type IB external fixator). ALPS requires much less post-operative maintenance than external fixators and ALPS can be placed beneath major soft tissues that limit where external fixators may be placed. The point contact to the bone of the ALPS plate combined with the construct rigidity of locking screws results in bone holding strength of monocortical screws similar to that of bicortical screws. Monocortical screw application not only reduces morbidity by avoiding damage to the endosteal blood supply and the bone trans cortex, it improves application versatility. The option to use monocortical screws allows placement of locking screws near vital structures such as joints and avoids interference with placement of complimentary implants such as intramedullary pins.

In my own practice I have used ALPS in 98 cases of body weight 0.2kg to 54kg since 2008. I have had clinical success treating many types of fractures. The ability to contour in both planes lends well to treatment of fractures in regions with complex bone geometry such as the distal femur and the dorsal acetabulum. The low profile of the construct permits well-tolerated placement near joints, in the distal antebrachium or crus, and in metatarsal and metacarpal fractures. Because of its low profile, in-plane contouring, and ability to use monocortical locking screws in metacarpal or metatarsal bones ALPS works especially well for partial carpal or partial tarsal arthrodesis procedures. As all of the application principles used in conventional compression plates can be applied with ALPS, it has almost completely supplanted conventional compression plating in my practice. Because stable fixation with ALPS requires point contact of the plate to the bone I have found it to be unsuitable for spinal fracture fixation in the dorsal-lateral region of thoracic and lumbar vertebral fractures. I have experienced a single case of implant failure (plate breaking). This occurred with an undersized plate applied on the dorsal/flexion surface of a pantarsal arthrodesis. When appropriately sized and applied I have not experienced any cases of plate or screw breakage even in the fawce of delayed healing due to infection or neoplasia. Examples of implant costs for actual cases including plates and screws: a) toy breed radius (5-hole ALPS 5) $169; b) acetabular fracture (6-hole ALPS 8) $268; c) tarsal arthrodesis (14-hole ALPS 8) $561; d) severe tibia fracture (15-hole ALPS 8, 14-hole ALPS 6.5) $708. It is difficult to quantify the cost savings to my practice and to my clients made by improving the rate of bone healing (fewer revisions) and reducing the rate of fracture infection (fewer explants).