American Journal of
Biomedical Science & Research

www.biomedgrid.com
ISSN: 2642-1747

Book Chapter

Comprehensive Investigation on Acupuncture at ST-36 (Zusanli), SP-6 (Sanyinjiao) and PC-6 (Neiguan) in Veterinary Studies

Amal Hammad* and Shaaban Gadallah

Department of Surgery, Anesthesiology and Radiology, Faculty of Veterinary Medicine, University of Sadat City, Egypt

***Corresponding author:** Amal Hammad, Department of Surgery, Anesthesiology and Radiology, Faculty of Veterinary Medicine, University of Sadat City, Egypt.

To Cite This Article: *Amal Hammad, Shaaban Gadallah. Comprehensive Investigation on Acupuncture at ST-36 (Zusanli), SP-6 (Sanyinjiao) and PC-6 (Neiguan) in Veterinary Studies. Am J Biomed Sci & Res. 2023 18(5) AJBSR.MS.ID.002501,* DOI: 10.34297/AJBSR.2023.18.002501

Received: April 14, 2023; **Published:** April 27, 2023

Abstract

Acupuncture at ST-36 [Zusanli], SP-6 [Sanyinjiao] and PC-6 [Neiguan] has gained increasing evidence of efficacy in management of variety of disorders. This chapter comprehensively investigated their therapeutic efficacy and mechanisms underlying their effects based on veterinary studies. Different studies demonstrated the efficacy of acutherapy at ST-36, SP-6 and PC-6 for treatment of various disorders in some animal models [for example, ST-36, SP-6 for pain and some immune-mediated diseases; ST-36 for intervertebral disc disease, certain arthritic models and skin problems; PC-6 for epilepsy and some ventricular arrhythmias; ST-36, SP-6 and PC-6 for motility problems of gastrointestinal tract and hypertension, etc.]. Some studies also explained some of the mechanisms behind the therapeutic effects of these acupoints. Despite of this, the involved mechanisms need further investigations to promote the objectivity of their efficacy. Thus, in this chapter some future studies have been proposed to address this point as well as to evaluate the potential not previously addressed roles of these points in some disorders based on the relevant previous findings. All of these could increase the validity of ST-36, SP-6 and PC-6 acupuncture stimulation as a therapeutic tool in veterinary patients.

Abbreviations: TCM: Traditional Chinese Medicine; NIH: National Institute of Health; WHO: World Health Organization; AVMA: American Veterinary Medical Association; Bcl-2: B-cell lymphoma 2; BAX: Bcl-2 associated X-protein; GAP-43: Growth Associated Protein 43; SOD: Serum superoxide Dismutase; MDA: Malondialdehyde; MDM2: Mouse Double Minute 2 Homolog; NO: Nitric Oxide; GABA: Gamma-Aminobutyric Acid; 5-HT: 5-Hydroxytryptamine; STZ: Streptozotozin; GnRH: Gonadotropin-Releasing Hormone.

Acupuncture at ST-36, SP-6 and PC-6 and Different Disorders in Animal Models

Acupuncture and pain control

One of the basic concepts of traditional Chinese medicine is pain emergence from stagnation of energy [chi] and/or blood [Xue] flow along different meridians. From this point, acupuncture was arisen to remove the blockage and promote free flow of energy and blood over meridians and consequently suppress pain phenomena [1-3].

Acupuncture is frequently used to mitigate pain in different animal species [4,5]. Several clinical conditions like acute abdominal pain in large animals [6], pain of musculoskeletal and cervical neurological disorders in dogs [7], chronic back pain in performance horses [8], surgical pain in cattle, cats and dogs [9,10] have been managed with success using acupuncture. In veterinary studies, acupuncture was also successful in providing considerable analgesia against experimental pain [7,11,12]. As a pain control therapy, acupuncture is advantageous as it allows the treated patients to heal rather than suppress the existing signs along with being a minimally invasive and less risky therapy [4,13-15]. This could be supported by absent or minimal pain and discomfort when acupuncture treatment is used as well as limited, infrequent adverse effects which could be encountered [accidental needle breakage, hematoma and period of excess of energy or fatigue] [14].

Among acupuncture points, ST-36 is an acupoint that is located at the stomach meridian [16] while SP-6 is an acupoint pertaining to spleen meridian [17]. The analgesic effect of both acupoints has been extensively investigated in veterinary studies. In this regard, laser acupuncture at ST-36 has been found to increase pain threshold in rabbits [18] and suppress visceral traction pain in rats [19]. Combined laser stimulation of ST-36 and LI-4 has also induced significant analgesia based on tooth pulp generated somatosensory evoked potential in rabbit [20]. Electroacupuncture at ST-36 in conjunction with Bladder [21,25,27] and Bai-hui has provided comparable rectal analgesia to butorphanol in horses with lesser hemodynamic and respiratory alterations [21].

In cats undergoing ovariohysterectomy, electroacupuncture at ST-36 along with GB-34 has been reported to induce greater reduction in the required isoflurane concentration and better stabilization of cardiorespiratory parameters relative to morphine [22]. For postoperative pain management, pharmacopuncture at ST-36, SP-6, GB-34and LIV-3 acupoints using a low dose of meloxicam [0.01mg/kg] produced similar analgesia to high dose given subcutaneously [0.1mg/kg] [23]. Electro acupuncture at ST-36 and SP-6 has showed an analgesic potential for control of acute postoperative pain in dogs [24]. Laser stimulation of both acupoints has also reduced postoperative analgesic requirements in cats undergoing ovariohysterectomy [25] (Figure 1).

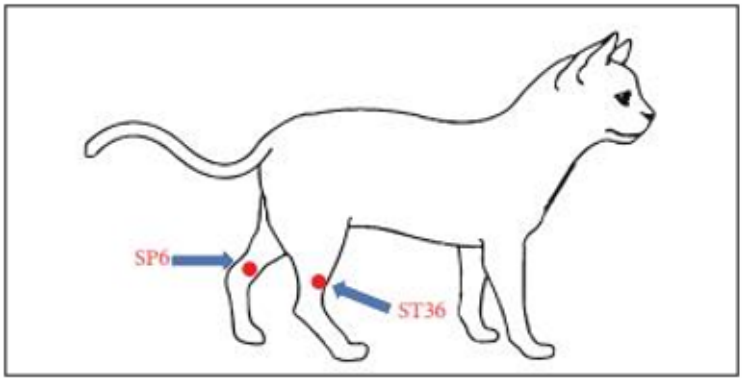

Figure 1: Location of ST-36 and SP-6 acupoints in cats.The acupoint ST-36 is located 3 cun [1 cun = width of the last rib] distal to the lateral head of the fibula. The acupoint SP-6 is located 3 cun proximal to the medial malleolus, at the caudal border of the tibia, close to the medial saphenous vein [25].

Generally, the analgesic effect of acupuncture has been explained to be mediated by secretion of endogenous opioids such as endorphins, enkephalins, and dynorphins [at mu, delta and kappa receptors] [26-28]. Serotonin, dopamine, acetylcholine, norepinephrine, gamma-aminobutyric acid, substance P, glutamate, cyclic AMP, calcium ions, cholecystokinin octapeptide and endogenous cannabinoids have been also proposed for acupuncture-based analgesia [29,30]. Vasodilation with the concomitant increment in blood flow in the needled area has been also speculated to contribute to the analgesic effect of acupuncture [31]. As the analgesic mechanisms of acupuncture could differ between normal and hyperalgesic animals [28,32], well designed studies are still required to determine the exact mechanisms in different animals in both situations and also in different pain conditions especially in relation to ST-36 and SP-6 due to their pivotal role in analgesia.

Acupuncture and Neurological Disorders

Neurological disorders can induce pain and/or impaired function. Pain originates from stimulation of different types of pain receptors while impaired function is resulting from impaired electrical transmission of nerve impulses [33,34]. Acupuncture has been shown to have a curative effect on various neurological disorders and their undesirable consequences. Considering this, acupuncture has effectively alleviated pain and hind limb paresis and paralysis associated with intervertebral disk disease [33,35]. Seizures, distemper, facial paralysis, cervical vertebral instability, cauda equina syndrome and wobbler syndrome [33] have been also managed with success using acupuncture. In dogs with wobbler syndrome, electroacupuncture has been found to be superior to conventional treatment [36]. Acupuncture has the potential to resolve different functional impairments as it induces axonal regrowth, reduces the resistance and enhances electrical activity of injured tissues [37]. In animal models with cerebral ischemia, electroacupuncture was also able to protect the brain from the effects of ischemia and promote stem cell proliferation and improve the associated neurological deficits [38,39]. On these bases, recent reports have suggested that neurogenesis plays a pivotal role in beneficial effects of acupuncture against different neurologic conditions [40].

In some neurological disorders, the role of ST36 has been previously investigated. In dogs with intervertebral disk disease, using dry needle acupuncture at ST-36, GB-30, GB-34 and bladder acupoints near the lesion and electroacupuncture at GV-2 and GV-7 acupoints plus prednisone was more efficacious than prednisone alone to recover ambulation, suppress back pain and decrease relapse [41]. Moreover, in dogs with intervertebral disc disease, bee venom acupuncture at ST-36 in combination with some acupoints [bilateral LI 04, SI 03, KI 03, BL 23, BL 40, GB 30, GB 34 and LR 03 with unilateral GV 01, Baihui and Ashi points] plus the conventional therapy [oral prednisone and carprofen] have effectively improved the pain and the functional numeric scale compared to conventional therapy alone [42]. The associated antinociception might be attributed to an increased secretion of IL-10 and reduced expression of IL-6 that previously noted following bee venom acupuncture at ST36 and GV3 in rats with spinal cord compression [43].

The efficacy of bee venom acupuncture at ST-36 [2.5 mg/kg] against cold allodynia was previously identified in rats. This antiallodynic effect was explained to be mediated by α_2-adrenergic receptors rather than α_1-adrenergic receptors [44,45]. Other receptors, such as $\alpha 4\beta_2$ nicotinic acetylcholine receptors were also suggested as sites for the suppressive effect of bee venom acupuncture against cold allodynia in rats [46]. In a previous study [45], bee venom acupuncture at ST-36 [0.1 mg/kg] has also considerably reduced ipsilateral mechanical allodynia induced by oxaliplatin [10 mg/kg] injection in right hind leg of mice. In the same study, the α_2-adrenergic receptors were considered the involved receptors whereas pre-injection of α_2-adrenoceptor antagonist, yohimbine [25μg/mouse], into the spinal cord has completely blocked all of the resultant effects. In another study [47], bee venom acupuncture at ST-36 has also exerted a more pronounced effect relative to L11 against paclitaxel [a chemotherapy drug] associated neuropathic pain in rats.

ST36 has a consistent effect on enhancing cell proliferation and neuronal differentiation [40]. In this regard, acupuncture at ST 36 has been reported to significantly increase cell proliferation in the dentate gyrus of hippocampus in diabetic rats [48]. Similar findings were also demonstrated in healthy rats following electroacupuncture at ST36 and GV20 [49]. Circulation through the primo vascular system has been suggested as one of possible ways through which stimulation of ST-36 could reach brain and induce neurogenesis [40,50, 51]. The neurogenic effect of ST36 could be further attributed to upregulation of brain-derived neurotrophic factor and activation of the cAMP response element-binding protein in the dentate gyrus of the studied rats. This explanation could be supported by the role of cAMP in proliferation, differentiation and survival of neuronal precursor cells as well as the role of brain-derived neurotrophic factor in supporting the differentiation and survival of neurons [49]. Considering this along with role of impaired hippocampal neuron replacement as triggering factor for development of several neurologic disorders including epilepsy [52], future studies are warranted to evaluate acupuncture at ST36 as potential therapy for epilepsy in different animal species especially canines due to its high prevalence. Further studies can be also conducted in epileptic dogs to determine the combined effect of acupuncture at ST36 along with different acupoints [GB-20 GV-23, GV-21, GV-20, GV-16, GV-14, auricular Shenmen, Yin-tang, LI-4, LIV-3, ST-40] which previously decreased frequency and severity of epileptic seizures in dogs [53].

In rats, electroacupuncture at ST-36 upregulated adrenaline levels in cerebral cortices and hippocampi [54]. Besides, adrenaline has been suggested to support stress-related memory processing due to its ability for enhancing hippocampal glucose metabolism after stress [55]. Hence, electroacupuncture at ST36 has been proposed as a suitable option for improving memory [54]. In the same context, laser acupuncture at GV-20 and HT-7 has significantly improved memory in rat with transient focal cerebral ischemia [via regulating gene expressions of brain-derived neurotrophic factor, B-cell lymphoma 2 [Bcl-2] and Bcl-2 associated X-protein [BAX] in the hippocampus] [56]. Due to importance of the previous findings, future studies are required to determine whether or not acupuncture at ST-36, GV-20 and HT-7 in dogs would produce similar findings to that previously detected in rats [54,55]. Accordingly, the proposed studies would reveal if acustimulation at ST-36 combined with GV-20 and HT-7 could be a useful tool in improving training memory in guard dogs.

Cerebral ischemia-reperfusion injury is an important area in which acupuncture was applied. In a previous study [57], laser acupuncture at ST-36 in combination with GV-20 and GV-2 has reduced cerebral ischemia-reperfusion injury in rats. Improving energy metabolism, up regulation of the expression of growth associated protein 43 [GAP-43] and serum superoxide dismutase [SOD] and down regulation of serum malondialdehyde [MDA] were the mechanisms underlying the beneficial effect of this acupuncture technique. Future studies could be conducted to determine if similar results would be obtained in other animal species which might be of great importance in animals subjected to brain injury.

Acupuncture at ST-36 has been reported to induce an integrated response from different brain areas including anterior cingulate cortex, ventrolateral prefrontal cortex, supplementary motor area, somatosensory cortex, occipital cortices and midbrain [58,59]. A more recent study [60], further supported the association between ST36 and motor area whereas acupuncture at ST36 has increased motor cortical excitation in human which evidenced by increased motor-evoked potentials and decreased motor cortical inhibition. Motor-evoked potential is a crude index for the overall excitability of cortex, spinal and corticospinal tract [61]. All of these could reflect

the ability of acupuncture at ST36 to induce excitation of cortical motor area and motor neurons of spinal cord. Accordingly, further investigations are required to determine the effect of acupuncture at ST36 on motor-evoked potentials in animals especially in horses. If positive results were obtained, this acupuncture technique could be tried later to optimize motor function and subsequently recovery period [induce faster recovery from anesthesia with better quality in horses which has its own complications [62-64].

With respect to PC-6, in rats with experimentally induced epilepsy, electroacupuncture at PC-6 in combination with LI-11 has attenuated the resultant epileptic seizures [65]. PC-6 has been also used for management of epilepsy, some behavioral problems and anxiety in small animals [66]. The anti-epileptic effect of PC-6 could be partly explained by the ability of acupuncture to modulate different brain neurotransmitters like opioid peptides, serotonin, and g-aminobutyric acid [67]. Decreased glutamate levels in hippocampus following acupuncture at PC-6 might be another possible mechanism. This could be supported by the reported ability of increased number of glutamatergic receptors to cause an imbalance between excitation and inhibition, resulting in epileptic seizure [68]. Glutamatergic excitotoxicity has been also reported to have a critical role in pathogenesis of ischemic stroke [69]. Based on this, electroacupuncture at PC6 has been proposed as a feasible approach to treat ischemic stroke [54]. In feline, PC-6 and SP- 6 can be used to dispel heat, pacify the mind and promote smooth flow of Liver Qi. Liver Qi stagnation is incriminated in inducing heart fire and consequently different psychological diseases including over grooming [70]. Considering all of this, acupuncture at PC-6 and SP-6 might be useful in management of over grooming in felines.

Acupuncture and Musculoskeletal Disorders

Musculoskeletal disorders are a commonly encountered problem in dogs and cats. For many disorders, analgesic and anti-inflammatory medications would be either ineffective or produce side effects. Also, surgical interventions wouldn't be beneficial or induce risks due to pre-existing conditions [71]. Considering this along with the increased clinical acceptance for using acupuncture for alleviating different musculoskeletal disorders in human [72], acupuncture has been applied for musculoskeletal disorders [mainly hip displasia and osteoarthritis] in dogs and cats. It has been successful in 79.6% of cases with animals getting better after 2 to 43 acupuncture sessions [33].

Many studies have also proposed acupuncture as an alternative therapy for musculoskeletal disorders in many animal species [73-75]. For musculoskeletal pain, acupressure was more effective compared to usual physical therapy. It was also associated with less to no side effects compared to medicinal treatments [76]. In horses, electro acupuncture has been effective in reducing lameness score and increasing pain threshold with increased plasma β-endorphin concentration to be the principal pathway [11,77]. Also in horses, acupuncture has promoted both tissue repair and muscle buildup [78]. The strength of racing animals has been also boosted with acupuncture [6,79]. Acupuncture is also effective in management of exercise related impairments like chronic pain, arthritis and musculoskeletal injuries [80]. Analgesia secondary to endorphin release, increased local vasodilation, anti-inflammatory effects, enhanced health of the affected regions, release of trigger points and relief of stiffness are the mechanisms behind the beneficial effects of acupuncture on musculoskeletal disorders [71,80]. Despite the previously reported merits of acupuncture in several musculoskeletal conditions, there are conditions where acupuncture will not work alone. For example, in cases of fracture, surgical reduction must be carried out. Nevertheless, acupuncture can be used to suppress post-operative pain, promote healing, and reduce the possibility of post-operative arthritis in fractures involving the joints [14,81,82].

In dogs with full thickness split Achilles tendon, electro acupuncture [10 min/day for 2 weeks] at ST-36 along with GB-30 and BL-40 was quite effective in promoting tendon healing and inducing rapid remodeling of collagenous fibers [83]. Enhanced tissue healing following acupuncture therapy could be attributed to increased secretion of peptides that causes vasodilation and improves blood flow [4,84,85].

For arthritis, electroacupuncture at ST-36 and GB-39 has been effective in inhibiting rheumatoid arthritis in rats by increasing expression of p53 while decreasing expression of mouse double minute 2 homolog [MDM2] [86]. These findings could be supported by previous studies denoting the pivotal role of p53 on mitochondrial-dependent apoptosis and the MDM2 associated cellular inflammation as well as its role as a negative regulator of p53 [87-91]. Also, in a previous study [4], traditional acupuncture at ST-36 along with ST-34 was successful in management of knee osteoarthritis in Owl monkey. Another acupuncture modality, BVA, was proven to be more effective than traditional acupuncture for pain relief associated with knee osteoarthritis in humans [92]. In another human study, BVA has markedly stimulated aromatase activation in osteoblast cells, enabled estrogen production by bone-derived cells and thereby inhibited development of osteoarthritis [93]. Collectively, from the previous studies, it seems necessary to conduct future studies to assess the potential therapeutic effect of BVA at ST-36 on osteoarthritis in different animal species. Another acupoint on stomach meridian, ST-35 was suggested as a key point for knee disease whereas laser irradiation of this point has successfully treated osteoarthritis in mice [94] and rats [95]. Induction of heat shock protein [HSP] 70 in the arthritic chondrocytes [94] and decreased expression of inflammatory cytokines in the dorsal horn of spinal cord [95] were thought to be the underlying mechanisms. Based on this, further studies could

be also established to determine the protective effect of different acupuncture modalities at ST-36 along with ST-35 on osteoarthritic animals.

In a published study [96], laser irradiation on ST-36 and KI-1 has been proved to be effective in inhibiting skeletal unloading induced bone loss in rats via systemic regulation. Low-level laser irradiation at SP-6 and ST-36 has also promoted longitudinal bone growth in rats by increasing bone growth rate and growth plate height [97]. Further studies are required to evaluate similar acupuncture techniques in different animal species rather than experimental animals. If positive results are obtained, these techniques could be evaluated later as adjunctive therapy for enhancing bone healing following fractures. The effect of laser acupuncture at ST-36 on hypoxia tolerance and inflammation reaction been also evaluated in mice. Improved tolerance to hypoxia and elevated levels of serum IL-1 were demonstrated after treatment [98]. Future studies are necessary to determine if comparable findings would be demonstrated in other animal species, especially horses. If so, this acupuncture protocol could be evaluated later for management of laminitis in horses where stagnant hypoxia is one of the major causes for development of this condition.

Acupuncture and Gastrointestinal Disorders

From Chinese perspectives, several acupuncture points underlying skin zones and muscles distributions are related to specific internal organs. Stimulating these points subsequently stimulates cutaneous and muscle sensory afferents which affect both sympathetic and parasympathetic activity constituting what is called somatovisceral reflexes [99].

In small animal practice, acupuncture was beneficial in treatment of gastrointestinal motility problems [vomiting, diarrhea and constipation], feline obstipation syndrome, pancreatitis associated pain and inflammation, rectal prolapse and immunomodulation in infectious gastrointestinal diseases. Among acupuncture points, ST-36 has been found to have analgesic and spasmolytic effects on gastrointestinal tract, regulatory effect on gastric acidity and homeostatic effect on endocrine and metabolic disorders. Thus, ST-36 has been used to treat impactions, gastroenteritis and pancreatitis in small animals [66]. Further, ST-36 has been found to increase plasma gastrin in rabbits and dogs which mediated by b-endorphins and somatostatin [100]. Needle acupuncture at ST-36 combined with BL-20 has been also effective in alleviating clinical signs and regulating digestive function in dogs with inflammatory bowel disease [101]. This was considered of great clinical relevance, given the lack of effective conventional treatments for this disorder in different animal species [102].

For assessment of acupuncture effects on gastrointestinal motility, studies have mainly focused on two key acupuncture points, ST-36 and PC-6 [66]. In this regard, the effect of manual or laser acupuncture at PC-6 or ST-36 on gastric motility in rats has been investigated and compared with other acupuncture points including CV-12 and BL-21. Results revealed that acustimulation of PC-6 or ST-36 has significantly increased gastric motility in rats while acustimulation of CV-12 or BL-21didnot produce similar effects [103]. On contrary, in a more recent study [104], manual acupuncture at PC-6 and ST-36 did not hasten gastrointestinal motility in healthy dogs [Figure 2]. Despite of this, clinically, acustimulation of ST-36 has been successful in treatment of impactions and ileus in small animals [66]. This discrepancy might be attributed to evaluation of acupuncture in dogs with normal rather than decreased gastrointestinal motility in the previous experimental study [104].

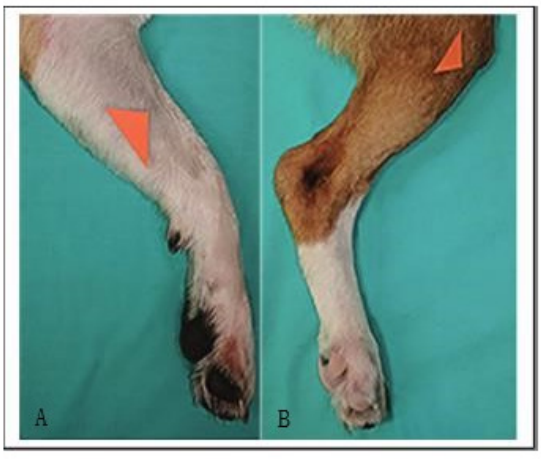

Figure 2: Location of PC-6 and ST-36 acupoints in dogs.The acupoint PC-6 is located at the medial side of thoracic limb, 3 cm proximal to the transverse carpal crease, in the groove between the flexor tendons [A]. The acupoint ST-36 is located at the craniolateral aspect of the pelvic limb distal to the stifle, lateral to the cranial aspect of the tibial crest, in the belly of the cranial tibialis muscle [B] [104].

Needle acupuncture with four different acupuncture manipulations [reinforcing by twisting, reducing by twisting, reinforcing by lifting and thrusting and reducing by lifting and thrusting] has induced recovery of the gastric electrical frequency in rabbits with bradygastria [105]. Also, in another previous report, electroacupuncture at ST36 has demonstrated a bi-directional, modulatory effect on gastric electrical activity [106]. These findings could be supported by the reported efficacy of acupuncture in normalizing both hypomotility and hypermotility of gastrointestinal tract [66]. Considering all of this, future studies could be conducted to evaluate similar acupuncture techniques for management of spasmodic and impaction colic in horses. These studies would be of great clinical significance considering the high incidence of equine colic. Another important area to consider in equines is the paralytic ileus that can be encountered following atropine administration. Atropine can be used in both sedated and anesthetized horses to counteract bradycardia induced by α_2-agonists, commonly used sedatives in equines [107]. For this, further studies could be also conducted to investigate if electroacupuncture at ST36 would be beneficial in eliminating intestinal ileus that might arise following atropine administration to horses.

The effect of acupuncture at SP-6 and ST-36 on intestinal myoelectric activity has been also evaluated in Wistar rats [108]. Results indicated that stimulating these points has a clear positive effect on intestinal myoelectric activity. Acupuncture points, SP-6 and ST-36 have been also considered as key points for treatment of diarrhea in cats regardless of the etiology [66]. SP-6 has been also used for treatment of gingivitis in cats [70].

The modulatory effect of different acupoints on gastrointestinal motility has been explained in previous reports. In this context, the autonomic nervous system and increased vagal activity has been suggested as a possible mediator for ST-36 and PC-6 associated gastrointestinal effects in different animal models [103,104]. Increased vagal activity following acustimulation of PC-6 was further explained by its inhibitory effect on GABA transmission to the dorsal motor nucleus of the vagus which could reduce the inhibition of efferent vagal motor fiber [109]. The M-cholinoceptors and α-adrenoceptors have been also suggested as possible mediator for ST-36 associated effects on gastric electrical activity in an animal model [106].

Manual acupuncture at ST-36 and PC-6 along with different acupoints, PC-9, HT-9, LI-4, LI-11 and ST-40, has induced a 70% resolution of regurgitation and increased weight gain in dogs with idiopathic megaesophagus [66]. Regurgitation [gastroesophageal reflux] is also a common event in veterinary patients undergoing general anesthesia. For example, regurgitation has been reported to occur in 13.3 to 60% of dogs under general anesthesia [110-113]. Regurgitation can be complicated with post-anesthetic esophagitis, oesophageal strictures and aspiration pneumonia which can predispose to high morbidity and mortality rates [112,114-116]. On these bases, establishing a preventive approach for anesthesia associated regurgitation would be of great clinical significance. Considering this along with efficacy of the acupuncture at ST-36, PC-6, PC-9, HT-9, LI-4, LI-11 and ST-40 in management of megaesophagus associated regurgitation in dogs [66]. Further studies are indeed to assess similar acupuncture protocol against anesthesia associated regurgitation in dogs.

Nausea and vomiting are a common, stressful situation in veterinary patients for which acupuncture has been evaluated. In this regard, electroacupuncture at PC-6, ST-36 or BL-21 has been investigated against vasopressin-induced emesis in dogs. Electroacupuncture at PC6 not ST-36 or BL-21 has significantly reduced retching and vomiting episodes [117]. Electroacupuncture at PC-6 has been evaluated against morphine-related signs of nausea and vomiting in dogs [118]. Results indicated the efficacy of PC-6 acutherapy in reducing the number of vomiting and retching events as well as preventing an increase in severity of nausea following morphine administration. In contrast, in a more recent study, manual acupuncture at PC6 and ST36 did not alleviate nausea associated with lidocaine infusions in clinically normal dogs [119]. Different results might be attributed to using different forms of acupuncture that might elicit variable degrees of PC-6 stimulation or variable neural codes. The latter assumption could be supported by the ability of different acupuncture manipulations to generate distinct neural electrical codes [17].

Understanding mechanisms underlying the antiemetic effect of PC-6 is a crude tool to increase its clinical acceptance as antiemetic. Thus, some studies have focused on this subject. In a human study, evaluation of fMRI during PC-6 stimulation showed activation of brain regions affecting gastric myoelectrical activity, vagal modulation and cerebellar and vestibular activity which collectively involved in nausea and vomiting [120]. In another human study, the antiemetic effects of acupuncture were explained by changes in serotonin transmission [121]. For animal models, in dogs, central opioid pathway was the suggested mechanism behind the antiemetic effect of acupuncture at PC-6 [117]. Considering different mechanisms provided by human and animal studies. Further studies can be conducted to determine whether or not mechanisms rather than opioidergic mechanism mediate the antiemetic effect of PC-6 acustimulation in animals.

The acupoint PC-6 is located at the medial side of thoracic limb, 3 cm proximal to the transverse carpal crease, in the groove between the flexor tendons [A]. The acupoint ST-36 is located at the craniolateral aspect of the pelvic limb distal to the stifle, lateral to the cranial aspect of the tibial crest, in the belly of the cranial tibialis muscle [B] [104].

Acupuncture and Cardiovascular Disorders

Acupuncture has been utilized in humans for treatment of different cardiovascular diseases such as hypertension, coronary artery disease and stroke. Despite the efficacy of pharmacotherapy in controlling blood pressure, it occasionally induces adverse effects such as hepatic and renal dysfunction and lethal arrhythmias. Thus, the involvement of acupuncture in treatment of hypertension was encouraged [122,123]. In animal studies, ST-36, SP-6 and PC-6 were of the major acupoints that frequently applied to reduce blood pressure. Using these points, duration and course (can vary from 7 to 36 days depending on animal models and species) of acupuncture treatment should be properly adjusted for obtaining better results. Acupuncture modality and stimulation form should be also considered where low frequency in electroacupuncture or a moderate stimulation in needle acupuncture is recommended [122].

Electroacupuncture at ST-36 not PC-6 has been associated with increased arginine levels in rats, hippocampus [54]. l-arginine involves nitric oxide [NO] synthase, which is related to the generation of endogenous NO. l-arginine has induced vasodilation and its long-term oral administration has alleviated the clinical symptoms of cardiovascular disorders [124]. Elevated NO levels in acupoints has also induced vasodilation and increased local blood flow [125]. Considering all of that increased NO synthase and plasma concentrations of NO could mediate the regulatory effect of acupuncture at ST-36 on hypertension in different animal models. This could be further supported by the ability of electroacupuncture at GV20 (another acupoint) in reducing both systolic and diastolic blood pressure through enhanced arterial nitric oxide synthase expression and increased plasma nitric oxide concentration in hypertensive rats [126]. Unlike ST-36, the modulatory mechanisms of PC-6 and SP-6 on hypertension have been yet addressed. For this, further studies are indeed to investigate this.

The effect of ST-36 and PC-6 on heart rate was explored in some animal studies. In this regard, in anesthetized rats, CO_2 laser stimulation at PC-6 has increased heart rate while stimulation at ST-36 has the opposite effect [127]. In contrast, in a previous study [128], laser irradiation at PC-6 has reduced heart rate in cats. In rabbits with bradycardia, stimulation of PC-6 with 10.6 μm CO2 laser has significantly improved bradycardia while the 650nm semiconductor laser did not produce similar effect [129,130]. The different effect of PC-6 on heart rate might be attributed to different species and different laser types involved in animal studies. The effect of laser acupuncture at PC-6 on heart rate was also time dependent where heart rate was significantly reduced following 20 min of interstitial laser acupuncture without significant changes following 10 and 30 min [131].

After a period of myocardial ischemia, there is a high risk of development of potentially lethal cardiac arrhythmias. Thus, acupuncture was evaluated for management of this issue. In this regard, electroacupuncture of PC-6 and PC-5 in rats was found to be successful in reducing ischemia-reperfusion-mediated ventricular tachyarrhythmias as well as reducing the cardiac metabolic demand during ischemia [132]. Also in rabbits, electroacupuncture of PC-6 and PC-5 has reduced myocardial ischemia-reperfusion injury and ventricular arrhythmias by inhibiting the cardiac sympathetic nervous system and modulating opioid and protein kinase c-dependent pathways [133]. On these bases, further studies are required to determine if electroacupuncture at PC-6 and PC-5 could produce similar cardioprotective effects in other animal species.

In a related report [134], electroacupuncture of each of PC-6 and ST- 36 has been reported to exert an inhibitory effect on ventricular extrasystoles in rabbits. This effect was mediated by inhibition of the rostral ventrolateral medulla and decreasing the sympathetic outflow. The involved mechanisms were the activation of arcuate nucleus-ventral periaqueductal gray-medullary raphe pathway with subsequent release of endorphin, enkephalin, gamma-aminobutyric acid [GABA] and 5-hydroxytryptamine [5-HT].

Atrial fibrillation is another type of arrhythmias for which acupuncture was also evaluated. In humans, acupuncture at PC-6, H-7, and UB-15 prevented the recurrence of atrial fibrillation after electrical cardioversion in patients with persistent atrial fibrillation [135]. Despite the significance of this finding, this acupuncture protocol hasn't been evaluated against atrial fibrillation in animals. For this, future studies could be conducted to investigate this point.

Acupuncture and Ocular Disorders

Acupuncture has been used for treatment of some ophthalmological disorders in cats such as conjunctivitis [secondary to cat flu or bacterial infections], dry eye and indolent ulcers and glaucoma. The local points that frequently used are LI-4, BL-1, BL-2, ST-1, ST-2, GB-1, TH- 23 and Yintang. Along with these points, LIV-2 can be used for red eyes, BL 18 or BL 23 for dry eyes and BL 23 and KI 3 for glaucoma [70]. Also in humans, acupuncture has been employed for management of some ocular disorders. In this regard, needle acupuncture at ST-36 and SP-6 combined with some other acupoints was found to be effective in reducing intraocular pressure in glaucoma patients by activating the autonomic nervous system [136]. In Rhesus monkeys with glaucoma, electroacupuncture at SP-6 along with other points involving SP-2&10 and ST-7 has also significantly decreased intraocular pressure [137]. Based on inclusion of ST-36 in acupuncture prescription for treatment of glaucoma in human [136] and lack of veterinary studies assessing its possible role in animal models, further studies should be conducted to investigate this.

Also in humans, stimulating the vision-related acupuncture points around the orbits and on the limbs is known to increase blood flow through the supratrochlear artery, a branch of the ophthalmic artery, by inducing changes in vascular resistance [138]. Acupuncture at SP-6 along with LR-3, GV-20, Yintang, BL-2 and GB-20 improved the vision in human subjects with prolonged visual evoked potential latency (physiological parameter used to objectively measure visual function and to reflect optic nerve functioning) [139]. Considering this, similar acupuncture protocol can be further investigated as therapeutic option in veterinary patients with impaired vision secondary to optic neuropathy.

Acupuncture and Hematobiochemical Parameters

The effect of acupuncture on hematological and biochemical parameters has been previously assessed in dogs. Electroacupuncture stimulation at GV-20, ST-36, SP-6 along with GV-6, BL-23, or TW 8, LU-1, GV-6 acupoints has significantly increased erythrocytes, leukocytes, neutrophils, packed cell volume, serum total proteins and globulin levels while significantly decreased lymphocyte counts and albumin levels [all returned to pre-stimulation level by 48-72 hours]. No significant changes were detected in hemoglobin concentration, coagulation time and electrolytes concentrations [140]. In another study, in rats with leucopenia, single and combined 10.6 μm laser and 650nm laser irradiation on ST-36 and GV-14 has boosted the recovery of white blood cell counts [141].

Acupuncture and Immune-Mediated Diseases

Acupuncture can stimulate the body's immune response. For this, acupuncture was employed for treatment of different immune mediated diseases as feline leukemia virus and feline infectious peritonitis with ST 36, SP 6, GV20 and KI3 being the proposed points [70]. The acupoint, ST 36 was also considered as one of the top main immune regulation points beside GV-14, LI-4 and LI-11 [142]. Laboratory studies have also proved the efficacy of ST-36 in enhancing immune status [143].

Both of ST 36 and SP 6 have been proposed for treatment of immune-mediated thrombocytopenia. Both points can be also used for treatment of autoimmune hemolytic anemia altogether with other points involving as BL 20, LI 10, BL 18, SP 10. Immune-mediated polyarthritis and immune-mediated polyarthropathies can be also managed with acustimulation at ST 36 [142].

Acupuncture and Diabetes Mellitus

Diabetes mellitus is a prevalent metabolic disorder that complicates with various micro-vascular [Retinopathy, Nephropathy and Neuropathy] and macro-vascular [dyslipidemia, hyper-tension, coronary heart disease, stroke, peripheral vascular disease] diseases [144]. Despite medicinal treatment is convenient and effective, it is extremely costly in terms of longevity and certain treatments can lead to serious side effects [145,146]. Further, patients with poorly controlled type 2 diabetes who frequently use oral hypoglycemic agents often present with unstable glucose levels [147]. Hence, researchers have searched for complementary treatment methods (such as acupuncture) with no side effects to increase insulin sensitivity [148]. Acupuncture has been also proposed as a cost-effective treatment compared to everyday medication as well as for its efficacy in treating diabetes and preventing and managing its complications [149,150].

For treatment of diabetes using acupuncture therapy, in human, the effectiveness of electroacupuncture at ST-36 and CV-12 in type 2 diabetic patients has been assessed. Results revealed the ability of electroacupuncture in lowering blood glucose levels, cholesterol level, free-fatty acid and body mass index and eliminating diabetic neuropathy [151,152].

In veterinary studies, in normal and streptozotozin [STZ]-induced type 2 diabetic rats, electroacupuncture [15 Hz] at bilateral ST-36 has produced a hypoglycemic effect, mediated through β-endorphin and increased insulin secretion [153]. In STZ-induced diabetic rats, the hypoglycemic effect of electroacupuncture at ST-36 was also explained by cholinergic nerve stimulation [147]. Consistently, in another study in rats, electroacupuncture [15 Hz] at ST-36 has improved insulin sensitivity and/or increased insulin-hypoglycemic activity by enhancing cholinergic nerve activity and increasing nitric oxide synthase activity [154]. In a related report, acu-tens stimulation [15HZ, 15MA, 5 sec pulse width for 5 minutes/60 days] of ST-36 in STZ-induced diabetic rats has also significantly reduced blood glucose level and restored the body weight in treated rats compared to anti-diabetic drug. These findings were explained by stimulation of flow of Qi to balance Yin and Yang and utilization of energy due to the resultant muscle twitching during stimulation [155].

Another acupuncture modality, laser acupuncture has been also assessed against diabetes in some animal models. In this regard, in mice, optical fiber acupuncture at ST-36 has induced marked lowering of glucose and lipid concentrations [156]. Like ST-36, laser acupuncture at SP-6 in combination with BL-20 and BL-23, provided a regulatory effect on hyperglycemia and insulin resistance in type 2 diabetic rats [157]. Despite of investigating the hypoglycemic effect of acupuncture at SP-6 in combination with some acupoints, the combined effect of acustimulation at ST-36 and SP-6 on hyperglycemia in different animal models has not been investigated so future studies are indeed to evaluate this.

From human studies, data have shown the beneficial anti-obesity effect of acupuncture which is the most modifiable risk factor for type 2 diabetes [158]. Different veterinary studies have also been established to determine the potential anti-obesity effect of acupuncture in rat models. In one of these studies,

pharmacopuncture at ST 36 and ST 25 has been effective in inducing weight loss in obese rats along with inducing favorable changes in glucose and cholesterol levels. In another study, laser acupuncture [30 J/cm2] at another acupoint, BL-23 reduced body weight and improved pituitary function in ovariectomized rats [159]. As the clinical efficacy of acupuncture treatment could be greatly improved by synergistic effects produced by compatibility of different acupoints [16]. We hypothesize that acustimulation of ST 36 and ST 25 in combination with BL-23 might produce a more prominent anti-obesity effect. Hence, several studies could focus on estimating the anti-obesity effect of these points in obese veterinary patients.

Acupuncture and Reproductive Disorders

Studies have supported the use of acupuncture in equine disorders including anestrus, urine pooling, infertility and poor libido in stallions. Hormonal regulation before altered smooth muscle motility and general stress and/or pain relief from musculoskeletal or environmental conditions [160]. Low-frequency electrostimulation has been shown to increase ovarian blood flow via a reflex response involving the ovarian sympathetic nerves [12].

With respect to ST-36 and SP-6, electroacupuncture at ST36 or SP-6 can elevate gonadotropin-releasing hormone [GnRH] mRNA levels in the hypothalamus of female rats [161]. GnRH acts as a primary brain signal in the hypothalamic– pituitary–ovarian axis response to the release of follicle-stimulating hormone, luteinizing hormone, and neurotransmitters and neuropeptides such as GABA and glutamate [161,162]. Further studies are required to determine whether or not electroacupuncture at ST36 or SP-6 would have a similar effect to that previously reported in other animal species [161].

Acupuncture and Dermatological Disorders

Acupuncture has been used for treatment of several kinds of dermatologic problems in dogs [163,164]. As skin is associated with internal organ systems and reflecting pathologic processes that are either primary or shared with other tissues, dermatologic patients are always a difficult patient to treat [164]. For this, following acupuncture therapy, dogs and cats with skin diseases only showed improvement after 6-11 acupuncture sessions [33].

Autoimmune skin diseases are an important category for which acupuncture can be applied. Acupuncture stimulation at ST-36 in combination with other points [SP 10, BL 17, SP 9, ST 40, LI 10, ST 36, GV-3/4, Bai Hui] could be used for treatment of Qi-Blood deficiency induced autoimmune skin diseases [142]. In a mouse model, bee venom acupuncture at BL40 acupoint proved to be effective in inhibiting synthesis of interleukin-4 and reducing levels of T helper cell type 1&2 cytokines in trimellitic anhydride-induced skin impairment [165]. Bee venom injection therapy was also effective in inhibiting immune response [166]. On these bases, further investigations could be established to study the effect of bee venom acupuncture at ST-36 in autoimmune mediated skin diseases.

References

1. Kawakita K, Shinbara H, Imai K, Fukuda F, Yano T, et al. (2006) How do acupuncture and moxibustion act?–Focusing on the progress in Japanese acupuncture research. J Pharmacol Sci 100(5): 443-459.
2. K Cheng KJ (2011) Neuroanatomical characteristics of acupuncture points: relationship between their anatomical locations and traditional clinical indications. Acupunct Med 29(4): 289-294.
3. L.Chen (2005) Acupuncture in pain management. Pain Management Round 2(7): 10-16.
4. Magden ER (2017) Spotlight on acupuncture in laboratory animal medicine. Vet Med (Auckl) 8: 53.
5. Fry LM, Neary SM, Sharrock J, Rychel JK (2014) Acupuncture for analgesia in veterinary medicine. Top Companion Anim Med 29(2): 35-42.
6. Habacher G, Pittler MH, Ernst E (2006) Effectiveness of acupuncture in veterinary medicine: systematic review. J Vet Intern Med 20(3): 480-488.
7. Kim M-S, Xie H (2009) Use of electroacupuncture to treat laryngeal hemiplegia in horses. Vet Rec 165(20): 602.
8. Rungsri P, Trinarong C, Rojanasthien S, Xie H, Sheng, et al. (2009) The effectiveness of electro-acupuncture on pain threshold in sport horses with back pain. American Journal of Traditional Chinese Veterinary Medicine 4(1): 22-26.
9. Xie Hs, Sivula N (2016) Review of Veterinary Acupuncture Clinical Trials. American Journal of Traditional Chinese Veterinary Medicine 11(1).
10. Kim D-H, Cho S-H, Song K-H, Lee S-E, Lee S-H, Kwon G-O, et al. (2004) Electroacupuncture analgesia for surgery in cattle. Am J Chin Med 32(01): 131-140.
11. Xie HS, Ott E, Colahan P (2009) The effectiveness of electro-acupuncture on experimental lameness in horses. American Journal of Traditional Chinese Veterinary Medicine 4(2): 17-29.
12. Kim JH, Choi KH, Jang YJ, Bae SS, Shin B-C et al. (2013) Electroacupuncture acutely improves cerebral blood flow and attenuates moderate ischemic injury via an endothelial mechanism in mice. Plos One 8(2): 1e56736.
13. Yu C, Zhang K, Lu G, Xu J, Xie H, Lui Z et al. (1994) Characteristics of acupuncture meridians and acupoints in animals. Rev Sci Tech 13(3): 927-933.
14. Hulea CI, Cristina RT (2012) Acupuncture as a therapeutic tool in health disorders in animals: a review. J Anim Sci Biotechnol 45(2): 166-177.
15. Yin CS, Jeong HS, Park HJ, Baik Y, Yoon MH, et al. (2008) A proposed transpositional acupoint system in a mouse and rat model. Research in veterinary science 84(2): 159-165.
16. Yang Y, Litscher G, Sun Z, Sun W (2021) The application of laser acupuncture in animal experiments: a narrative review of biological aspects. Evid Based Complement Alternat Med 2021: 6646237.
17. Yang Q, Xie Y-D, Zhang M-x, Huang B, Zhang C et al. (2014) Effect of electroacupuncture stimulation at Zusanli acupoint (ST36) on gastric motility: possible through PKC and MAPK signal transduction pathways. BMC Complement Altern Med 14(1): 1-8.
18. Bian XP, Yu ZQ, Liu DM (1989) The experiment studies of semiconductor GaAs-laser points irradiation the analgesic effect. Zhen ci yan jiu= Acupuncture Research 14(3): 379-382.

19. Yang HY, Guo TT, Ma YN, Liu TY, Gao M (2010) Effects of 650 nm laser and moxibustion pretreatment on enteric nervous system and medullary visceral zone in rats with visceral traction pain. Zhongguo zhen jiu Chinese acupuncture & moxibustion 30(9): 745-751.

20. Sing T, Yang M (1997) Electroacupuncture and laser stimulation treatment: evaluated by somatosensory evoked potential in conscious rabbits Am J Chin Med 25(3-4): 263-271.

21. Skarda RT, Muir Iii WW (2003) Comparison of electroacupuncture and butorphanol on respiratory and cardiovascular effects and rectal pain threshold after controlled rectal distention in mares. Am J Vet Res 64(2): 137-144.

22. Maria Coletto Freitas P, Pignaton W, Rodrigues Simões J, Zacché E, Rezende Luz M, et al. (2011) Electroacupuncture and morphine on cardiorespiratory parameters on cat elective ovariohysterectomy. R bras Saúde Prod Anim 42(1): 241-254.

23. de Sousa NR, Luna SPL, de Capua MLB, da Maia Lima AF, de Oliveira FA et al.(2012) Analgesia of preemptive pharmacopuncture with meloxicam or aquapuncture in cats undergoing ovariohysterectomy/Analgesia da farmacopuntura com meloxicam ou da aquapuntura preemptivas em gatas submetidas a ovariosalpingohisterectomia. Ciência Rural 42(7): 1231-1236.

24. Cassu RN, Silva DAd, Genari Filho T, Stevanin H (2012) Electroanalgesia for the postoperative control pain in dogs. Acta Cir Bras 27(1): 43-48.

25. Marques VI, Cassu RN, Nascimento FF, Tavares RCP, Crociolli GC, et al. (2015) Laser acupuncture for postoperative pain management in cats. Evidence-Based Complementary and Alternative Medicine 2015: 653270.

26. Han JS, J Tang, Ren MF, Zhou ZF, Fan S, et al. (1980) Central neurotransmitters and acupuncture analgesia. Am J Chin Med 8(4): 331-348.

27. Han JS (2003) Acupuncture: neuropeptide release produced by electrical stimulation of different frequencies. Trends Neurosci 26(1): 17-22.

28. Zhao Z-Q (2008) Neural mechanism underlying acupuncture analgesia. Prog Neurobiol 85(4): 355-375.

29. L Chen (2005) Acupuncture in pain management. Pain Management Round 2(7): 10-16.

30. Chen L, Zhang J, Li F, Qiu Y , Wang L, et al. (2009) Endogenous anandamide and cannabinoid receptor-2 contribute to electroacupuncture analgesia in rats. The Journal of Pain 10(7): 732-739.

31. Alimi OA, Abubakar AA, Yakubu AS, Aliyu A, Abulkadir SZ, et al. (2020) Veterinary acutherapy in management of musculoskeletal disorders: An eye-opener to the developing countries' veterinarians. Open Veterinary Journal 10(3): 252-260.

32. Lin JG, Chen WL (2008) Acupuncture analgesia: a review of its mechanisms of actions. The American journal of Chinese medicine 36(04): 635-645.

33. Angeli A L, Joaquim JGF, Gama EDD, Luna SPL (2005) Outcome of 119 dogs and cats treated at the acupuncture unit of the Faculty of Veterinary Medicine and Animal Science of the University of São Paulo State, Botucatu city, Brazil. Brazilian Journal of Veterinary Research and Animal Science 42(1): 68-74.

34. Loo WC (1985) Symptoms associated with impaired transmission of nerve impulses to different muscle areas and their treatment with acupuncture. Am J Acupunct 13: 319-330.

35. Kline K, Caplan E, Joseph R (2001) Acupuncture for neurologic disorders. Veterinary Acupuncture, Ancient Art to Modern Medicine Mosby 179-192.

36. Sumano H, Bermudez E, Obregon K (2000) Treatment of wobbler syndrome in dogs with electroacupuncture. DTW Deutsche Tierarztliche Wochenschrift 107(6): 231-235.

37. Stefanatos J (1984) Treatment to reduce radial nerve paralysis. VETERINARY MEDICINE & SMALL ANIMAL CLINICIAN 79(1): 67-71.

38. Wang Q, Peng Y, Chen S, Gou X, Hu B, et al. (2009) Pretreatment with electroacupuncture induces rapid tolerance to focal cerebral ischemia through regulation of endocannabinoid system. Stroke 40(6): 2157-2164.

39. Tao J, Xue XH, Chen LD, Yang SL, Jiang M, et al. (2010) Electroacupuncture improves neurological deficits and enhances proliferation and differentiation of endogenous nerve stem cells in rats with focal cerebral ischemia. Neurological Research 32(2): 198-204.

40. Nam MH, Yin CS, Soh KS, Choi SH (2011) Adult neurogenesis and acupuncture stimulation at ST36. Journal of Acupuncture and Meridian Studies 4(3): 153-158.

41. Han HJ, Yoon HY, Kim JY, Jang HY, Lee B, et al. (2010) Clinical effect of additional electroacupuncture on thoracolumbar intervertebral disc herniation in 80 paraplegic dogs. The American Journal of Chinese Medicine 38(06): 1015-1025.

42. Tsai LC, Lin YW, Hsieh CL (2015) Effects of bee venom injections at acupoints on neurologic dysfunction induced by thoracolumbar intervertebral disc disorders in canines: a Randomized, Controlled Prospective Study. BioMed research international 2015: 363801.

43. de Souza RN, Silva FK, de Medeiros MA (2017) Bee venom acupuncture reduces interleukin-6, increases interleukin-10, and induces locomotor recovery in a model of spinal cord compression. Journal of Acupuncture and Meridian Studies10(3): 204-210.

44. Kang SY, Roh DH, Park JH, Lee HJ, Lee JH (2012) Activation of spinal α2-adrenoceptors using diluted bee venom stimulation reduces cold allodynia in neuropathic pain rats. Evidence-based complementary and alternative medicine: eCAM 2012: 784713.

45. Yoon SY, Lee JY, Roh DH, Oh SB (2018) Pharmacopuncture with scolopendra subspinipes suppresses mechanical allodynia in oxaliplatin-induced neuropathic mice and potentiates clonidine-induced anti-allodynia without hypotension or motor impairment. The Journal of Pain 19(10): 1157-1168.

46. Yoon H, Kim MJ, Yoon I, Li DX, Bae H, et al. (2015) Nicotinic acetylcholine receptors mediate the suppressive effect of an injection of diluted bee venom into the GV3 acupoint on oxaliplatin-induced neuropathic cold allodynia in rats. Biological and Pharmaceutical Bulletin 38(5): 710-714.

47. Choi J, Jeon C, Lee JH, Jang JU, Quan FS, et al. (2017) Suppressive effects of bee venom acupuncture on paclitaxel-induced neuropathic pain in rats: mediation by spinal α2-adrenergic receptor. Toxins 9(11): 351.

48. Kim EH, Jang MH, Shin MC, Lim BV, Kim HB, et al. (2002) Acupuncture increases cell proliferation and neuropeptide Y expression in dentate gyrus of streptozotocin-induced diabetic rats. Neuroscience letters 327(1): 33-36.

49. Hwang IK, Chung JY, Yoo DY, Yi SS, Youn HY, et al. (2010) Effects of electroacupuncture at Zusanli and Baihui on brain-derived neurotrophic factor and cyclic AMP response element-binding protein in the hippocampal dentate gyrus. Journal of Veterinary Medical Science 72(11): 1431-1436.

50. Johng HM, Yoo JS, Yoon TJ, Shin HS, Lee BC, et al. (2007) Use of magnetic nanoparticles to visualize threadlike structures inside lymphatic vessels of rats. Evidence-Based Complementary and Alternative Medicine 4(1): 77-82.

51. Baik KY, Ogay V, Jeoung SC, Soh KS (2009) Visualization of Bonghan microcells by electron and atomic force microscopy. Journal of Acupuncture and Meridian Studies 2(2):124-129.

52. Jessberger S, Zhao C, Toni N, Clemenson GD, Li Y, et al. (2007) Seizure-associated, aberrant neurogenesis in adult rats characterized with retrovirus-mediated cell labeling. Journal of Neuroscience 27(35): 9400-9407.

53. Goiz Marquez G, Caballero S, Solis H, Rodriguez C, Sumano H (2009) Electroencephalographic evaluation of gold wire implants inserted in acupuncture points in dogs with epileptic seizures. Research in Veterinary Science 86(1): 152-161.

54. Lee DY, Jiu YR, Hsieh CL (2020) Electroacupuncture at Zusanli and at Neiguan characterized point specificity in the brain by metabolomic analysis. Scientific Reports 10(1): 1-8.

55. Osborne DM, Pearson Leary J, McNay EC (2015) The neuroenergetics of stress hormones in the hippocampus and implications for memory. Frontiers in neuroscience 9: 164.

56. Yun YC, Jang D, Yoon SB, Kim D, Choi DH, et al. (2017) Laser acupuncture exerts neuroprotective effects via regulation of Creb, Bdnf, Bcl-2, and Bax gene expressions in the hippocampus. Evidence-Based Complementary and Alternative Medicine 2017: 7181637.

57. Xiong G, Li X (2017) Effects of laser acupoint irradiation on energy metabolism of brain tissue of rats with cerebral ischemia-reperfusion. Laser Physics 27(12): 125601.

58. Hui KKS, Liu J, Marina O, Napadow V, Haselgrove C, et al. (2005) The integrated response of the human cerebro-cerebellar and limbic systems to acupuncture stimulation at ST 36 as evidenced by fMRI. Neuroimage 27(3): 479-496.

59. Liu P, Zhou G, Zhang Y, Dong M, Qin W, et al. (2010) The hybrid GLM–ICA investigation on the neural mechanism of acupoint ST36: an fMRI study. Neuroscience Letters 479(3): 267-271.

60. Sun ZG, Pi YL, Zhang J, Wang M, Zou J, et al. (2019) Effect of acupuncture at ST36 on motor cortical excitation and inhibition. Brain and behavior 9(9): e01370.

61. Ziemann U, Rothwell JC (2000) I-waves in motor cortex. Journal of Clinical Neurophysiology 17(4): 397-405.

62. Hodgson DS, Dunlop CI (1990) General anesthesia for horses with specific problems. Veterinary Clinics of North America: Equine Practice 6(3): 625-650.

63. Johnston GM, Taylor PM, Holmes MA (1995) Confidential enquiry into perioperative equine fatalities (CEPEF-1): interim results of the United Kingdom study, in Proceedings. Annu Conv Am Assoc Equine Pract 41: 192-193.

64. Young SS, Taylor PM (1993) Factors influencing the outcome of equine anaesthesia: a review of 1,314 cases. Equine Veterinary Journal 25(2): 147-151.

65. Kang X, Shen X, Xia Y (2013) Electroacupuncture-induced attenuation of experimental epilepsy: a comparative evaluation of acupoints and stimulation parameters. Evidence-Based Complementary and Alternative Medicine 2013: 149612.

66. Schoen AM (2003) Veterinary Medical Acupuncture for Gastrointestinal Conditions World Small Animal Veterinary Association World Congress Proceedings

67. Ding Zong W (1990) Acupuncture and neurophysiology. Clinical Neurology and Neurosurgery 92(1): 13-25.

68. Naylor DE (2010) Glutamate and GABA in the balance: convergent pathways sustain seizures during status epilepticus. Epilepsia 51: 106-109.

69. Niciu MJ, Kelmendi B, Sanacora G (2012) Overview of glutamatergic neurotransmission in the nervous system. Pharmacology Biochemistry and Behavior 100(4): 656-664.

70. Wurth U (2003) Feline Acupuncture World Small Animal Veterinary Association World Congress Proceedings.

71. SHOEN A M (2001) Acupuncture for musculoskeletal disorders. In: SHOEN AM (Ed.), Veterinary acupuncture: ancient art to modern medicine (2nd edn) St. Louis, Mosby, pp. 161-169.

72. Barlas P, Robinson J, Allen J, Baxter GD (2000) Lack of effect of acupuncture upon signs and symptoms of delayed onset muscle soreness. Clinical physiology 20(6): 449-456.

73. Choi KH, Hill SA (2009) Acupuncture treatment for feline multifocal intervertebral disc disease. Journal of feline medicine and surgery 11(8): 706-710.

74. Crouch MA (2009) Egg binding and hind limb paralysis in an African Penguin–a case report. Acupuncture in Medicine 27(1): 36-38.

75. Koski MA (2011) Acupuncture for zoological companion animals. Veterinary Clinics: Exotic Animal Practice 14(1): 141-154.

76. Kim YC, Lee MS, Park ES, Lew JH, Lee BJ, et al. (2012) Acupressure for the treatment of musculoskeletal pain conditions: a systematic review. Journal of Musculoskeletal Pain 20(2): 116-121.

77. Xie H, Ott EA, Harkins JD, Tobin T, Colahan PT, et al. (2001) Influence of electro-acupuncture on pain threshold in horses and its mode of action. Journal of Equine Veterinary Science 21(12): 591-600.

78. le Jeune S, Henneman K, May K (2016) Acupuncture and equine rehabilitation. Veterinary Clinics: Equine Practice 32(1): 73-85.

79. Krishan G, Narang A Integrative therapy in veterinary practice. J Pharmacol Pharmacother 2(1): 50-55.

80. Xie H (2017) Veterinary acupuncture: indications and contraindications p. 1-5.

81. Haltrecht H (1999) Veterinary acupuncture. The Canadian Veterinary Journal 40(6): 401-403.

82. Amaro J (2005) Acupuncture in veterinary medicine. Dynamic Chiropractic 23(6): 1-6.

83. Sharifi D, Bakhtiari J, Sasani F, Rezaei T (2009) The effect of acupuncture therapy on the repair of the calcaneal tendon (tendo calcaneus communis) in dogs. Turkish Journal of Veterinary & Animal Sciences 33(3): 181-184.

84. Dawidson I, Angmar Månsson B, Blom M, Theodorsson E, Lundeberg T (1998) Sensory stimulation (acupuncture) increases the release of vasoactive intestinal polypeptide in the saliva of xerostomia sufferers. Neuropeptides 32(6): 543-548.

85. Dawidson I, Angmar-Månsson B, Blom M, Theodorsson E, Lundeberg T (1999) Sensory stimulation (acupuncture) increases the release of calcitonin gene-related peptide in the saliva of xerostomia sufferers. Neuropeptides 33(3): 244-250.

86. Su C, Chen Y, Chen Y, Zhou Y, Li L, et al. (2019) Effect of electroacupuncture at the ST36 and GB39 acupoints on apoptosis by regulating the p53 signaling pathway in adjuvant arthritis rats. Molecular Medicine Reports 20(5): 4101-4110.

87. Doroshevskaya AY, Kondratovskii PM, Dubikov AI, Eliseikina MG (2014) Apoptosis regulator proteins: basis for the development of innovation strategies for the treatment of rheumatoid arthritis in patients of different ages. Bulletin of experimental biology and medicine 156(3): 377-380.

88. Nakano K, Vousden KH (2001) PUMA, a novel proapoptotic gene, is induced by p53. Molecular cell 7(3): 683-694.

89. Thomasova D, Mulay SR, Bruns H, Anders HJ (2012) p53-independent roles of MDM2 in NF-κB signaling: implications for cancer therapy, wound healing, and autoimmune diseases. Neoplasia 14(12): 1097-1101.

90. Zhang L, Luo J, Wen H, Zhang T, Zuo X, et al. (2016) MDM2 promotes rheumatoid arthritis via activation of MAPK and NF-κB. International immunopharmacology 30: 69-73.

91. Vassilev LT, Vu BT, Graves B, Carvajal D, Podlaski F, et al. (2004) *In vivo* activation of the p53 pathway by small-molecule antagonists of MDM2. Science 303(5659): 844-848.

92. Kwon YB, Kim JH, Yoon JH, Lee JD, Han HJ, et al. (2001) The analgesic efficacy of bee venom acupuncture for knee osteoarthritis: a comparative study with needle acupuncture. The American journal of Chinese medicine 29(02): 187-199.

93. Kim KS, Choi US, Lee SD, Kim KH, Chung KH, et al. (2005) Effect of bee venom on aromatase expression and activity in leukaemic FLG 29.1 and primary osteoblastic cells. Journal of ethnopharmacology 99(2): 245-252.

94. Zhao L, Shen Xy, Cao YL, Wang LZ, Deng Hp, et al. (2011) Effects of laser irradiation on arthritic histopathology and heat shock protein 70 expression in C57 black mice with osteoarthritis. Journal of Chinese Integrative Medicine 9(7): 761-767.

95. Wu F, Zhang R, Shen X, Lao L (2014) Preliminary study on pain reduction of monosodium iodoacetate-induced knee osteoarthritis in rats by carbon dioxide laser moxibustion. Evidence-Based Complementary and Alternative Medicine 2014: 754304.

96. Guo X, Liu MQ, Man HC, Wang XY, Mu JJ, et al. (2010) Laser acupuncture and prevention of bone loss in tail-suspended rats. Aviation, space, and environmental medicine 81(10): 914-918.

97. Yeom M, Kim SH, Lee B, Zhang X, Lee H, et al. (2013) Effects of laser acupuncture on longitudinal bone growth in adolescent rats. Evidence-Based Complementary and Alternative Medicine 2013: 424587.

98. Liu S, Xu M, Cao X, Hou J, Chen N, et al. (2017) The effect of laser acupuncture on hypoxia tolerance and inflammation reaction in mice with optical fiber acupuncture needle intra body. Journal of Innovative Optical Health Sciences 10(02): 1650039.

99. Kendall DE (2002) Dao of Chinese medicine: understanding an ancient healing art: Oxford University Press, USA.

100. Dill S, Bierman N (2001) Acupuncture for Gastrointestinal Disorders. In: Schoen (Ed.), Veterinary Acupuncture: Ancient Art to Modern Medicine. (2nd edn). St Louis, Mosby, pp. 239-260.

101. Dayou S, Shengqiang L, Xiaolin S (2011) Effects of acupuncture on digestive function indicators of experimental-induced gastrointestinal disorders in dogs. Chinese Animal Husbandry and Veterinary Medicine 38(10): 192-193.

102. Schneider A, Streitberger K, Joos S (2007) Acupuncture treatment in gastrointestinal diseases: a systematic review. World Journal of Gastroenterology: WJG 13(25): 3417.

103. Yang ZK, Wu ML, Xin JJ, He W, Su YS, et al. (2013) Manual acupuncture and laser acupuncture for autonomic regulations in rats: observation on heart rate variability and gastric motility. Evidence-Based Complementary and Alternative Medicine 2013: 276320.

104. Radkey DI, Writt VE, Snyder LBC, Jones BG, Johnson RA (2019) Gastrointestinal effects following acupuncture at Pericardium-6 and Stomach-36 in healthy dogs: a pilot study. Journal of Small Animal Practice 60(1): 38-43.

105. Wang K, Xu Y, Niu Y, Liu Y, Lai H, et al. (2020) Effects of varying acupuncture manipulations at ST36 (zusanli) on gastric electrical frequency and amplitude in bradygastria rabbits. Evidence-Based Complementary and Alternative Medicine 2020: 9357120.

106. Zheng J, Luo C, Qin Z (2010) A preliminary study of the relationship between the cutaneous electrogastrogram and stimulation of ST-36 Hou-San-Li. Proc 1st Int Conf Trad Chin Vet Med: 3-8.

107. Dugdale A (2010) Equine sedation and premedication. Veterinary Anaesthesia Principle to Practice West Sussex, Wiley-Blackwell, USA, pp. 247-258.

108. Tabosa A, Yamamura Y, Forno ER, Mello LEAdM (2002) Effect of the acupoints ST-36 (Zusanli) and SP-6 (Sanyinjiao) on intestinal myoelectric activity of Wistar rats. Brazilian Journal of Medical and Biological Research 35: 731-739.

109. Lu M, Chen C, Li W, Yu Z, Xu B, et al. (2019) EA at PC6 promotes gastric motility: role of brainstem vagovagal neurocircuits. Evidence-Based Complementary and Alternative Medicine 2019: 7457485.

110. Galatos AD, Raptopoulos D (1995) Gastro-oesophageal reflux during anaesthesia in the dog: the effect of preoperative fasting and premedication. The Veterinary Record 137(19): 479-483.

111. Galatos AD, Raptopoulos D (1995) Gastro-oesophageal reflux during anaesthesia in the dog: the effect of age, positioning and type of surgical procedure. The Veterinary Record 137(20): 513-516.

112. Wilson DV, Evans AT, Miller R (2005) Effects of preanesthetic administration of morphine on gastroesophageal reflux and regurgitation during anesthesia in dogs. American Journal of Veterinary Research 66(3): 386-390.

113. Favarato ES, De Souza MV, dos Santos Costa PR, Pompermayer LG, Favarato LSC, et al. (2011) Ambulatory esophageal pHmetry in healthy dogs with and without the influence of general anesthesia. Veterinary research communications 35(5): 271-282.

114. Adamama Moraitou KK, Rallis TS, Prassinos NN, Galatos AD (2002) Benign esophageal stricture in the dog and cat: a retrospective study of 20 cases. Canadian Journal of Veterinary Research 66(1): 55.

115. Sellon RK, Willard MD (2003) Esophagitis and esophageal strictures. Veterinary Clinics: Small Animal Practice 33(5): 945-967.

116. Wilson DV, Walshaw R (2004) Postanesthetic esophageal dysfunction in 13 dogs. Journal of the American Animal Hospital Association 40(6): 455-460.

117. Tatewaki M, Strickland C, Fukuda H, Tsuchida D, Hoshino E, et al. (2005) Effects of acupuncture on vasopressin-induced emesis in conscious dogs. American Journal of Physiology-Regulatory, Integrative and Comparative Physiology 288(2): R401-R408.

118. Koh RB, Isaza N, Xie H, Cooke K, Robertson SA (2014) Effects of maropitant, acepromazine, and electroacupuncture on vomiting associated with administration of morphine in dogs. Journal of the American Veterinary Medical Association 244(7): 820-829.

119. St James ML, Kosanovich DL, Snyder LB, Zhao Q, Jones BG, et al. (2019) Effects of acupuncture at Pericardium-6 and Stomach-36 on nausea, sedation and gastrointestinal motility in healthy dogs administered intravenous lidocaine infusions. Plos one 14(12): e0226065.

120. Streitberger K, Ezzo J, Schneider A (2006) Acupuncture for nausea and vomiting: an update of clinical and experimental studies. Autonomic Neuroscience 129(1-2): 107-117.

121. Lee A, Done ML (1999) The use of nonpharmacologic techniques to prevent postoperative nausea and vomiting: a meta-analysis. Anesthesia & Analgesia 88(6): 1362-1369.

122. Shengfeng L, Xin C, Ohara H, Nakamura Y, Izumi Nakaseko H, et al. (2015) Common parameters of acupuncture for the treatment of hypertension used in animal models. Journal of Traditional Chinese Medicine 35(3): 343-348.

123. Diao D, Wright JM, Cundiff DK, Gueyffier F (2012) Pharmacotherapy for mild hypertension. Cochrane database of systematic reviews 2012(8): CD006742.

124. Böger RH, Bode Böger SM (2001) The clinical pharmacology of L-arginine. Annual review of pharmacology and toxicology 41(1): 79-99.

125. Ma Sx (2017) Nitric oxide signaling molecules in acupoints: toward mechanisms of acupuncture. Chinese journal of integrative medicine 23(11): 812-815.

126. Hwang HS, Kim YS, Ryu YH, Lee JE, Lee YS, et al. (2011) Electroacupuncture delays hypertension development through enhancing NO/NOS activity in spontaneously hypertensive rats. Evidence-Based Complementary and Alternative Medicine 2011: 130529.

127. Friedemann T, Shen X, Bereiter-Hahn J, Schwarz W (2012) Regulation of the cardiovascular function by CO2 laser stimulation in anesthetized rats. Lasers in Medical Science 27(2): 469-477.

128. Zhang SY, Qu JH, Zhang ML (1986) Electrocardiogram effects following He-Ne laser irradiation of "neiguan" in cats. Zhen ci yan jiu= Acupuncture Research 11(1): 60-65.

129. Shen XY, Ding GH, Gao JP, Zhao L, Wei JZ, et al. (2006) Effect of infrared laser on pituitrin-induced bradycardia in rabbits. Zhong xi yi jie he xue bao= Journal of Chinese Integrative Medicine 4(6): 644-648.

130. Zhao L, Shen Xy, Gao Jp, Ding Gh, Wei Jz, et al. (2006) Effect of different LLLT on pituitrin-induced bradycardia in the rabbit. Lasers in Medical Science 21(2): 61-66.

131. He W, Litscher G, Jing XH, Shi H, Wang XY, et al. (2013) Effectiveness of interstitial laser acupuncture depends upon dosage: experimental results from electrocardiographic and electrocorticographic recordings. Evidence-Based Complementary and Alternative Medicine 2013: 934783.

132. Lujan HL, Kramer VJ, DiCarlo SE (2007) Electroacupuncture decreases the susceptibility to ventricular tachycardia in conscious rats by reducing cardiac metabolic demand. American Journal of Physiology-Heart and Circulatory Physiology 292(5): 2550-2555.

133. Zhou W, Ko Y, Benharash P, Yamakawa K, Patel S, et al. (2012) Cardioprotection of electroacupuncture against myocardial ischemia-reperfusion injury by modulation of cardiac norepinephrine release. American Journal of Physiology-Heart and Circulatory Physiology 302(9): 1818-1825.

134. Li P, Tjen A Looi SC (2013) Mechanism of the inhibitory effect of electroacupuncture on experimental arrhythmias. Journal of Acupuncture and Meridian Studies 6(2): 69-81.

135. Lomuscio A, Belletti S, Battezzati PM, Lombardi F (2011) Efficacy of acupuncture in preventing atrial fibrillation recurrences after electrical cardioversion. Journal of cardiovascular electrophysiology 22(3): 241-247.

136. Kurusu M, Watanabe K, Nakazawa T, Seki T, Arai H, et al. (2005) Acupuncture for patients with glaucoma. Explore 1(5): 372-376.

137. Brooks DE, Cantwell SL, Xie H, Sapp HL (2007) Electro-Acupuncture to Decrease Intraocular Pressure in Rhesus Monkeys with Chronic Glaucoma. Investigative Ophthalmology & Visual Science 48(13): 1281.

138. Takayama S, Seki T, Watanabe M, Monma Y, Yang SY, et al. (2010) Brief effect of acupuncture on the peripheral arterial system of the upper limb and systemic hemodynamics in humans. The Journal of Alternative and Complementary Medicine 16(7): 707-713.

139. Sagara Y, Fuse N, Seimiya M, Yokokura S, Watanabe K, et al. (2006) Visual function with acupuncture tested by visual evoked potential. The Tohoku Journal of Experimental Medicine 209(3): 235-241.

140. Kelawala NH, Kumar A, Jadon NS (1998) Haematological and biochemical effects of electrostimulation of acupoints for abdomino-pelvic analgesia in dogs. Indian Journal of Veterinary Surgery 19(2): 99-102.

141. Zhao J, Cheng K, Deng H, Zhao L, Liu L, et al. (2014) The effect of different laser irradiation on cyclophosphamide-induced leucopenia in rats. Evidence-Based Complementary and Alternative Medicine 2014: 756406.

142. Xie H (2009) Acupuncture for Immunologic Disorders World Small Animal Veterinary Association World Congress Proceedings.

143. Chen L, Xu A, Yin N, Zhao M, Wang Z, et al. (2017) Enhancement of immune cytokines and splenic CD4+ T cells by electroacupuncture at ST36 acupoint of SD rats. PLoS One 12(4): e0175568.

144. Murthy SN (2017) EFFECT OF ACU-TENS THERAPY ON ZHONGWAN (CV12) ACUPOINT IN STREPTOZOTOCIN INDUCED DIABETIC RATS. Int J Pharma Bio Sci 8(3): 1053-1058.

145. Murthy SSN, Felicia C (2015) antidiabetic activity of Musa sapientum fruit peel extract on streptozotocin induced diabetic rats. International Journal of Pharma and Bio Sciences 6(1): 537-543.

146. Sheikhrabori A, Dehghan M, Ghaedi F, Khademi GR (2017) Complementary and alternative medicine usage and its determinant factors among diabetic patients: an Iranian case. Journal of evidence-based complementary & alternative medicine 22(3): 449-454.

147. Lee YC, Li TM, Tzeng CY, Chen YI, Ho WJ, et al. (2011) Electroacupuncture at the Zusanli (ST-36) acupoint induces a hypoglycemic effect by stimulating the cholinergic nerve in a rat model of streptozotocine-induced insulin-dependent diabetes mellitus. Evidence-Based Complementary and Alternative Medicine 2011: 650263.

148. Ishizaki N, Okushi N, Yano T, Yamamura Y (2009) Improvement in glucose tolerance as a result of enhanced insulin sensitivity during electroacupuncture in spontaneously diabetic Goto-Kakizaki rats. Metabolism 58(10): 1372-1378.

149. Subbulakshmi R, Sivakumar G, Murthy SN (2018) Acu-TENS stimulation at bilateral Zusanli (ST36) acupoint in Streptozotocin induced diabetic rats. INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH 9(11): 4770-4774.

150. Kumar M (2013) Treatment of diabetes through acupuncture. IRJC 2(2): 175-188.

151. Cabıoğlu MT, Ergene N (2006) Changes in levels of serum insulin, C-peptide and glucose after electroacupuncture and diet therapy in obese women. The American journal of Chinese medicine 34(03): 367-376.

152. Cho SH, Lee JS, Thabane L, Lee J (2009) Acupuncture for obesity: a systematic review and meta-analysis. International journal of obesity 33(2): 183-196.

153. Pai HC, Tzeng CY, Lee YC, Chang CH, Lin JG, et al. (2009) Increase in plasma glucose lowering action of rosiglitazone by electroacupuncture at bilateral Zusanli acupoints (ST. 36) in rats. Journal of Acupuncture and Meridian Studies 2(2): 147-151.

154. Lin RT, Tzeng CY, Lee YC, Chen YI, Hsu TH, et al. (2014) Acupoint-specific, frequency-dependent, and improved insulin sensitivity hypoglycemic effect of electroacupuncture applied to drug-combined therapy studied by a randomized control clinical trial. Evidence-Based Complementary and Alternative Medicine 2014: 371475.

155. Subbulakshmi R, Sivakumar G, Murthy SN (2018) Acu-TENS stimulation at bilateral Zusanli (ST36) acupoint in Streptozotocin induced diabetic rats. INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH 9(11): 4770-4774.

156. Zhang S, Liu Y, Ye Y, Wang XR, Lin LT, et al. (2018) Bee venom therapy: Potential mechanisms and therapeutic applications. Toxicon 148: 64-73.

157. Li Y, Qian Zy, Cheng K, Zhao L, Shen Xy (2020) Effect of compound laser acupuncture-moxibustion on blood glucose, fasting insulin and blood lipids levels in type 2 diabetic rats. Chinese Journal of Integrative Medicine 26(1): 33-38.

158. Peplow PV, Baxter GD (2012) Electroacupuncture for control of blood glucose in diabetes: literature review. Journal of Acupuncture and Meridian studies 5(1): 1-10.

159. Zhang YS, Xu YX, Chen CS, Chen GZ, Weng ZX, et al. (2011) Effects of laser irradiation of acupuncture points Shenshu on ovariectomized rats. Photomedicine and Laser Surgery 29(4): 271-275.

160. Schofield WA (2008) Use of acupuncture in equine reproduction. Theriogenology 70(3): 430-434.

161. Zhu H, Nan S, Suo C, Zhang Q, Hu M, et al. (2019) Electro-acupuncture affects the activity of the hypothalamic-pituitary-ovary axis in female rats. Frontiers in physiology 10: 466.

162. Tobari Y, Son YL, Ubuka T, Hasegawa Y, Tsutsui K, et al. (2014) A new pathway mediating social effects on the endocrine system: female presence acting via norepinephrine release stimulates gonadotropin-inhibitory hormone in the paraventricular nucleus and suppresses luteinizing hormone in quail. Journal of Neuroscience 34(29): 9803-9811.

163. Looney AL, Rothstein E (1998) Use of acupuncture to treat psychodermatosis in the dog. Canine practice (Santa Barbara, Calif: 1990) USA.

164. Bierman N (2001) Acupuncture for dermatological disorders. Veterinary acupuncture: ancient art to modern medicine: Mosby, St Louis (MO) 281-294.

165. Sur B, Lee B, Yeom M, Hong JH, Kwon S, et al. (2015) Bee venom acupuncture alleviates trimellitic anhydride-induced atopic dermatitis-like skin lesions in mice. BMC complementary and alternative medicine 16(1): 1-13.

166. Lee JD, Kim SY, Kim TW, Lee SH, Yang HI, et al. (2004) Anti-inflammatory effect of bee venom on type II collagen-induced arthritis. The American journal of Chinese medicine 32(03): 361-367.