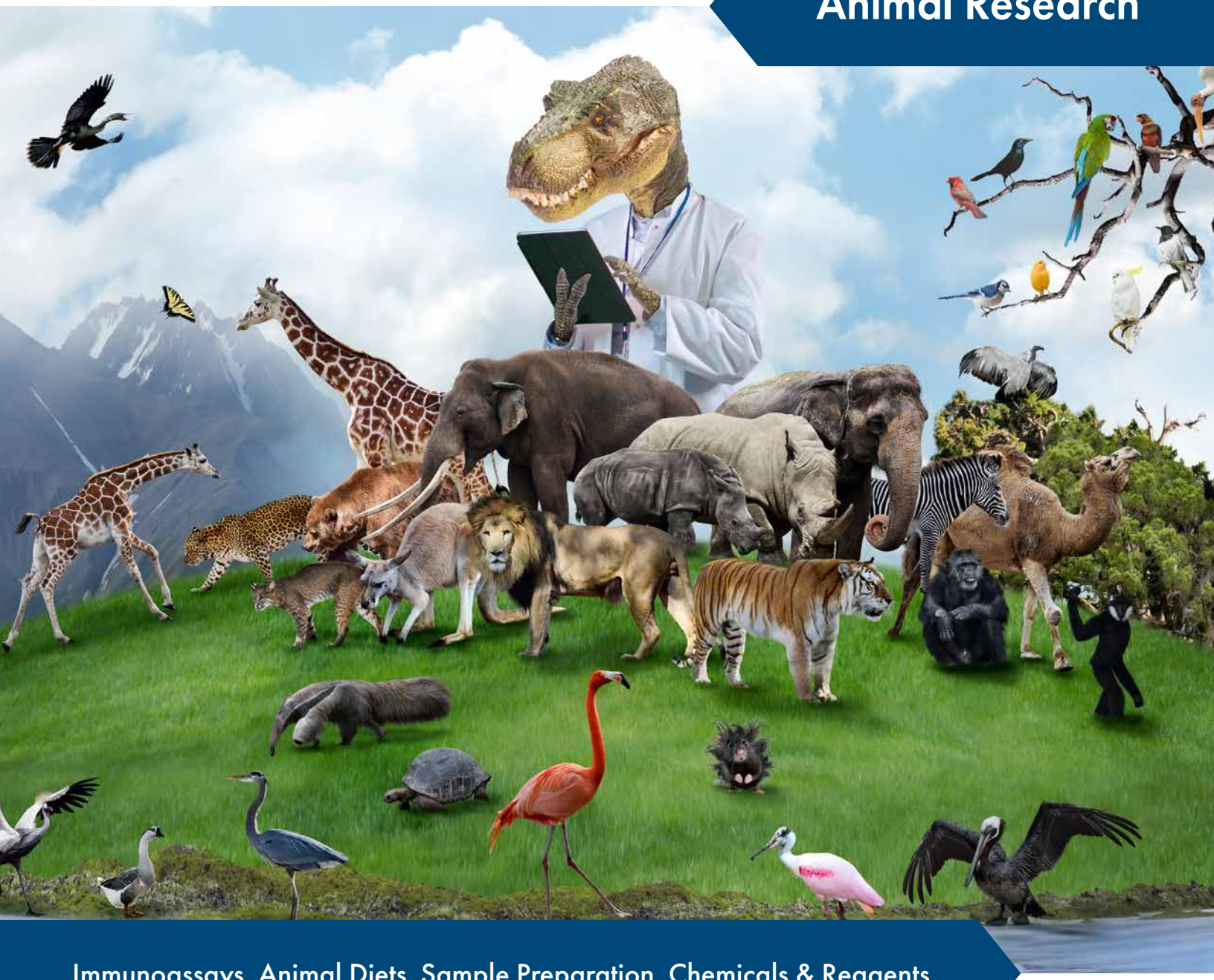
Kits and Reagents for

Animal Research



Immunoassays, Animal Diets, Sample Preparation, Chemicals & Reagents

- Diets for Research Animals
- Animal Science Research
- Veterinary Science Research
- Laboratory Animal Science
- Wildlife Monitoring
- Animal Welfare

MP BIO™

www.mpbio.com

Studying Stress?

Trust the Gold Standard in Corticosterone measurement

- Proven performance and reliability for over 30 years
- Over 2,500 scientific publications
- Adaptable to many species and sample types
- Highly sensitive

MP Bio Corticosterone RIA Kit *(see page 26)*

Other Stress Research Immunoassays *(see page 27)***:**

ACTH • Cortisol • Dopamine • Epinephrine • Growth Hormone • Norepinephrine • Prolactin

One Call. One Source.
A World of Animal Research Products.

MP Biomedicals provides essential tools for life science and diagnostic teams dedicated to improving the quality of life. We partner with our customers, and the wider scientific community, to advance the science of medical diagnostics and life science research. Quality products, innovative technology and expert knowledge all play an essential role in the scientific pursuit for answers.

Providing Reliable Animal Research Diagnostic Solutions for Over 40 Years

Animal research is vital in our quest for improving the quality of life for both humans and animals. Nearly all medical breakthroughs originally started from animal models which eventually progressed into clinical studies, and finally reached the market to be utilized to improve health, economics, scientific understanding, and overall quality of life for both humans and animals. Millions of lives have been affected by the critical animal research that is being performed. Our goal at MP Bio is to support researchers with the tools they need to conduct powerful research and ***make an impact***.

- **Animal Science:** Animal Scientists are dedicated to advancing our understanding of all types of animals, including farm animals, wildlife, zoo animals, pets and laboratory animals. These animals are important as they provide us with food, clothing, labor and companionship, as well as playing a major role in scientific research. From reproduction management of bovine, to understanding the effect of environmental stress on wildlife, Animal Scientists rely on MP Bio Immunoassays for accurate and reliable measurements.
- **Veterinary Science:** Veterinary Scientists aim to better understand animal health and disease, and how Veterinarians can apply this knowledge to the animals they care for. Veterinary Science explores the habits and care of domesticated and wild animals, which includes topics such as pet health, wildlife conservation and breeding/ reproductive management. MP Bio supports this research by providing high-quality, reliable assays and reagents.
- **Laboratory Animal Science and Other Animal Models in Research:** The use of animal models in research over the last few centuries has been instrumental in achieving the vast knowledge we have today of numerous human conditions and diseases. Animal models give us the ability to conduct breakthrough scientific research leading to discoveries in all areas of human physiology, including diagnosis and treatment of many diseases. From reproductive management to measuring stress levels, our kits and reagents provide you with accurate results every time.
- **Wildlife Monitoring:** Studying and understanding animals in the wild can provide impactful insight into the world around us and how certain circumstances can positively or negatively affect a species. We are proud to supply researchers with the solutions they need to continue to learn about and monitor the wildlife surrounding us.
- **Animal Welfare:** Through many advances in technology and practical applications, animal testing has become more efficient and humane, with the overall intent to cause less harm to animals while preserving the quality of research. Our immunoassays provide the detailed information you need to help improve the welfare of laboratory animals.

It is our mission to provide reliable, high quality products to ensure accurate results for your lab. Our worldwide Technical Service Department is available to deliver expert advice and answers when you have questions or need additional information. Highly trained team members are experienced in all aspects of life science and diagnostic applications and will help you find solutions quickly and efficiently. With ISO-certified and FDA-approved manufacturing and distribution facilities throughout the globe, we are committed to providing high quality diagnostic tests and life science reagents that help advance scientific discovery, improve health and manage diseases.

We deliver the tests you need and the results you can trust.

www.mpbio.com

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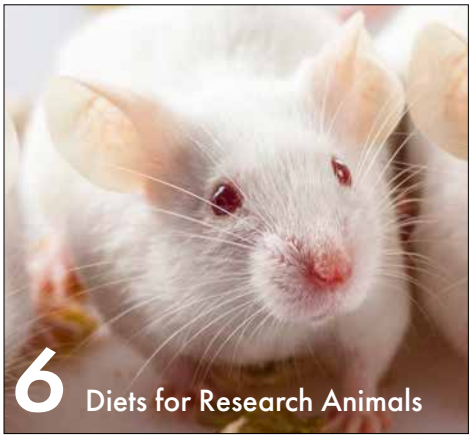

Diets for Research Animals

Take a fresh look at MP Bio's prepared animal research diets. You'll discover an entirely new standard in quality, freshness and value. Whether you're studying obesity, type II diabetes, a vitamin or mineral deficiency, insect breeding or memory loss based on diet, MP Bio offers you a fresh perspective for your animal dietary needs.

Our animal diets and dietary components are of the finest quality and the most uniform of commercially available diets. Our specialists adhere to strict specifications and every component is extensively monitored throughout the entire manufacturing process to ensure greater consistency with every order.

Because dietary components vary in shelf-life, we choose not to stock any finished preparation. Instead, every diet is freshly formulated after an order has been placed. Furthermore, due to the tremendous volume of components we handle weekly, we are constantly restocking raw materials, so you can rest assured that the diet ingredients are always fresh.

MP Bio has over five decades of experience in customized animal research diets and more than 15,000 successful custom formulations. We specialize in mineral and vitamin deficient diets. Upon request, we can easily change any combination of components in our existing diets or design a custom diet to your exact specifications. Each diet is produced specifically to your order. Take a fresh look and find the diet that will make your research project more palatable and effective.

Standard Research Diets

These research diets are routinely available standard preparations, made to order when you need them. Most are available in 10 kg, 20 kg and 50 kg packages (unless otherwise indicated), and in pelleted and/or powdered form, as you desire. Pellets may be color-coded for ease of identification, and pellet size may be varied to accommodate smaller or larger animals. Complete formulations can be found on our website at www.mpbio.com.

Description	Size	Cat. No.
AIN-76 Semipurified Diet American Institute of Nutrition standard formulation for rats and mice for effective growth, appearance and survival.	10 kg, 20 kg, 50 kg	02905453
AIN-76A Semipurified Diet Intended for growth and maintenance during the first year of life. The diet has been found to be satisfactory for reproduction and lactation in both rats and mice.	10 kg, 20 kg, 50 kg	02960097
AIN-76C Semipurified Diet Basic animal diet for maintaining mouse and rat colonies in the research lab.	10 kg, 20 kg, 50 kg	02960296
AIN-93G Diet An updated formulation of AIN-76 Diet designed for growth, pregnancy and lactational phases of rodents.	10 kg, 20 kg, 50 kg	02960399
AIN-93M Diet An updated formulation of AIN-76 Diet designed for maintenance of adult rodents.	10 kg, 20 kg, 50 kg	02960397
Amino Acid Diet, Synthetic A rodent diet containing the essential amino acids in varying naturally occurring ratios.	10 kg, 20 kg, 50 kg	02960362
Atherogenic Diet Rich in cholesterol and other atherogenic factors. Feeding mice with atherogenic diet can induce the formation of plaques in the inner lining of arteries associated with coronary heart disease.	10 kg, 20 kg, 50 kg	02960404
Biotin-Free Diet A diet essentially free of all detectable amounts of Biotin.	10 kg, 20 kg, 50 kg	02904672
Biotin Control Diet A diet containing standard amounts of Biotin.	10 kg, 20 kg, 50 kg	02960410
Calcium Deficient Diet Calcium deficient diet can be used to study calcium deficiency on bone density, osteoporosis and other calcium signaling pathways.	10 kg, 20 kg, 50 kg	02960177
Carbohydrate Diet, High, Modified A normal test diet modified to contain 68% carbohydrate by weight.	10 kg, 20 kg, 50 kg	02960236

Description	Size	Cat. No.
2% Cholesterol Diet A complete rat feed with 2% cholesterol added.	10 kg, 20 kg, 50 kg	02904691
Choline Sufficient Diet Supplemented with MP's Vitamin Diet Fortification Mixture to supply sufficient levels of Choline.	10 kg, 20 kg, 50 kg	02960412
Choline Deficient Diet Choline Deficient Diet, is used for the study of typical cellular and extracellular adult liver progenitor cells in rodents.	10 kg, 20 kg, 50 kg	02960034
Choline Control Diet Diet for animals used to study liver injury in conjunction with MP's Methionine/Choline Deficient diet.	10 kg, 20 kg, 50 kg	02960414
Dairy Butter Diet for Mice An atherogenic diet for mice.	10 kg, 20 kg, 50 kg	02960393
Fat-Free Diet Fat Free diet has been used to study cholesterol metabolism.	10 kg, 20 kg, 50 kg	02901683
Fat Diet, High, Modified Our normal High Fat Diet modified to contain essential trace minerals, DL-Methionine and Fiber.	10 kg, 20 kg, 50 kg	02960192
Fat Diet, High Saturated Fat High Saturated Fat Diet has been used to induce obesity and high cholesterol in the mice.	10 kg, 20 kg, 50 kg	02960242
Fat Diet, High Unsaturated Fat High Unsaturated Fat Diet has been used to induce obesity and high cholesterol in the mice.	10 kg, 20 kg, 50 kg	02960244
Gypsy Moth Diet Gypsy Moth Diet is used for general colony maintenance of moth larvae.	1L, 4L	02960292
Iron Diet, Low Typically contains approximately 7 ppm iron.	10 kg, 20 kg, 50 kg	02960183
Magnesium Diet, Low Typically contains approximately 60 ppm magnesium.	10 kg, 20 kg, 50 kg	02960187
Methionine/Choline Deficient Diet This diet is used to study induction of non-alcoholic steatohepatitis (NASH) in experimental models and its routes of development.	10 kg, 20 kg, 50 kg	02960439
Methionine/Choline Control Diet This control diet triggers the resolution of hepatic inflammatory and fibrotic reactions and hepatocyte apoptosis, suggesting that MCDD-induced steatohepatitis is also reversible.	10 kg, 20 kg, 50 kg	02960441
Mouse Diet Purified A natural-ingredient diet specifically formulated to provide the proper balance of all known nutrients considered essential for the growth, maintenance, and reproduction of mice for lab experiments.	10 kg, 20 kg, 50 kg	02904606
Potassium Deficient Diet Based on a modified AIN-76 formulation. Includes potassium iodate and chromium potassium sulfate. The additional potassium from these minerals is negligible.	10 kg, 20 kg, 50 kg	02960188
4% Protein Diet A low protein maintenance diet.	10 kg, 20 kg, 50 kg	02960254
12% Protein Diet A maintenance diet with 12% protein.	10 kg, 20 kg, 50 kg	02960258
Sodium Deficient Diet Typically contains an estimated 40 to 80 ppm sodium. Provides approximately 4.1 kcal/gm.	10 kg, 20 kg, 50 kg	02960364

Description	Size	Cat. No.
Thiamine Deficient Diet, Modified Thiamine deficiencies can cause loss of appetite, fatigue, and irritability.	10 kg, 20 kg, 50 kg	02960165
Thiamine Control Diet, Modified Contains MP's Vitamin Diet Fortification Mixture to supply normal levels of Thiamine.	10 kg, 20 kg, 50 kg	02960420
Vanderzant-Adkisson Special Wheat Germ Diet for Insects Widely used for laboratory rearing of more than 20 species of insects.	10 kg, 20 kg, 50 kg	02902942
Vitamin D-Free Diet Used to study role of Vitamin D in carbohydrate metabolism.	10 kg, 20 kg, 50 kg	02960074
Zinc Deficient Diet Zinc deficiency is studied to understand slower than expected growth, poor immune system development, poor wound healing.	10 kg, 20 kg, 50 kg	02960372
Zinc Control Diet Uses AIN-76 Mineral mix to afford normal zinc levels for a healthy diet.	10 kg, 20 kg, 50 kg	02960428

Research Diet Basics

Looking to formulate or supplement your own special animal feed? Take a fresh look at our research diet components, including mineral and vitamin mixes, as well as a full list of individual ingredients ready for use. We offer proteins, carbohydrates, fats, oils and much more to simplify the preparation of your proprietary blend. MP Bio only uses the freshest ingredients in all of our diet formulations, and the same applies to our individual Diet Components. We also price them competitively, so you don't overspend when you blend!

Mineral & Salt Mixes

Many of MP Bio Mineral Mixes follow nationally accredited specifications and formulations to provide confidence in what you are feeding your animals. From the American Institute of Nutrition (AIN) formulae to USP specifications, our Mineral Mixes adhere to the strictest controls available. Quality tested and assured, using the best ingredients possible, check out our Mineral Mix offerings. Complete formulations may be found on our website at www.mpbio.com.

Description	Size	Cat. No.
AIN-76 Mineral Mixture	2 kg 10 kg	02905455
AIN-93G Mineral Mix	2 kg 10 kg	02960400
AIN-93M Mineral Mix	2 kg 10 kg	02960401
Briggs Salt Mixture	2 kg 10 kg	02902834
Guinea Pig Mineral Mix	2 kg 10 kg	02990285
Hegsted Salt Mix	2 kg 10 kg	02902840
Hubbel, Mandel & Wakeman Salt Mixture	2 kg 10 kg	02902838
Jones & Foster Salt Mix	2 kg 10 kg	02902110

Description	Size	Cat. No.
Phillips & Hart Salt Mix	2 kg 10 kg	02902844
Rogers & Harper Salt Mix	2 kg 10 kg	02902842
Salt Mix #2 USP XIII	2 kg 10 kg	02902845
Salt Mix USP XIV	2 kg 10 kg	02902850
Sodium-Free Salt Mix for Rat	2 kg 10 kg	02960352
Trace Minerals for Ultra Clean Environment	500 gm 1 kg	02960264
Wesson Salt Mixture	2 kg 10 kg	02902851
Williams-Briggs Salt Mix	2 kg 10 kg	02902837

Vitamin Mixtures

Proper nutrition in your animals' maintenance diets includes a complete regimen of daily vitamins. Consequently, MP Bio offers a range of vitamin mixtures to cover most needs. Further, if you wish to study specific vitamin effects, such as lack of Vitamin D or excess Vitamin B, we can customize a vitamin mix and diet to your exact specifications. Want to put together your own research diet? No problem, we have the following Vitamin mixtures available for your selection.

Description	Size	Cat. No.
AIN-76 Vitamin Mixture	1 kg	02905454
AIN-76A Vitamin Mixture	1 kg	02960098
AIN-93VX Vitamin Mixture	1 kg	02960402
Vanderzant Modification Vitamin Mixture for Insects	1 kg, 5 kg	02903244
Vitamin Diet Fortification Mixture	1 kg	02904654

Additional Diet Ingredients

For those who prefer to formulate and mix their own research diets completely from scratch, we have a comprehensive range of ingredients from which you may select. Again, these individual diet components are of the finest quality available in the market, and always fresh. These individual ingredients are available in quantities from grams to kilos. So, if you're thinking of preparing your own research diets, take a fresh look at MP Bio's diet components and get started!

Description	Cat. No.
Alphacel Hydrolyzed	02900454
Alphacel Non-Nutritive Bulk	02900453
Brewers Yeast	02903312
Casein Purified High Nitrogen	02901293
Casein Vitamin Free	02905420
Cocoa Butter	02905417
Coconut Oil	02901403
Coconut Oil Hydrogenated	02901404
Cod Liver Oil	02901405
Corn Ground Yellow	02901411
Corn Oil	02901414
Corn Oil Tocopherol-Stripped	02901415

Description	Cat. No.
Cottonseed Oil	02901419
Dextrin Type II	02901520
Dextrinized Corn Starch	02960429
D-(+)-Dextrose Anhydrous	02901521
Dextrose Monohydrate	02905594
Egg White Spray Dried	02901633
Gelatin	02960317
Lard Tocopherol-Stripped	02902141
Linseed Oil, Raw	02960122
Liver Powder	02900396
Liver Concentrate Powder	02900377
Menhaden Oil	02960120

Description	Cat. No.
Milk Powder, Whole	02902363
Milk Powder, Skim	02902887
Peanut Oil	02904684
Soybean Meal Defatted	02960024
Soybean Protein	02902940
Soy Protein Isolated	02905456
Starch, Corn	02902956
Starch, Wheat	02902952
Sucrose	02904713
Torula Yeast	02903085
Wheat Germ	02903288
Xanthan Gum	02960021

MP Bio Immunoassays for Animal Research

Analyte	Assay Type	Tests	Cat. No.	Species*
17α-hydroxyprogesterone	RIA (CT)	100	07271102	Human
		500	07271105	
	RIA (DA)	100	07171102	
	ChLIA	96	07M5275A	
ACTH	RIA (DA)	50	07106101	Human
		100	07106102	
Androstenedione	RIA (DA)	100	07109202	Human
Bile Acids, conjugated	RIA (CT)	100	06B242918	Human
Corticosterone	EIA / ELISA	96	07DE9922	Rat, Mouse
	RIA (DA)	100	07120102	
		200	07120103	
Cortisol	RIA (CT)	100	07221102R	Human
		500	07221105R	
		1000	07221106R	
	EIA / ELISA	96	07P631	
		96	07M21602	
		2 x 96	07M21603	
	ChLIA	96	07M3675A	
C-Peptide	IRMA	100	07RK84CT	Human
	EIA / ELISA	96	07M61102	
		2 x 96	07M61103	
	ChLIA	96	07M2775A	
E2 (17β-Estradiol)	EIA / ELISA	96	07P634	Human
			07BC1111	
			07DE9999	Rat
	RIA (CT)	100	07238102	Human
		500	07238105	
	RIA (DA)	100	07138102	
		500	07138105	
	ChLIA	96	07M4975A	
E3 (Estriol), unconjugated	EIA / ELISA	96	07P633	Human
Estrone-3-sulfate	EIA / ELISA	96	07DE9933	Equine
Follicle Stimulating Hormone (FSH)	RIA	120	07RK550	Rat
	EIA / ELISA	96	07BC1029	Human
	ChLIA	96	07M475A	
		192	07M475B	
Gastrin	RIA (DA)	100	06B255017	Human
		200	06B255025	
Glucagon	RIA (DA)	50	07152101	Human
Growth Hormone (GH)	RIA	120	07RK551	Rat
	IRMA	100	07RK5CT	Human
	EIA / ELISA	96	07BC1033	
	ChLIA	96	07M1775A	
hCG	EIA / ELISA	96	07BC1027	Human
		96	07BC1045	
	ChLIA	96	07M875A	
		192	07M875B	
Insulin	EIA / ELISA	96	07EK547	Rat
	RIA	100	07RK547	Rat
	RIA (CT)	100	07RK547CT	Rat
	EIA / ELISA	96	07M60102	Human
	IRMA	100	07RK400CT	
	ChLIA	96	07M2475A	
Luteinizing Hormone (LH)	RIA	120	07RK552	Rat
	EIA / ELISA	96	07BC1031	Human
	ChLIA	96	07M675A	
		192	07M675B	
Progesterone	RIA (CT)	100	07270102	Human
		500	07270105	
	RIA (DA)	100	07170102	
		500	07170105	
	EIA / ELISA	96	07P637	
		96	07BC1113	
		96	07DE9988	Rat, Mouse
	ChLIA	96	07M4875A	Human
Prolactin	RIA	120	07RK553	Rat
	EIA / ELISA	96	07BC1037	Human
		96	07DE9944	Canine
		96	07DE9966	Rat
	IRMA	100	07RK780CT	Human
	ChLIA	96	07M775A	
		192	07M775B	
Testosterone	EIA / ELISA	96	07P635	Human
		96	07BC1115	
		96	07DE9911	Rat, Mouse
	RIA (DA)	100	07189102	Human
		500	07189105	
	ChLIA	96	07M3775A	
T3 (Free)	ChLIA	96	07M1375A	Human
		192	07M1375B	
	RIA (CT)	100	06B258709	
		500	06B258710	
	EIA / ELISA	96	07BC1006	
T3 (Total)	EIA / ELISA	96	07BC1005	Human
	ChLIA	96	07M175A	
		192	07M175B	
	RIA	100	06B254215	
		200	06B256447	
		500	06B254216	
T3 Uptake	RIA	100	06B237116	Human
	ChLIA	96	07M575A	
		192	07M575B	
T4 (Free)	ChLIA	96	07M1275A	Human
		192	07M1275B	
	RIA (CT)	100	06B257214	
		500	06B257215	
	EIA / ELISA	96	07BC1008	
T4 (Total)	EIA / ELISA	96	07BC1007	Human
	ChLIA	96	07M275A	
		192	07M275B	
	RIA	100	06B254011	
		200	06B254029	
		500	06B254030	
Thyroid Stimulating Hormone (TSH)	IRMA (CT)	100	07294102	Human
		500	07294105	
	RIA	120	07RK554	Rat
	EIA / ELISA	96	07BC1001	Human
		96	07DE9955	Canine
		96	07DE9977	Rat
	ChLIA	96	07M375A	Human
		192	07M375B	
Vitamin B12, Folate - SNB	RIA	100	06B257117	Human
		200	06B264806	
2-CAT Fast Track [Adrenaline (Epinephrine) and Noradrenaline (Norepinephrine)]	EIA / ELISA	2 x 96	07LE6500	Human
	RIA	100	07LR6500	
3-CAT Fast Track [Adrenaline (Epinephrine), Noradrenaline (Norepinephrine) and Dopamine]	EIA / ELISA	3 x 96	07LE6600	Human
	RIA	100	07LR6600	
Adrenaline (Epinephrine) Fast Track	EIA / ELISA	96	07LE6100	Human
Dopamine Fast Track	EIA / ELISA	96	07LE6300	Human
	RIA	96	07LR6300	
Noradrenaline (Norepinephrine) Fast Track	EIA / ELISA	96	07LE6200	Human
	RIA	100	07LR6200	
HEV IgG, IgM and IgA	EIA / ELISA	96	0763541096	Human, Swine, Equine, Rodent

Additional species have been cited in scientific publications. All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.

CT = coated tube DA = double antibody

Animal Science Research

Animal Scientists are dedicated to advancing our understanding of all types of animals, including farm animals, wildlife, zoo animals, pets and laboratory animals. These animals are important as they provide us with food, clothing, labor and companionship, as well as playing a major role in critical scientific research. From reproduction management of bovine, to understanding the effect of environmental stress on wildlife, Animal Scientists rely on MP Bio Immunoassays for accurate and reliable measurements.

Reproductive Hormone Testing

Reproductive management has become increasingly important for livestock owners, as well as breeders of animals for companion or sport. The efficient production of food and milk from livestock is heavily dependent on the producer's ability to effectively manage the reproductive capacity of the farm. Even modest improvements in the efficiency of reproductive management could be worth millions of dollars annually. Breeders are also interested to know when their animals are ready to mate or be artificially inseminated, especially in species such as dogs, since their estrus window is relatively short and only occurs 2-3 times per year.

One of the most common ways to monitor the estrous cycle of an animal is by measuring the level of progesterone in their blood. The change in the level of progesterone can be used to predict the optimal time for breeding if a series of samples are taken. If only a single sample is analyzed, progesterone levels above 2 ng/mL generally indicate breeding can begin.

Males are also evaluated for reproductive soundness and ability to breed. In stallions, for example, testosterone levels can be a useful indicator of normal or abnormal reproductive function. Adequate levels of testosterone (and FSH) must be present to stimulate Sertoli cells to create an environment conducive to spermatogenesis. A high value of testosterone (often measured alongside estrone sulfate) indicates the presence of testicular tissue. Another test to measure the testicular function of breeding stallions is the human chorionic gonadotropin (hCG) stimulation test, which helps to determine if testicular tissue is present or absent in cryptorchid horses. A different challenge test, using gonadotropin releasing hormone (GnRH), can be used to assess how responsive the pituitary and testes are to a GnRH challenge. Both tests require the measurement of testosterone in the stallion at specific time intervals after injections.

Equine

Progesterone is important in the regulation of reproductive function in the mare. This steroid hormone regulates uterine activity, aids in the coordination of the estrous cycle, and plays an essential role in the survival of the embryo in pregnant mares. During the estrous cycle and in early pregnancy, progesterone is produced by the corpus luteum, whereas later in the pregnancy it is produced by the placenta. During the estrous cycle, progesterone levels are low, but rise rapidly during the luteal phase once ovulation begins. If pregnancy does not occur, progesterone levels will return to a lower level and the estrous cycle begins again. If pregnancy does occur, the progesterone level will remain high throughout the gestation period until birth. During mid-late gestation, another hormone – estradiol – may be measured to monitor the pregnancy, since low levels can potentially indicate a problem with fetal viability.

Measuring progesterone levels in mares can be useful for distinguishing the different reproductive states as well as monitoring a pregnancy. Accurate measurement of progesterone levels can aid in the management of mare reproduction in the following ways:

- Determine the status of the estrous cycle to plan the most effective reproductive program.
- Measure progesterone during early pregnancy to determine if supplementation is needed.
- Determine the cause of abnormal behavior (e.g. if a mare is always in heat).
- Measure progesterone throughout the entire gestation to determine if supplementation is needed.

Ruminant

Progesterone levels can also be useful for monitoring ovarian status in cattle. Samples are collected frequently at specific intervals and can provide information to detect anestrous cows or monitor response to treatments (e.g. prostaglandins). Measurements of progesterone can also be helpful in differentiating between follicular and luteal cysts or verifying if a corpus luteum is present.

Sheep (and goats) are seasonally polyestrous and typically give birth in the spring. The estrous cycle for a sheep is generally 16-18 days in length and usually begins in late summer. This seasonal breeding pattern leads to a defined lambing period, as well as a seasonal pattern of milk production. By managing this reproductive process, it would be possible to supply product year-round. Progesterone concentrations measured by our immunoassays provide useful information on luteal function to aid in managing this process.

Research in Animal Science using MP Bio Immunoassays

"Alternations in the neonatal lamb leptin surge have been associated with appetite dysregulation in postnatal life where predisposing offspring of MNR and MO ewes exhibit hyperphagia, increased adiposity and weight gain, and hyperleptinemia when subjected to ad libitum feeding challenge (Long et al., 2010; George et al., 2012; Long et al., 2015). Therefore, this study shows that early pregnancy is a specific period of vulnerability for programming of the leptin surge by decreased maternal and fetal nutrition...Plasma cortisol and insulin were measured in duplicate using a commercially available ImmuChem RIA kit (MP Biomedicals, LLC., Solon, OH). Mean intra-assay and interassay CV for cortisol were 8.9% and 9.3%, respectively, with a sensitivity of 10.0 ng/mL. Mean intra-assay and interassay CV for insulin were 12.2% and 8.9%, respectively, with a sensitivity of 5.5 µIU/ mL."

Smith, A.M.; Pankey, C.L.; Odhiambo, J.F.; Ghnenis, A.B.; Nathanielsz, P.W.; Ford, S.P. Reduced maternal nutrition during early- to mid-gestation elevates newborn lamb plasma cortisol concentrations and eliminatesthe neonatal leptin surge. *Journal of Animal Science.* **2018**, *96 (7)*, 2640-2645.

"Reproductive efficiency in cattle impacts production profitability. Estrogen concentrations are critical for follicular maturation and control of estrus behavior. These results indicate that WNT3A administrated during the follicular phase of the estrous cycle can impact reproductive events associated with ovarian estrogen production. The wingless-type mammary-integrated site-signaling pathway may be an important regulator of ovarian dynamics regulated by FSH in vivo...Blood samples were centrifuged 1,500 gravity force for 15 min at 4 °C, serum was decanted and stored at −20 °C, until analysis. Estradiol concentrations were quantified using a commercially available RIA kit (MP Biomedicals, Solon, OH). Detection limit was 95% of maximum binding of the assay was 2 pg/mL. Intra-assay CV was 21% and interassay CV was 23%."

Aloqaily, B.H.; Ferranti, E.M.; Summers, A.F.; Gifford, C.A.; Hernandez Gifford, J.A. Intraovarian WNT3A modulates estrogen-mediated estrus behavior in cattle. *Translational Animal Science.* **2018**, *2*, Issue suppl_1, September 2018, Pages S19–S21.

"In conclusion, provision of a cooled perch system to laying hens ameliorated the stressful effects of combination of stressors...These results suggest that water-chilled perches are an effective cooling method for caged laying hens to improve the efficacy of induced molt under conditions of daily cyclic heat. Commercially available I125 RIA kits were used for determining plasma levels of triiodothyronine (T3) (Catalog # 06B-254,216, MP Biomedicals, Solon, OH), thyroxine (T4) (Catalog # 06B-254,030, MP Biomedicals, Solon, OH), and corticosterone (CORT) (Catalog # 0,712,0103, MP Biomedicals, Solon, OH)."

Hu, J.Y.; Hester, P.Y.; Xiong, Y.; Gates, R.S.; Makagon, M.M.; Cheng, H.W. Effect of cooled perches on the efficacy of an induced molt in White Leghorn laying hens previously exposed to heat stress. *Poultry Science.* **2019**, [ahead of print] pez317.

"LH is essential for dominant follicle growth (Ginther, 2000), oocyte maturation (Hyttel et al., 1989), ovulation, corpus luteum development, and synthesis of P4 (Tomac et al., 2011). These events are critical for establishment and maintenance of pregnancy in domestic animals (Spencer et al., 2004). Therefore, selecting cows with greater capacity for LH secretion under defined conditions could be a strategy to improve fertility in dairy cows...Plasma P4 concentrations were determined in duplicate using a commercial solid-phase, no-extraction RIA (ImmuChem Coated Tube, MP Biomedicals, Costa Mesa, CA)."

Stangaferro, M.L.; Wijma, R.; Masello, M.; Giordano, J.O. Reproductive performance and herd exit dynamics of lactating dairy cows managed for first service with the Presynch-Ovsynch or Double-Ovsynch protocol and different duration of the voluntary waiting period. Journal of Dairy Science. 2017, 101, 2, 1673-1686.

"Pregnancy status was also determined during peri-implantation (day 7 and 19) by analysis of progesterone concentration as per manufacturer's instructions (ImmuChem™ Coated Tube 125 RIA Kit; MP Biomedicals; Costa Mesa, CA, USA; CV < 10%, sensitivity; 0.02 ng/mL) following collection of jugular blood samples (5-10 mL). Heparin treated blood samples were centrifuged (3,000 × g; 15 mins; room temp) before being frozen at -20 °C. Ewes with progesterone concentrations > 1ng/mL were considered pregnant [34]."

Rickard, J. P.; Ryan, G.; Hall, E.; de Graaf, S. P.; Hermes, R. Using transrectal ultrasound to examine the effect of exogenous progesterone on early embryonic loss in sheep. PLOS ONE. 2017, 12, 8.

Veterinary Science Research

Veterinary Scientists aim to understand animal health and disease and apply this knowledge to better care for animals. It explores the habits and care of domesticated and wild animals, which includes topics such as pet health, wildlife conservation and breeding/reproductive management. Veterinary research studies the prevention, control, diagnosis and treatment of diseases of animals, as well as the basic biology, welfare and care of animals.

Reproductive Management

Canine

Progesterone can be used to determine the optimum time of breeding in bitches by predicting the timing of ovulation. Blood sampling can begin as soon as the female has started proestrus. After proestrus, the female will continue into estrus and begin ovulating, leading to an increase in the level of progesterone in the blood. Therefore, progesterone levels can be used to predict ovulation and breeding time.

A female dog is typically diestrous (goes into heat twice per year), although some breeds can have one or three cycles per year. The proestrus is relatively long at 5 to 9 days, while the estrus may last 4 to 13 days. Ovulation occurs 24–48 hours after the luteinizing hormone peaks, which is usually around the fourth day of estrus. This is the best time to begin breeding. Progesterone levels can also be used to diagnose ovarian remnant syndrome.

Hypoluteoidism is a condition in females where insufficient levels of progesterone are present, which can result in loss of a pregnancy. Low or declining levels of progesterone in pregnant females may cause concern for breeders and prompt progesterone supplementation to be prescribed. Our Progesterone RIA kit was used in a study to measure the levels of progesterone that resulted from either intravaginally or orally delivered micronized progesterone to study the overall pharmacokinetics:

> *"Blood samples from each subject were obtained at time points 0, 0.5, 1, 1.5, 2, 4, 6, 8, 12, 24, 36, 48 and 72 hours following one initial dosing of each treatment.* ***Concentrations of plasma progesterone were determined by RIA (ImmuChem Double Antibody, 125I RIA Kit, MP Biomedicals, Costa Mesa, CA).***"
>
> Malbrue, R. A. Pharmacokinetics of Micronized Progesterone Administration in Female Dogs. Louisiana State University Master's Thesis, 2017.

Feline

Cats are considered polyestrous, having multiple estrous cycles throughout their breeding season. They do have a seasonal anestrus during part of the year, depending on certain environmental factors such as temperature and daylight hours. The queen can be bred any time while she is in heat since felines are considered "induced ovulators". This means the queen will generally ovulate any time she is in heat once "provoked", which occurs when sperm triggers an egg to be released. However, spontaneous ovulation has been known to happen in domestic and non-domestic felines, which can make it difficult to determine when a female is ready to be bred. Without ovulation, the queen may go into interestrous before reentering estrus. With the induction of ovulation, the queen either becomes pregnant or goes through a non-pregnant luteal phase, also known as pseudopregnancy.

Spayed felines may display behaviors indicating they are in heat; however, this is most likely due to remnant ovarian tissue left behind, which can still produce estrogen and cause the body to react as if it were in heat. The most widely regarded test for diagnosing ovarian remnant syndrome is a hormone stimulation test. A synthetic hormone is administered while the cat is in heat, and a blood sample is taken 5-7 days later and tested for progesterone. An increase in the level of progesterone indicates the presence of functional ovarian tissue.

Digestive Disorders of the Pancreas and Liver

The pancreas is responsible for controlling blood sugar levels through the secretion of insulin and glucagon hormones. A deficiency in insulin, and therefore the inability to regulate glucose in the bloodstream, results in diabetes mellitus (sugar diabetes). Type I diabetes is caused by the complete destruction of the beta cells that produce insulin, whereas Type II diabetes (which is more common) results from the inability of the body to properly regulate the production or secretion of insulin, or the resistance of the body's tissue to utilize insulin. Hypoglycemia, or "low blood sugar", is often related to diabetes, however it can also be caused by other diseases such as Addison's disease, severe liver disease or tumors of the pancreas.

Insulin levels can also be beneficial to measure if insulinoma is suspected, which is an insulin-secreting mass. Insulinomas are functional neuroendocrine tumors of the beta cells of the pancreas and can occur in many animals, including dogs, cats, and older cattle. The excessive, unregulated insulin production can cause a significant drop in blood glucose levels. If the animal has low blood glucose, high blood insulin, decreased fructosamine and an ultrasound showing a pancreatic mass, the animal can be referred for a biopsy to confirm diagnosis.

In horses, analysis of insulin levels in the blood is the key element for assessing insulin resistance and insulin dysregulation, as well as for aiding in the diagnosis of equine metabolic syndrome (EMS). These tests are either based on the quantitative measurement of basal serum insulin in fasted or non-fasted horses, or increased insulin stimulated by oral or intravenous dynamic diagnostic tests. Increased insulin concentration in horses has been shown to be central to the pathophysiology of endocrinopathic laminitis, a vascular condition of the hoof resulting in severe lameness of the horse.

In dogs, gastrin levels are measured to provide a diagnosis of gastrinoma. Gastrinomas are neuroendocrine tumors that are typically located in the pancreas and can lead to increased production of gastrin. Gastrin ultimately stimulates the secretion of gastric acid, which can cause ulcers and lead to chronic vomiting, weight loss and other clinical signs of upper gastrointestinal disorders. Most healthy dogs will have undetectable levels of serum gastrin; therefore, detecting levels of gastrin in the blood can provide valuable diagnostic information.

If liver disease is suspected, measuring the level of bile acids in the serum provides valuable information. A healthy liver will recycle bile acids and remove them from the bloodstream shortly after they are used to break down fats during digestion. A damaged liver will not effectively perform this function, leading to an increased concentration of bile acids in the blood.

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
Bile Acids, conjugated	RIA (CT)	Serum or Plasma	100	06B242918	25 µL	0.2 µmole/L	Human
C-Peptide	IRMA	Serum	100	07RK84CT	50 µL	0.105 ng/mL	Human
	EIA / ELISA		96	07M61102		0.02 ng/mL	
			2 x 96	07M61103			
	ChLIA		96	07M2775A		0.025 ng/mL	
Gastrin	RIA (DA)	Serum	100	06B255017	200 µL	3.3 pg/mL	Human
			200	06B255025			
Glucagon	RIA (DA)	Plasma	50	07152101	20 µL	Inquire	Human
Insulin	EIA / ELISA	Serum or Plasma	96	07EK547	20 µL	0.1 ng/mL	Rat
	RIA	Plasma, Tissue or Cell Culture	100	07RK547	100 µL	60 pg/mL	
	RIA (CT)	Serum or Plasma	100	07RK547CT	50 µL	0.1 ng/mL	
	EIA / ELISA	Serum	96	07M60102	50 µL	0.75 µIU/mL	Human
	IRMA		100	07RK400CT	100 µL	0.6 µIU/mL	
	ChLIA		96	07M2475A	50 µL	0.114 µIU/mL	

*Additional species have been cited in scientific publications.
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.

CT = coated tube DA = double antibody

Thyroid Hormone Testing

The thyroid gland produces many hormones, including Thyroxine (T4) and Triiodothyronine (T3), and controls the metabolic processes in all cells. The function of the thyroid gland is controlled by the hypothalamus and the pituitary gland using a hormone called TSH (Thyroid Stimulating Hormone).

There are two main thyroid disorders: hypothyroidism and hyperthyroidism. Hypothyroidism, which is common in middle-aged dogs, is due to a decreased production of thyroid hormones. This can be caused by inflammation or shrinkage of the thyroid gland, hindering its ability to produce sufficient levels of hormones. When thyroid hormones are overproduced and the overall level of T4 in the body is too high, the resulting condition is called hyperthyroidism, which is commonly seen in older cats. Symptoms of either thyroid disorder are typically systemic and non-specific; therefore, diagnosis by clinical signs alone can be difficult. Measuring the level of T4 in a patient will help to confirm either hypothyroidism or hyperthyroidism diagnosis.

The primary hormone produced by the thyroid gland is T4, and measuring its overall levels in the body provides the most useful indication of overall thyroid function. There is a feedback system between the thyroid gland and the pituitary gland, so that when T4 levels are low, the pituitary will increase TSH production to send a signal to the thyroid to increase T4 production. T4 circulates in the blood either as a free hormone or bound to other blood proteins. In order to measure both free and bound T4, a Total T4 assay should be used. If the Total T4 level is low, or below the normal range, then the patient may have hypothyroidism. A Free T4 test can be used to confirm this diagnosis, since hypothyroidism is the main disorder that can interfere with the levels of Free T4.

Additional information can be collected by measuring the TSH levels of the patient since TSH levels may be increased as the pituitary gland attempts to stimulate the thyroid gland to increase production of T4. If Total T4 levels are noticeably elevated, a diagnosis of hyperthyroidism can be confirmed. If Total T4, Free T4 and TSH levels are normal, hypothyroidism can essentially be ruled out; however, there are some instances when a patient with hyperthyroidism will exhibit T4 levels within the normal range.

Measuring T4 levels can also be useful when an animal is on a thyroid hormone replacement therapy, or if thyroid cancer is suspected and levels of T4 need to be monitored.

Hypothyroidism is known to be heritable, therefore breeders are often interested in this information.

Hypothyroidism testing in dogs	Total T4 and cTSH levels. Free T3 optional if additional info needed.
Hyperthyroidism testing in cats	Only Total T4 levels. Free T4 or Free T3 optional if additional info needed.

MP Bio Immunoassays for Thyroid Hormone Testing

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
T3 (Free)	ChLIA	Serum	96	07M1375A	50 µL	0.03 ng/dL	Human
			192	07M1375B			
	RIA (CT)	Serum or Plasma	100	06B258709	100 µL	0.06 pg/mL	
			500	06B258710			
	EIA / ELISA	Serum	96	07BC1006	50 µL	0.05 pg/mL	
T3 (Total)	EIA / ELISA	Serum	96	07BC1005	50 µL	0.2 ng/mL	Human
	ChLIA	Serum or Plasma	96	07M175A	50 µL	0.126 ng/mL	
			192	07M175B			
	RIA	Serum	100	06B254215	100 µL	6.7 ng/dL	
			200	06B256447			
			500	06B254216			
T3 Uptake	RIA	Serum	100	06B237116	25 µL	Inquire	Human
	ChLIA	Serum or Plasma	96	07M575A	25 µL		
			192	07M575B			
T4 (Free)	ChLIA	Serum	96	07M1275A	50 µL	0.03 ng/dL	Human
			192	07M1275B			
	RIA (CT)	Serum or Plasma	100	06B257214	50 µL	0.045 ng/dL	
			500	06B257215			
	EIA / ELISA	Serum	96	07BC1008	50 µL	0.05 ng/dL	
T4 (Total)	EIA / ELISA	Serum	96	07BC1007	25 µL	0.5 µg/dL	Human
	ChLIA	Serum or Plasma	96	07M275A	25 µL	0.1 µg/dL	
			192	07M275B			
	RIA	Serum or Plasma	100	06B254011	25 µL	0.76 µg/dL	
			200	06B254029			
			500	06B254030			
Thyroid Stimulating Hormone (TSH)	IRMA (CT)	Serum or Plasma	100	07294102	200 µL	0.04 µIU/mL	Human
			500	07294105			
	RIA	Plasma, Tissue or Cell Culture	120	07RK554	100 µL	0.05 ng/tube	Rat
	EIA / ELISA	Serum	96	07BC1001	100 µL	0.7 mIU/mL	Human
		Serum or Plasma	96	07DE9955		0.01 ng/mL	Canine
		Serum	96	07DE9977	25 µL	0.1 ng/mL	Rat
	ChLIA	Serum	96	07M375A	50 µL	0.0062 µIU/mL	Human
			192	07M375B			

**Additional species have been cited in scientific publications.*
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.
CT = coated tube DA = double antibody

Adrenal-associated Endocrinopathies

Addison's Disease

Addison's disease, or hypoadrenocorticism, is the reduced production of two hormones from the adrenal gland: cortisol and aldosterone. In most cases, the adrenal gland is being attacked by the body's own immune system because the gland tissue is incorrectly being recognized as foreign, therefore being destroyed. In other, more rare cases, hypoadrenocorticism can be caused by a decreased stimulation of the gland by ACTH (adrenocorticotropic hormone), or by therapeutic interventions used to treat hyperadrenocorticism (Cushing's disease).

Once a complete blood count (CBC) is performed as an initial screening to identify any other disease conditions, an ACTH stimulation test can be performed if Addison's disease is suspected (see below). Natural levels of ACTH in the patient may also be measured to help determine the cause of Addison's disease (see below). Low levels of ACTH indicate a malfunctioning pituitary gland, whereas high levels of ACTH indicate deficient adrenal glands. Aldosterone is typically not measured because it cannot help to distinguish the different causes of Addison's disease.

Cushing's Syndrome

Cushing's syndrome, or hyperadrenocorticism, is associated with excessive cortisol levels in the serum. Typical causes of increased cortisol production by the adrenal glands are: excessive stimulation of the adrenal glands caused by a pituitary tumor or hyperplasia; adrenocortical carcinoma or adenoma; or administration of steroid-containing medications. The clinical signs of Cushing's syndrome progress slowly and are highly variable; therefore, diagnosis by clinical symptoms alone is difficult. Once an initial screening is completed and Cushing's syndrome is suspected, more extensive and specific tests are required to confirm the disease. This is generally accomplished by manipulating the pituitary-adrenal axis using either a dexamethasone suppression or ACTH stimulation test.

"Validation of the [MP Bio/ICN] RIA for ACTH revealed intra-assay coefficients of variation of 7.1%, 8.8%, and 5.8% for samples containing high, medium, and low concentrations of ACTH, respectively (Table 2)."

Couëtil, L.; Paradis, M. R.; Knoll, J. Plasma Adrenocorticotropin Concentration in Healthy Horses and in Horses with Clinical Signs of Hyperadrenocorticism. *Journal of Veterinary Internal Medicine.* **1996**, *10*, 1, 1-6.

Dexamethasone Suppression Test

Dexamethasone (synthetic cortisol) is an exogenous steroid that signals the pituitary gland to suppress the secretion of ACTH, mimicking the natural negative feedback loop caused by increased levels of cortisol. When healthy animals are injected with dexamethasone, ACTH and cortisol production is suppressed. In patients with Cushing's syndrome, this negative feedback loop is either lost or diminished because cortisol levels are always elevated. If the origin of Cushing's syndrome is due to the adrenal gland, the negative feedback mechanism is completely lost, so there will be no reduction in cortisol levels after injection of dexamethasone. If the origin of the disorder is due to the pituitary gland, the negative feedback loop is only diminished, and a slight decrease in the cortisol level is expected after the injection. Therefore, the Dexamethasone Suppression Test is useful for confirming Cushing's syndrome, as well as distinguishing the origin.

ACTH Stimulation Test

For the ACTH Stimulation test, ACTH is injected into the patient to stimulate the adrenal glands to produce cortisol, similar to the body's natural pathway. The idea of this test is to demonstrate the ability of the animal's adrenal glands to produce cortisol. A blood sample is taken before and after the injection, and the level of cortisol is measured in both and compared. If a significant increase in cortisol levels is observed, this is highly indicative of Cushing's syndrome. This is because the adrenal glands have been overstimulated by natural ACTH due to the disorder, so they are highly responsive to the synthetic ACTH. On the other hand, if little or no increase in cortisol levels is detected, the patient is showing a lack of response to ACTH stimulation, confirming the diagnosis of Addison's disease. The confirmation of Cushing's syndrome by the ACTH stimulation test is unable to distinguish the origin of the disorder (adrenal or pituitary), and some animals with Cushing's syndrome will be unresponsive to this test. Patients displaying clinical signs of Cushing's syndrome due to steroid therapy will actually show a very mild (or no) response to this test, confirming iatrogenic Cushing's syndrome.

Endogenous ACTH Serum Test

Natural levels of ACTH in the animal may also be measured to help screen for Cushing's syndrome; however, the results may not clearly confirm diagnosis on its own. In general, increased levels of ACTH indicate a malfunctioning pituitary gland, whereas low levels of ACTH indicate adrenal or iatrogenic Cushing's syndrome. However, the levels may overlap and give ambiguous results. A combination of these tests mentioned above will either allow a diagnosis to be confirmed or will help to rule out this disorder in the patient.

MP Bio Immunoassays for Adrenal-associated Endocrinopathy Testing

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
17α-hydroxyprogesterone	RIA (CT)	Serum or Plasma	100	07271102	25 µL	Inquire	Human
			500	07271105			
	RIA (DA)		100	07171102		0.08 ng/mL	
	ChLIA		96	07M5275A		0.040 ng/mL	
ACTH	RIA (DA)	Plasma	50	07106101	100 µL	5.7 pg/mL	Human
			100	07106102			
Corticosterone	EIA / ELISA	Serum or Plasma	96	07DE9922	10 µL	4.1 ng/mL	Rat, Mouse
	RIA (DA)		100	07120102		Inquire	
			200	07120103			
Cortisol	RIA (CT)	Serum or Plasma	100	07221102R	25 µL	0.17 µg/dL	Human
			500	07221105R			
			1000	07221106R			
	EIA / ELISA	Saliva	96	07P631	25 µL	0.0519 ng/mL	
		Serum	96	07M21602	25 µL	91.5 pg	
			2 x 96	07M21603			
	ChLIA	Serum or Plasma	96	07M3675A	25 µL	0.27 µg/dL	

Additional species have been cited in scientific publications.
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.

CT = coated tube DA = double antibody

Plasma prolactin and adrenocorticotropin responses to thyrotropin releasing hormone in mares treated with detomidine and butorphanol

ACTH

CASE STUDY

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Introduction

Stimulation and/or suppression tests are routinely used in equine veterinary medicine to evaluate for endocrine disease (e.g. insulin sensitivity, EMS, PPID). Many endocrine responses are subject to perturbations during times of excitement or stress; therefore, these endocrine tests often require the horse to be calm. Sedation may be necessary for certain diagnostic procedures or if the animal is overly fractious. Use of detomidine and butorphanol to produce sedation and analgesia are commonplace in equine practices, but their effects on endocrine responses to secretagogues are largely unknown. The current recommended test for early pituitary pars intermedia dysfunction is to assess the ACTH response to a standard dose of TRH (Frank et al. 2015). Thyrotropin-releasing hormone is a known stimulator of prolactin and ACTH (Arana Valencia et al. 2013). Horses diagnosed with early PPID will have an exaggerated response to TRH stimulation. A reduction in plasma ACTH has been reported in horses administered clonidine, an alpha2 adrenergic agonist (Alexander and Irvine, 2000), but the effects of these drugs on the ACTH response to TRH have not been described. Information regarding the effects of alpha adrenergic agonists and/or opioids on circulating prolactin and ACTH is sparse. Administration of the opioid antagonist, naloxone, failed to alter plasma prolactin concentrations in diestrous mares (Aurich et al. 2000), but increased it dramatically in pregnant mares (Aurich et al. 2001). Evaluating the effects of detomidine and butorphanol on basal prolactin concentrations as well as the prolactin and ACTH responses to TRH would be the first report of these in horses.

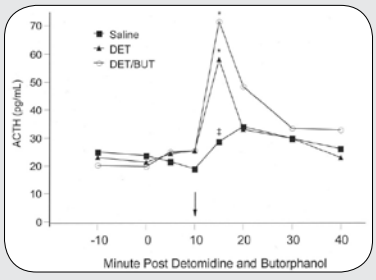
Materials & Methods – ACTH Assay

Frozen plasma samples were thawed and analyzed for prolactin and ACTH. Commercially available reagents were used to measure ACTH (MP Biomedicals, Santa Ana, CA) as previously described and validated (Arana Valencia et al. 2013).

Analyte	Assay Type	Sample Type	Tests	Cat. No.
ACTH	RIA (DA)	Plasma	50	07106101
			100	07106102

Results

Plasma prolactin increased ($P < .001$) after TRH in all groups, slowly over 30 min in control mares, but rapidly peaking at 5 min in DET and DET/BUT treated mares. Plasma prolactin in DET-treated mares returned to pretreatment concentrations 20 min post TRH, whereas they remained stimulated ($P \leq .05$), albeit lower than controls, in DET/BUT-treated mares for 30 min. Mean resting ACTH concentrations were < 30 pg/mL for all treatments. A peak rise in ACTH was observed in DET and DET/BUT-treated mares 5 min after administration of TRH, whereas a peak rise was observed in control mares 10 min post TRH and was almost 2-fold lower ($P = 0.05$) than the peak observed in DET and DET/BUT-treated mares. Post-treatment, but pre-TRH, ACTH concentrations were not affected by DET or DET/BUT.



Mean plasma ACTH responses to 1 mg TRH (arrow) in mares pre-treated with saline, detomidine (DET), or detomidine combined with butorphanol (DET/BUT). Means with different symbols differ at $P < .05$. Pooled SEM was 15.1 pg/mL.

"We have validated several MP RIAs for equine and bovine endocrinology studies and routinely use them in our research. We know we're getting a quality assay that produces repeatable and reliable results. Ordering is effortless and kits are received in a timely manner. We will choose MP assays as long as they are available!"

–Dr. Erin Oberhaus, Assistant Professor at Louisiana State University

Conclusion

1. Resting concentrations of prolactin and ACTH were not affected by detomidine or detomidine combined with butorphanol.
2. TRH stimulated prolactin and ACTH in all treated mares.
3. Detomidine and detomidine combined with butorphanol attenuated the prolactin response to TRH.
4. Detomidine and detomidine combined with butorphanol potentiated the ACTH response to TRH.
5. Use of these compounds for sedation may not be advisable for obtaining reliable plasma ACTH concentrations in response to TRH.
6. Use of these compounds could be used to obtain reliable resting plasma concentrations of ACTH within 10 minutes of sedation.

Infectious Disease Testing - Hepatitis E Virus*

Hepatitis E Virus (HEV) is endemic on commercial swine farms in nearly every region of the world, with farm-scale prevalence ranging from 30 to 98%.[1] Hepatitis E is considered to be an emerging zoonosis with domestic pigs being identified as the main source of infection in industrialized countries. It has been reported recently that HEV can transmit from swine to human either by direct handling and contact of the animals, or by consuming infected pork food products. HEV seroprevalence in humans exposed to infected animals, such as slaughterhouse workers and veterinarians, can be as high as 35%, whereas non-exposed humans show a significantly lower seroprevalence.

Seroprevalence Study on Swine using HEV ELISA 4.0v

Type of Swine Farm	Number of Serum Samples	Reactive	Positive Rate
Organic Farm	417	372	89.2%
Free-range Farm	164	128	78.0%
Conventional Farm	265	194	73.2%
Total	**846**	**694**	**82.0%**

HEV ELISA 4.0v could detect seroconversion from pigs as early as 14 days post inoculation.

Any pig can become infected; however, natural infection is commonly seen in piglets around 7-9 weeks as their maternal immunity diminishes. HEV transmission between pigs occurs mainly by the fecal-oral route. When the virus is shed in the feces, an accumulation of HEV in the pigs' environment can occur at all production stages on infected farms. HEV has also been detected in urine, which could be another potential transmission route. If drinking/feeding equipment becomes easily contaminated with urine and feces, this may result in an indirect route of HEV transmission.

It is critical to fully understand the infection status of pigs on swine farms and the transmission dynamics of HEV within the swine populations to reduce the risk of introducing contaminated products into our food supply. Recognizing HEV infection in swine can be quite difficult due to the absence of any clinical signs. The MP Diagnostic HEV ELISA 4.0v utilizes a proprietary recombinant antigen which is highly conserved between different HEV strains. This assay allows detection of the presence of specific antibodies (including IgG, IgM and IgA) against HEV in a variety of animal species, including swine, equine, rodent and others.

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species^
HEV IgG, IgM and IgA	EIA / ELISA	Serum or Plasma	96	0763541096*	20 µL	99.20%	Human, Swine, Equine, Rodent

^Additional species have been cited in scientific publications.

**For research use only in the U.S.*

[1]Salines, M.; Andraud, M.; Rose, N. From the epidemiology of hepatitis E virus (HEV) within the swine reservoir to public health risk mitigation strategies: a comprehensive review. *Vet Res.* **2017**, 48, 31.

AlbumiNZ™ Bovine Serum Albumin (BSA)

A superlative BSA for every application

MP Bio produces various grades of BSA at its state-of-the-art manufacturing facility in Auckland, New Zealand, to suit different applications, including Low IgG, Ultra-low IgG, Low Endotoxin, Protease Reduced, Low Free Fatty Acid, and Microbiological grade BSA. All these grades can be gamma irradiated based on customer needs. The IgG and Free Fatty Acid limits in our Low IgG and Low Free Fatty Acid BSA, respectively, is among the lowest in industry!

- Bovine Plasma sourced only from within New Zealand, with no BSE or List A animal diseases present
- Chromatographic extraction ensures high purity, intact proteins processed without the compromising effects of traditional methods
- Assured and secure supply chain
- An ISO 9001 certificate and Quality Systems audited to cGMP principles ensure the highest level of process control, consistent product quality and complete traceability
- Highly flexible operations to enable better product mix and customized product offerings

The Microbiological grade BSA is particularly suited for animal health research due to the following features:

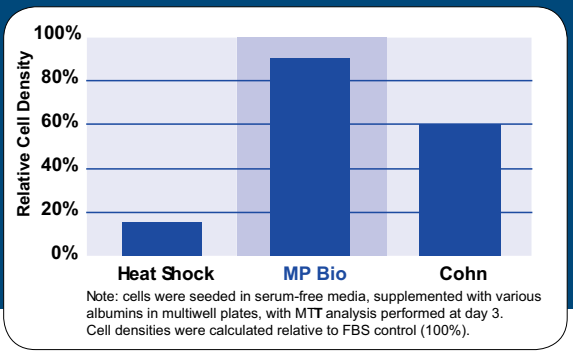
Low endotoxin and protease limits	High lipid content	Very low ammonium ion content	Pack sizes from 10 g–5 kg

Description	Size	Cat. No.
AlbumiNZ™ Microbiological Grade BSA	10 g	0218062010
	25 g	0218062025
	50 g	0218062050
	100 g	0218062080
	500 g	0218062090
	1 kg	0218062091

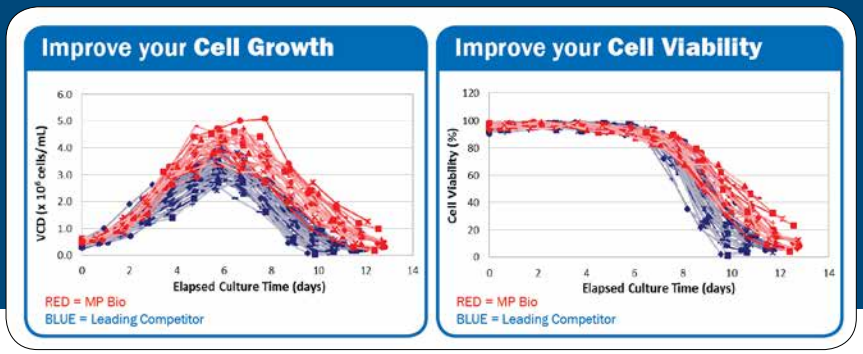
Not all BSA is the same

AlbumiNZ is produced using the Chromatographic Extraction process and has distinct advantages over BSA produced using traditional methods:

- ✓ Lipid-rich protein
- ✓ Good lot-to-lot consistency
- ✓ Enhanced cell nutrition
- ✓ Greater cell number yield



Superior growth rates in cell culture (CHO and SP2/O cells) using MP Bio BSA, compared to BSA produced from traditional methods.



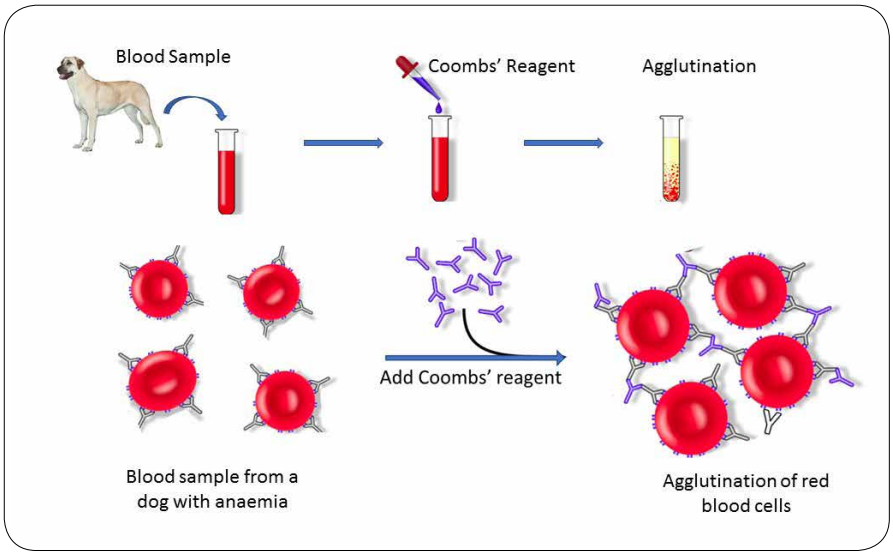
This evaluation was done by a prominent global biopharma company for a life-saving drug. The scale of the bioreactor was 10,000 L and the processed cell line was a murine myeloma NS0.

Sensitive and Specific Coombs' Test (Anti-Globulin) for Animal Studies

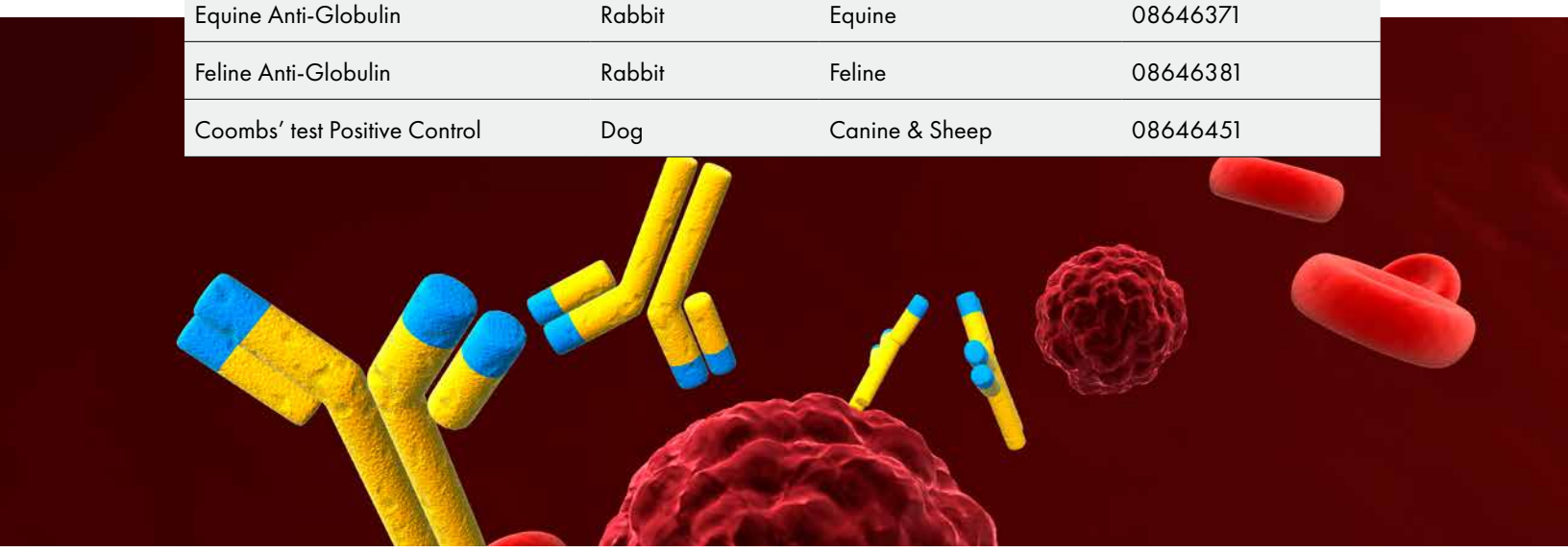
Coombs' test is used in research laboratories to screen animals with autoimmune disorders and to develop models for autoimmune diseases. Blood agglutination in the test is a visual positive indication of these diseases, especially immune-mediated hemolytic anemia (IMHA).

With over 50 years industry experience, MP Bio has long been providing scientists and researchers with high quality and reliable Coombs' tests (research use only) that feature:

- Species-specific antibodies for canine, equine, and feline
- Sensitivity to immunoagglutination to IgG, IgM and C3
- Lyophilized powder for extended shelf life and more efficient storage
- Simple reconstitution - diluted with buffer
- Versatility using multiple test platforms



Description	Host	Target	Cat. No.
Canine Anti-Globulin	Rabbit	Canine	08646351
Equine Anti-Globulin	Rabbit	Equine	08646371
Feline Anti-Globulin	Rabbit	Feline	08646381
Coombs' test Positive Control	Dog	Canine & Sheep	08646451



Laboratory Animal Science and Other Animal Models in Research

The use of animal models in research over the last few centuries has been critical to the vast knowledge we have today of numerous human conditions and diseases. Animal models give us the ability to conduct breakthrough scientific research leading to discoveries in all areas of human physiology, including diagnosis and treatment of many diseases. Since Pavlov's Dogs and Classical Conditioning in the late 1800's, to the next breakthrough cancer treatment of tomorrow, research in animal models has benefitted humans, as well as animals, by greatly improving our understanding of biological processes and discovering ways to improve the quality of life for all creatures. From reproductive management to measuring stress levels, our Immunoassays provide you with the accurate data you need, every time.

Typical Laboratory Animals include mice, rats, hamsters, guinea pigs, rabbits and dogs; however, other animals are becoming more standardized in research as well, such as other mammals, birds, fish and non-human primates. Many of our immunoassay tests are designed for use with human samples, but most analytes are not species-specific. Analytes such as steroid hormones (cortisol, progesterone, testosterone), thyronines (T3, T4) and small molecule peptides (insulin, ACTH) are similar across many animal species and can be measured successfully using our immunoassay kits intended for human samples.

Animal Applications for Human Diagnostic Kits - Feasibility Checklist

- **Does the diagnostic range of the analyte you are measuring fall within the standard curve range of the kit?** Dilution of the sample may be necessary (too high), or the expected value may fall below the first standard level. The addition of a lower standard (diluting the first kit standard) may be possible with certain assay systems where there is room for enhanced sensitivity in the standard curve.
- **What is the sample size required in the assay?** This can be an issue when working with small animals.
- **Is the analyte you want to measure species-specific?** For steroids (ex: Progesterone, Testosterone, etc.) and thyronines (T3, T4, etc.) this is NOT an issue. They are not species-specific and will be equally recognized by the kit antibody regardless of the source of the sample to be tested. For polypeptides (ex: LH, FSH, TSH) there may differences between species, making adaptations for alternate, nonhuman uses difficult.
- **Will there be unexpected cross-reactivity issues?** There may be other substances (steroids, for example) that are similar in structure to the analyte of interest in the animal sample. Those substances may be present at higher concentrations than seen in humans, resulting in increased "cross-reaction". This may affect the accuracy of the result.
- **Are there matrix issues?** The matrix (serum/plasma base of the sample) may be quite different in its protein make up from human serum. This may cause the animal sample to behave differently than a human sample would, producing inaccurate or unreliable results. Matrix issues are one of the most common obstacles in adapting human kits for animal use.

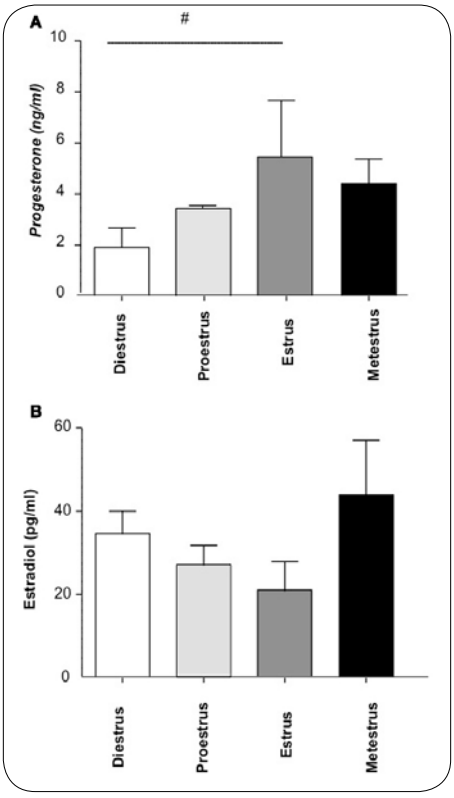
Reproductive Hormone Testing in Laboratory Animals

Rats, mice and hamsters have rapid estrous cycle times of 4 to 6 days, with estrus lasting <1 day. Although they ovulate spontaneously, they do not develop a fully functioning corpus luteum unless they receive coital stimulation. Fertile mating leads to pregnancy, and infertile mating leads to a state of pseudopregnancy lasting approximately 10 days.

While visual observation of the rodent vagina is typically the quickest method to determine estrus status in timed breeding, quantitative measurement of steroid hormones can help to provide a quantitative value when more detailed information is needed. The accurate measurement of sex steroids in rodents is also useful in the study of disorders such as breast cancer, prostate cancer, osteoporosis, polycystic ovary syndrome and cardiovascular diseases.

Rat Estrous Cycle	
Length of Estrous Cycle (avg.)	4.8 days
Proestrus	12-14 hours
Estrus	25-27 hours
Metestrus	6-8 hours
Diestrus	55-57 hours

Westwood, F. R. *Toxicologic Pathology*. **2008**, 36, 3.



Zenclussen, M.; Casalis, P.; Jensen, F.; Woidacki, K.; Zenclussen, A. *Front. Endocrinol*. **2014**, *5*, 32.

MP Bio Corticosterone RIA Kit for Stress Research

- Highly sensitive*
- Simple and convenient compared with HPLC or GC-MS
- **Flexible** – Various animal model references (rodents, avian, marine, amphibian, reptiles, non-human primates and many more!)
  - Double antibody method able to accommodate different sample types
- **Efficient** – uses unextracted serum or plasma, no protein denaturation step required
- **Outstanding reliability for decades** – over 2,000 publications
- **Unparalleled technical support to guide you through your assay**

Description	Size	Cat. No.
Corticosterone RIA Kit	100 Tubes	07120102
	200 Tubes	07120103

MP Bio Corticosterone Radioimmunoassay Outperforms 3 ELISA Assays

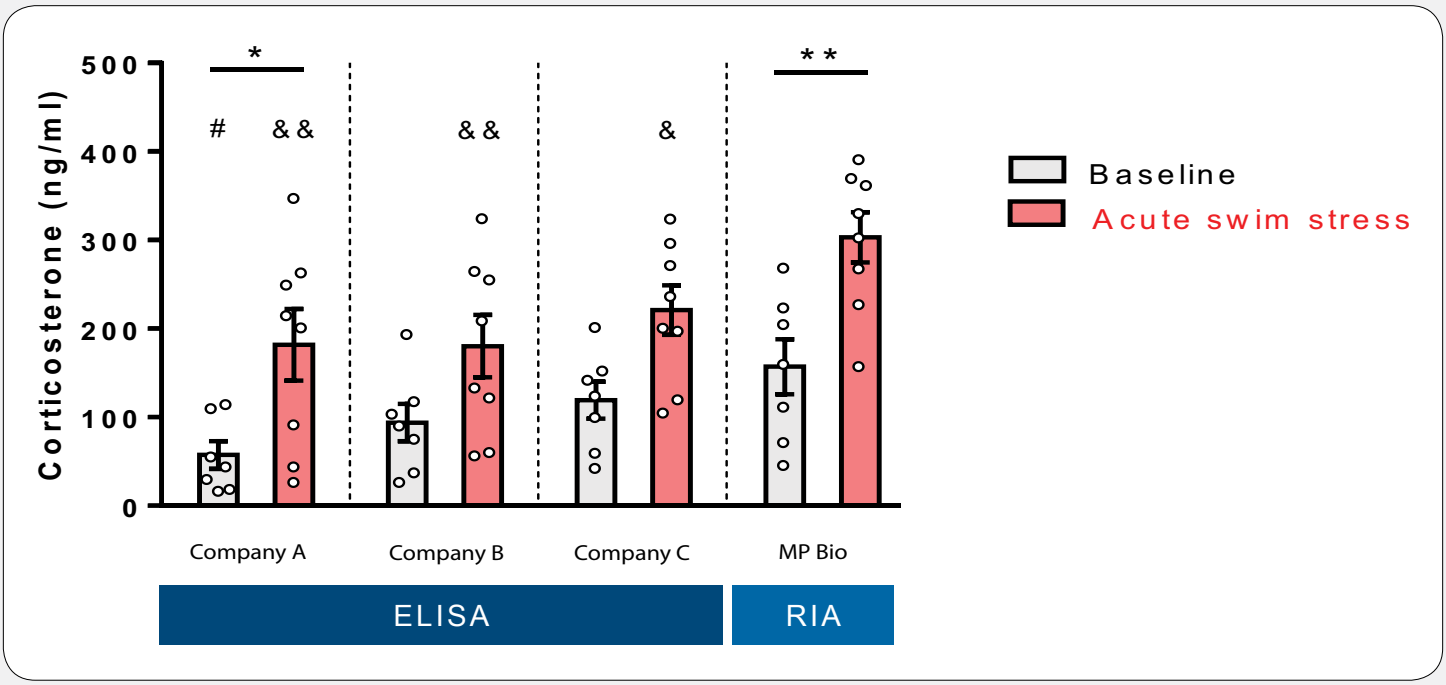


*Figure 1. "...Multiple comparisons showed that **at baseline, the RIA kit yielded significantly higher corticosterone concentrations** compared to Company Aassay (#, $p < .05$). **In the acute stress condition, the RIA kit also yielded significantly greater concentrations** compared to Company A [(&&, $p < .0001$),B (&&, $p < .0001$), and C assays (&, $p < .01$), respectively]..." Bekhbat, M.; Glasper E. R.; Rowson, S. A.; Neigh, G. N. Measuring corticosterone concentrations over a physiological dynamic range in female rats. *Physiol. Behav.* **2018**, *194*, 73–76.

MP Bio Immunoassays for Stress Research

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
ACTH	RIA (DA)	Plasma	50	07106101	100 µL	5.7 pg/mL	Human
			100	07106102			
Corticosterone	EIA / ELISA	Serum or Plasma	96	07DE9922	10 µL	4.1 ng/mL	Rat, Mouse
	RIA (DA)		100	07120102		Inquire	
			200	07120103			
Cortisol	RIA (CT)	Serum or Plasma	100	07221102	25 µL	0.17 µg/dL	Human
			500	07221105			
			1000	07221106			
	EIA / ELISA	Saliva	96	07P631		0.0519 ng/mL	
		Serum	96	07M21602		91.5 pg	
	ChLIA	Serum or Plasma	96	07M3675A		0.27 µg/dL	
Growth Hormone (GH)	RIA	Plasma, Tissue or Cell Culture	120	07RK551	100 µL	0.16 ng/tube	Rat
	IRMA	Serum	100	07RK5CT	50 µL	0.04 µIU/mL	Human
	EIA / ELISA		96	07BC1033		0.5 ng/mL	
	ChLIA		96	07M1775A		0.118 µIU/mL	
Prolactin	RIA	Plasma, Tissue or Cell Culture	120	07RK553	100 µL	0.07 ng/tube	Rat
	EIA / ELISA	Serum	96	07BC1037	50 µL	2.0 ng/mL	Human
			96	07DE9944	25 µL	0.4 ng/mL	Canine
			96	07DE9966		0.6 ng/mL	Rat
	IRMA		100	07RK780CT	100 µL	0.04 ng/mL	Human
	ChLIA		96	07M775A	25 µL	0.8 ng/mL	
2-CAT Fast Track [Adrenaline (Epinephrine) and Noradrenaline (Norepinephrine)]	EIA / ELISA	Plasma or Urine	2 x 96	07LE6500	10 or 300 µL	Adrenaline: 0.01 ng/mL plasma, 0.9 ng/mL urine Noradrenaline: 0.036 ng/mL plasma, 1.7 ng/mL urine	Human
		Urine	2 x 96	07LE7500	25 µL	Adrenaline: 0.5 ng/mL Noradrenaline: 1.7 ng/mL	Human
	RIA	Plasma or Urine	100	07LR6500	10 or 300 µL	Adrenaline: 19 pg/mL plasma, 0.39 ng/mL urine Noradrenaline: 42 pg/mL plasma, 1.1 ng/mL urine	Human
3-CAT Fast Track [Adrenaline (Epinephrine), Noradrenaline (Norepinephrine) and Dopamine]	EIA / ELISA	Plasma or Urine	3 x 96	07LE6600	10 or 300 µL	Adrenaline: 0.01 ng/mL plasma, 0.9 ng/mL urine Noradrenaline: 0.036 ng/mL plasma, 1.7 ng/mL urine Dopamine: 0.049 ng/mL plasma, 2.5 ng/mL urine	Human
		Urine	3 x 96	07LE7600	25 µL	Adrenaline: 0.5 ng/mL Noradrenaline: 1.7 ng/mL Dopamine: 3 ng/mL	Human
	RIA	Plasma or Urine	100	07LR6600	10 µL for Urine 300 µL for Plasma	Adrenaline: 0.01 ng/mL plasma, 0.3 ng/mL urine Noradrenaline: 0.05 ng/mL plasma, 1.5 ng/mL urine Dopamine: 0.02 ng/mL plasma, 4.5 ng/mL urine	Human
Adrenaline Fast Track	EIA / ELISA	Plasma or Urine	96	07LE6100	10 or 300 µL	Plasma: 0.01 ng/mL Urine: 0.9 ng/mL	Human
Adrenaline	EIA / ELISA	Urine	96	07LE7100	25 µL	0.5 ng/mL	Human
Dopamine Fast Track	EIA / ELISA	Plasma or Urine	96	07LE6300	10 or 300 µL	Plasma: 0.049 ng/mL Urine: 2.5 ng/mL	Human
		Urine	96	07LE7300	25 µL	3 ng/mL	Human
	RIA	Plasma or Urine	96	07LR6300	10 or 300 µL	Plasma: 29 pg/mL Urine: 3.0 ng/mL	Human
Noradrenaline (Norepinephrine) Fast Track	EIA / ELISA	Plasma or Urine	96	07LE6200	10 or 300 µL	Plasma: 0.036 ng/mL Urine: 1.7 ng/mL	Human
		Urine	96	07LE7200	25 µL	1.7 ng/mL	Human
	RIA	Plasma or Urine	100	07LR6200	10 or 300 µL	Plasma: 42 pg/mL Urine: 1.1 ng/mL	Human

**Other species have been cited in scientific publications.*
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.
CT = coated tube DA = double antibody

www.mpbio.com

Hundreds of species validated using the MP Bio Corticosterone RIA Kit

"We measured plasma corticosterone concentrations in each individual blood sample using a commercially available corticosterone I^{125} radioimmunoassay kit (Cat. #07-120102, ICN Biomedicals, Costa Mesa, California)...We conducted parallelism and recovery of exogenous corticosterone validation assays on two pooled plasma samples (low and high; each pool consisted of plasma from five individuals) from each bird species to validate plasma corticosterone RIA utility, accuracy, and precision (Jeffcoate 1981)."

Washburn, B. E.; Morris, D. L.; Millspaugh, J. J.; Faaborg, J.; Schulz, J. H. Using a commercially available radioimmunoassay to quantify corticosterone in avian plasma. *Condor*. **2002**, *104*, 558–563.

"Levels of plasma CORT were determined in 17 assays using double-antibody radioimmunoassay kits (Catalog # 07–102103, MP Biomedical, Orangeburg, NY, USA) that had already been validated for use in our study system [32]...Therefore, from our data it is apparent that garter snakes of the slow-living ecotype are exposed to overall higher levels of circulating glucocorticoids – both baseline and stressed-induced – than garter snakes of the fast-living ecotype. Our study, thus, shows an association between glucocorticoid levels and pace of life in a reptilian system, as has been recently documented for birds [4,15], supporting the possible role of glucocorticoids as mediators of life-history trade-offs in this vertebrate group."

Palacios, M. G.; Sparkman, A. M.; Bronikowski, A. M. Corticosterone and pace of life in two life-history ecotypes of the garter snake Thamnophis elegans. *General and Comparative Endocrinology*. **2012**, *175*, 3, 443-448.

"Serum corticosterone was analyzed using a radioimmunoassay and protocol from MP Biomedicals (Orangeburg, NY, USA).... Increased levels of corticosterone are well known to inhibit hippocampal neurogenesis [8,9] and adrenalectomy increases the number of surviving newborn neurons [10], supporting a role for corticosterone in regulating hippocampal neurogenesis."

Lindqvist, A.; Mohapel, P.; Bouter, B.; Frielingsdorf, H.; Pizzo, D.; Brundin, P.; Erlanson-Albertsson, C. High-fat diet impairs hippocampal neurogenesis in male rats. *European Journal of Neurology*. **2006**, *13*, 1385-1388.

"Corticosterone was determined by double antibody radioimmunoassay (125I-RIA, MP Biomedicals, 07-120103) with modifications validated for several avian species (Washburn et al. 2002; Newman et al. 2008; Schmidt and Soma 2008)... In summary, we found that experimental manipulation of plasma corticosterone had a positive effect on foraging behavior, which resulted in direct increases in chick growth even in females that were pushed toward very high levels and had temporarily suspended foraging activity."

Crossin, G. T.; Trathan, P. N.; Phillips, R. A.; Gorman, K. B.; Dawson, A.; Sakamoto, K. Q.; Williams, T.D. Corticosterone Predicts Foraging Behavior and Parental Care in Macaroni Penguins. *The American Naturalist*. **2012**, *180*, 1, E31-E41.

"Faecal extracts were also analysed using a double-antibody 125I-labelled corticosterone RIA (MP Biomedicals, Orangeburg, NY, USA), previously validated for jaguar faeces (Conforti et al., 2012), according to the manufacturer's instructions, except that all reagent volumes were halved... The biological validity of the corticosterone RIA is further supported by the results of a previous study of captive jaguars that were challenged with exogenous adrenocorticotrophic hormone (Conforti et al., 2012)."

Mesa-Cruz, J. B.; Brown, J. L.; Kelly, M. J. Effects of natural environmental conditions on faecal glucocorticoid metabolite concentrations in jaguars (Panthera onca) in Belize. *Conserv Physiol*. **2014**, *2*, 1.

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Corticosterone - Avian

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Corticosterone – Buffalo

Spaan, J. M.; Pitts, N.; Buss, P.; Beechler, B.; Ezenwa, V. O.; Jolles, A. E. Noninvasive measures of stress response in African buffalo (*Syncerus caffer*) reveal an age-dependent stress response to Immobilization. *Journal of Mammalogy*. **2017**, *98*, *5*, 1288–1300.

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Corticosterone – Jaguar

Mesa-Cruz, J. B.; Brown, J. L.; Kelly, M. J. Effects of natural environmental conditions on faecal glucocorticoid metabolite concentrations in jaguars (*Panthera onca*) in Belize. *Conserv Physiol*. **2014**, *2*, 1.

Corticosterone – Mice

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Young, A. M.; Hallford, D. M. Validation of a fecal glucocorticoid metabolite assay to assess stress in the budgerigar (*Melopsittacus undulatus*). *Zoo Biology*. **2012**, *32, 1*, 112-6.

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Crossin, G. T.; Trathan, P. N.; Phillips, R. A.; Gorman, K. B.; Dawson, A.; Sakamoto, K. Q.; Williams, T.D. Corticosterone Predicts Foraging Behavior and Parental Care in Macaroni Penguins. *The American Naturalist*. **2012**, *180, 1*, E31-E41.

Corticosterone – Primate

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Bekhbat, M.; Glasper E. R.; Rowson, S. A.; Neigh, G. N. Measuring corticosterone concentrations over a physiological dynamic range in female rats. *Physiol. Behav.* **2018**, 194, 73-76.

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Corticosterone – Snake

Palacios, M. G.; Sparkman, A. M.; Bronikowski, A. M. Corticosterone and pace of life in two life-history ecotypes of the garter snake *Thamnophis elegans*. *General and Comparative Endocrinology*. **2012**, *175, 3*, 443-448.

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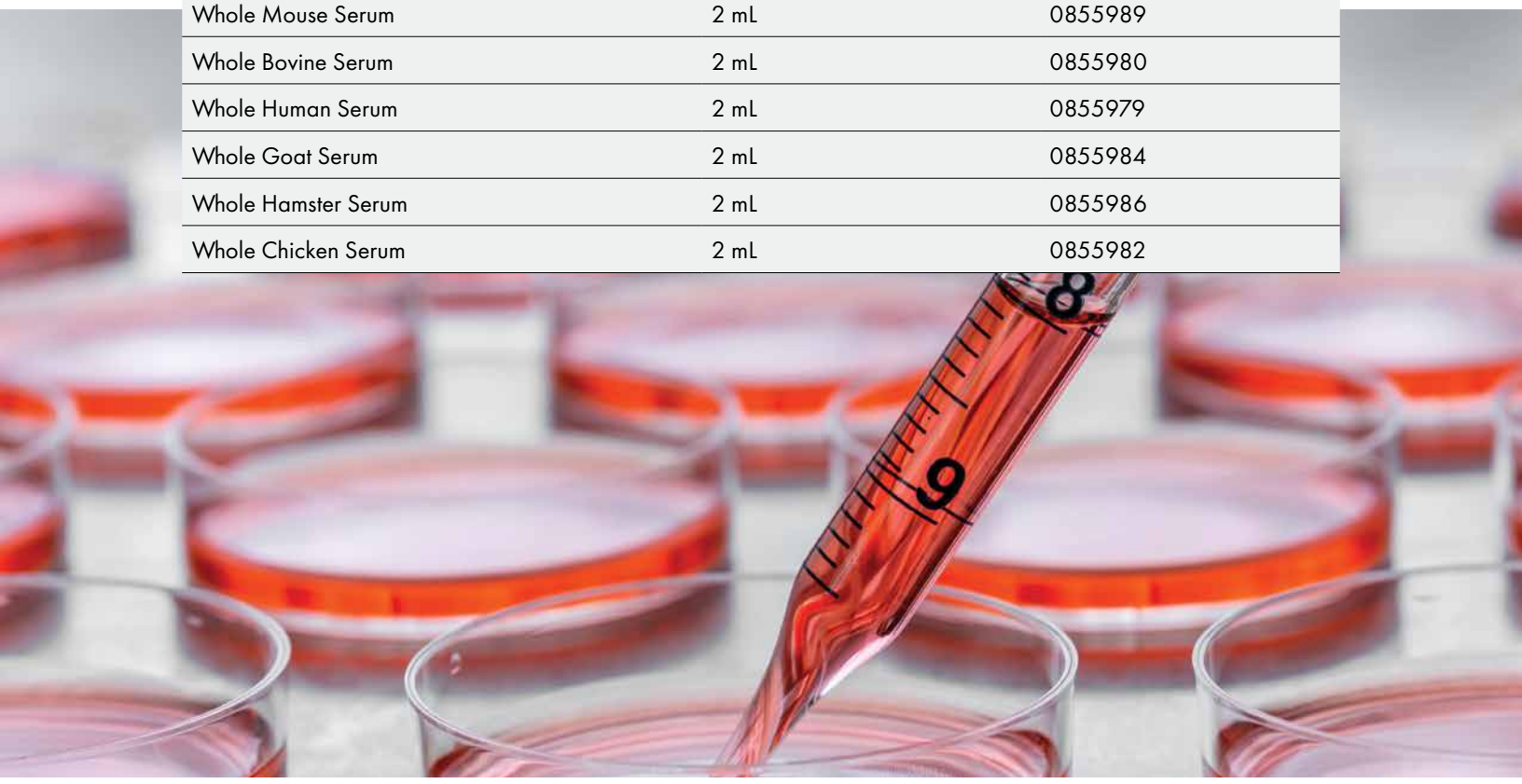
Animal Sera for Immunoassays

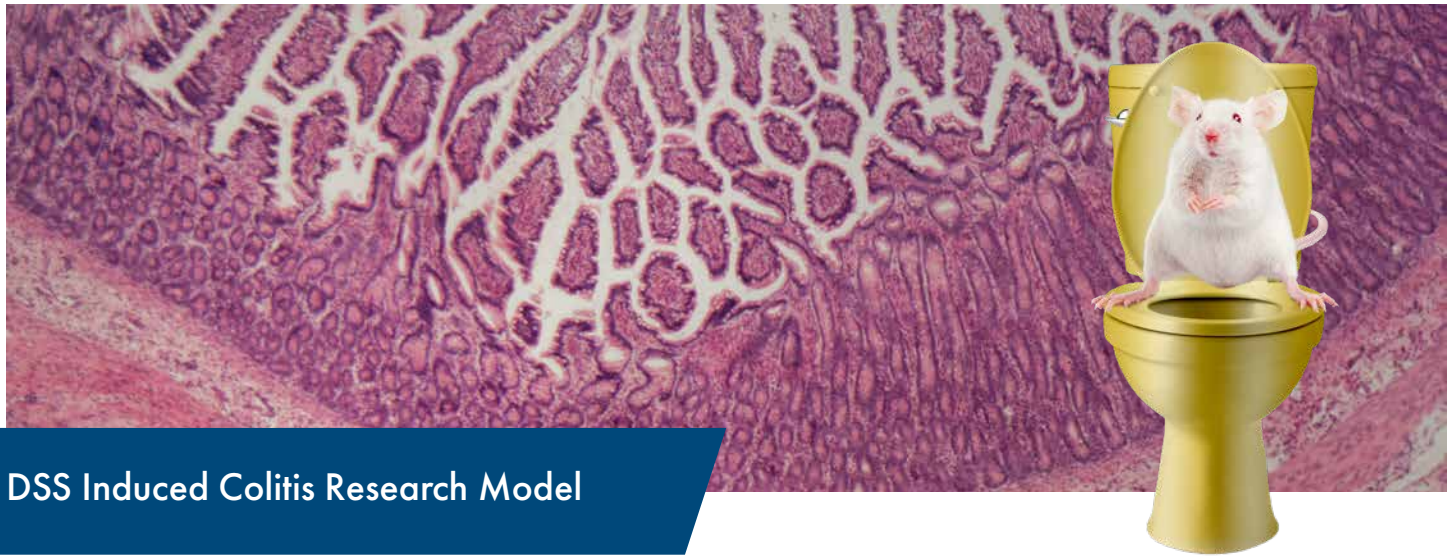
Normal and whole sera are non-immune serum samples prepared from the blood of healthy human, goat, mouse, rabbit, pig, or other species. They provide sufficient quantities of endogenous proteins to saturate and block nonspecific binding interactions for a wide range of immunological applications, including immunohistochemistry (IHC), ELISA and Western blotting. MP Bio offers a wide range of high-quality, disease-free sera from a variety of species.

Advantages and Features:

High quality from healthy animals or donors	Versatile for blocking or saturating nonspecific interactions	Comprehensive collection from various species	Constant availability

Description	Size	Cat. No.
Normal Goat Serum	50 mL	08642921
Normal Mouse Serum	10 mL	08642931
Normal Sheep Serum	50 mL, 100 mL	08642951
Normal Rat Serum	10 mL	08642941
Whole Horse Serum	2 mL	0855987
Whole Swine Serum	2 mL	0855993
Whole Mouse Serum	2 mL	0855989
Whole Bovine Serum	2 mL	0855980
Whole Human Serum	2 mL	0855979
Whole Goat Serum	2 mL	0855984
Whole Hamster Serum	2 mL	0855986
Whole Chicken Serum	2 mL	0855982





DSS Induced Colitis Research Model

Inflammatory Bowel Disease (IBD) is characterized by chronic and relapsing inflammation of the gastrointestinal tract and is associated with an increased risk of developing colitis-associated cancer. Several animal models have been used to study colitis. One such model involves the oral administration of dextran sulfate sodium salt (DSS) in the drinking water of mice, leading to chronic colitis. This DSS induced colitis model is spontaneous and used to assess the therapeutic potential of treatments for IBD.

Accelerate your IBD research with the most validated and attested Dextran Sulfate Sodium Salt.

Highest sulfur content: **19%**

Highest chirality: **+104°** of specific rotation

Lowest pH: **6.2** at 1% solution

Over **3,000** publications

Dextran Sulfate Sodium Salt (DSS) is a polyanionic derivative of Dextran. Our DSS is offered at the highest quality and purity and is the most reproducible form. This allows for its use in a variety of research applications, such as clinical, molecular biology, biomedical and even cosmetics.

Dextran Sulfate Sodium Salt has the following properties:

- Water soluble polyanion
- Forms a clear solution and mimics natural mucopolysaccharides
- High purity and excellent stability
- Readily degradable by ecological systems
- Acts as a stabilizer for sensitive natural ingredients

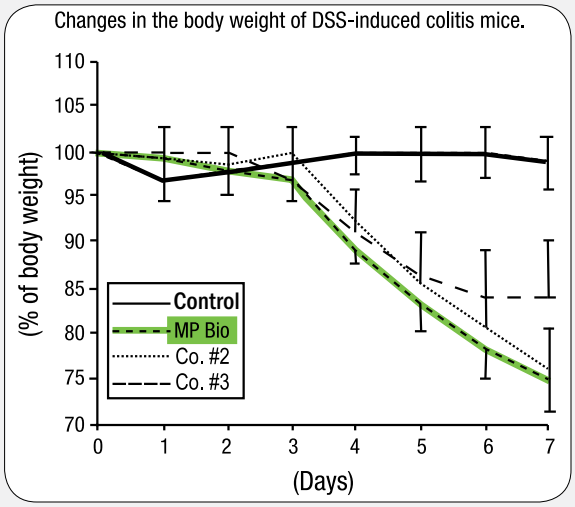
"In our opinion, MP Biomedical's Dextran Sulfate Sodium Salt (36,000-50,000 M.Wt.) Colitis Grade is the best product available on the market for reliably inducing colitis in mice. Using this product, we observe consistent body weight loss, disease severity and changes in colon length in various strains of mice. With MP Bio's DSS we have never experienced lot to lot variability."

–Dr. Natacha Steinckwich-Besancon, Ph.D., Invivotek LLC, a member of Genesis Biotechnology Group

www.mpbio.com

The Proven Gold Standard

Bamba et al[1] performed a comparative analysis of 3 different DSS preparations to examine the chemical and cytotoxic properties as well as severity of colitis. Their study concluded that DSS from MP Bio most effectively induced colitis, as indicated by body weight transition, DAI score, colon weight/length and histological scores.



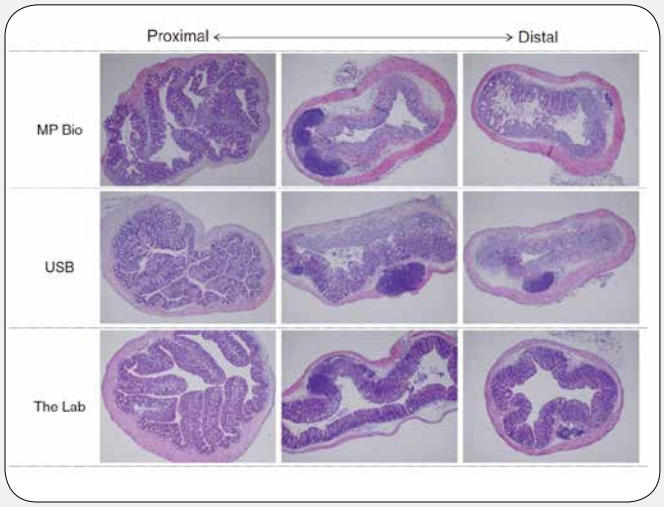


Figure 1. Changes in body weight loss as reported by Bamba et al.

Variability of protocols can lead to variability in results. We suggest following the guidelines, as reported in the literature:

Critical parameters and key factors in applications utilizing DSS for colitis research are discussed in an article in Current Protocols in Immunology[2]: *"The successful and reproducible induction of DSS-induced colitis depends on numerous key factors, including DSS source, lot #, molecular weight, concentration, duration, mouse strain, source, age, gender and body weight as well as environmental factors including the hygienic condition of the vivarium[3]. If high mortality is observed, suggesting high susceptibility to DSS, a decreased dose of DSS should be adopted. If no or weak colitis is observed, suggesting low susceptibility, an increase in DSS concentration and/or duration should be considered."*

A sharp DSS dose-response curve (for weight loss) enables sensitive screening for susceptible or resistant mutants (Figure 2). In this protocol, ENU-mutagenized C57BL/6J G3 mice are fed for several days with 1% DSS from MP Bio (w/v) in the drinking water, a dosage that is insufficient to cause weight loss in wild type C57BL/6J mice.

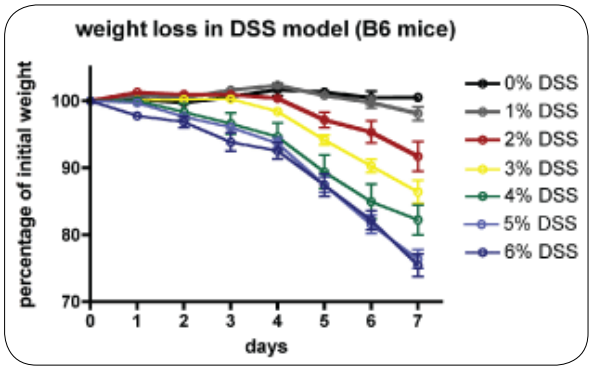


Figure 2. Relationship between the dose of DSS and weight loss. Mice were exposed to 0-6% DSS in drinking water for 7 days. Body weight, expressed as percentage of weight on the day of first exposure to DSS, is plotted against time. n=14 for each group.[4]

Improve effectiveness of DSS by combining with Azoxymethane (AOM)

Research on IBD and Crohn's disease using animal models has been conducted using various chemicals. In addition to MP Bio product 02160110 (DSS 35,000-50,000 MW), chemically induced mouse models of intestinal inflammation were reported using 2,4,6-trinitro benzene sulfonic acid (TNBS) and oxazolone.[5]

Recently, to reduce the amount of time needed to induce intestinal inflammation or colorectal cancer in animal models, combinations of chemicals have been utilized.[6] High effectiveness is shown by the azoxymethane (AOM)/DSS combination.[7-9]

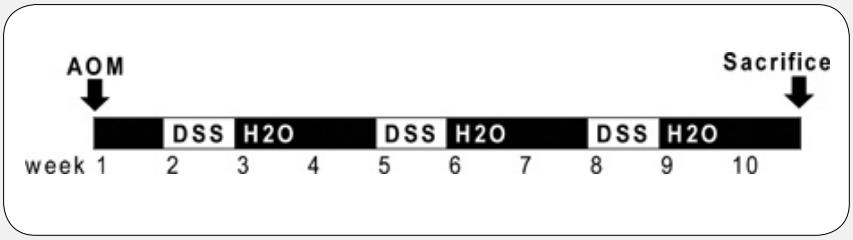


Figure 3. Schematic of AOM and DSS administration. AOM (10 mg/kg) is injected on day 0. At the beginning of the second week (day 7), 2.5% DSS solution is administered to mice in their drinking water. Seven days of DSS treatment is followed by two weeks of autoclaved water. An additional two cycles of DSS are administered prior to sacrifice.[7]

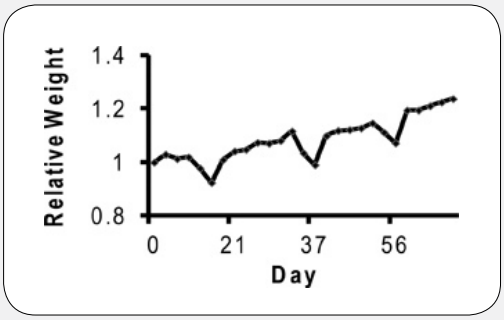


Figure 4. Mouse weight relative to baseline during AOM and DSS administration. Note that in the week following each DSS cycle, mice lose 5-10% of their body weight. Weight loss in this experiment is a surrogate marker for colitis severity.[7]

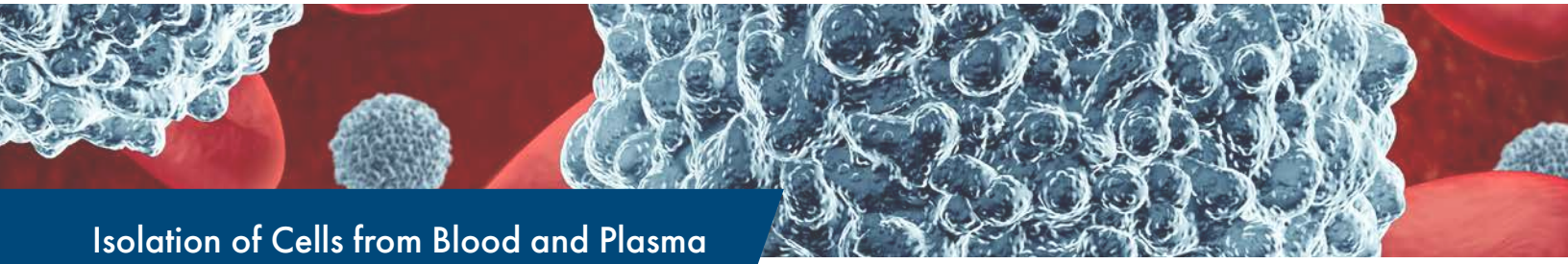
Description	Size	Cat. No.
Dextran Sulfate Sodium Salt (36,000 – 50,000 Da) The most recommended and cited DSS	1 g	0216011001
	10 g	0216011010
	25 g	0216011025
	50 g	0216011050
	100 g	0216011080
	500 g	0216011090
	1 kg	0216011091
Azoxymethane Minimum purity of 95%, typically over 99% AOM	100 mg	02180139.1
	25 mg	02180139.3

References:

[1] Bamba, S. et al. *Digestive Diseases and Sciences*. **2012**, *57 (2)*, 327-334.
[2] Chassaing, B. et al. *Curr. Protoc. Immunol.* **2014**, *104*, 15.25.1-15.25.14
[3] Nell, S. et al. *Nature reviews. Microbiology*. **2010**, *8*, 564-577.
[4] https://mutagenetix.utsouthwestern.edu/protocol/protocol_rec.cfm?pid=9
[5] Wirtz, S. et al. *Nat. Protoc.* **2007**, *2*, 541-546.
[6] De Robertis, M. et al. *J. Carcinog.* **2011**, *10*, 9.
[7] Thaker, A. et al. *J. Vis Exp.* **2012**, *67*, 4100.
[8] Parang, B. et al. *Methods Mol. Biol.* **2016**, *1422*, 297-307.
[9] Angelou, A. et al. *Anticancer Res.* **2018**, *38 (6)*, 3467-3470.

Dosage of DSS for different strains of mice:

Animal/Strain	Dose	Days	Publication
C57BL/6	2.5%	8	Jia, Q.; Ivanov, I.; Zlatev, Z.; et al. Dietary fish oil and curcumin combine to modulate colonic cytokinetics and gene expression in dextran sodium sulphate-treated mice. *Br.J.Nutr.* **2011**, *106(4)*, 519-9.
Wild-type C57BL/6J(m)	3%	6	Thiess, A.L.; Laroui, H.; Obertone, T.S.; et al. Nanoparticle-based therapeutic delivery of prohibitin to the colonic epithelial cells ameliorates acute murine colitis. *Inflamm. Bowel Dis.* **2011**, *17(5)*, 1163-76.
C57BL/6 AhR null, WT	3.5%	7	Arsenescu, R.; Arsenescu, V.; Zhong, J.; et al. Role of xenobiotic receptor in inflammatory bowel disease. *Inflamm. Bowel Dis.* **2011**, *17(5)*, 1149-2.
C57BL/6	5%	3-14	Nagalingham, N.A.; Kao, J.Y.; Young, V.B. Microbial ecology of the murine gut associated with the development of dextran sodium sulfate-induced colitis. *Inflamm, Bowel Disease.* **2011**, *7(4)*, 917-26.
C57BL/6	1.5%	7	Ramakers, J.; Verstege, M.I.; Thuijls, G.; et al. The PPARγ agonist rosiglitazone impairs colonic inflammation in mice with experimental colitis. *J.Clin.Immunol.* **2007**, *27(3)*, 275-283.
BALB/c	1%	10	Palffy, R.; Gardlik, R.; Behuliak, M.; et al. Salmonella-mediated gene therapy in experimental colitis in mice. *Ex.Biol.Med.* **2011**, *236(2)*, 177-83.
C57BL/6J	3%	5	Shiomi, Y.; Nishiumi, S.; Ooi, M.; et al. GCMS-based metabolomic study in mice with colitis induced by dextran sulfate sodium. *Inflamm. Bowel Dis.* **2011**, *17(11)*, 2261-74.
BALB/c	1-5%	10	Rochat, T.; Bermudez-Humaran, L.; Gratadoux, J-J.; et al. Anti-infammatory effects of Lactobacillus casei BL23 producing or not a manganese-dependent catalase on DSS-induced colitis in mice. *Microb. CellFact.* **2007**, *20(6)*, 22.
BALB/c; NMRI/KI	2.5-5%	n/a	Bylund-Fellenius, A-C.; Landström, E.; Axelsson, L.G.; et al. Experimental colitis induced by dextran sulphate in normal and germfree mice. *Microbial Ecology in Health and Disease.* **1994**, *7*, 207-215.
IL-5-/- and +/+	2.9%, 5%	9	Stevceva, L.; Pavli, P.; Husband, A.; et al. Eosinophilia is attenuated in experimental colitis induced in IL-5 deficient mice. *Genes Immun.* **2000**, *1(3)*, 213-8.
BALB/c; athymic nu/nu CD-1 (BR)	2.5-5%	7-35	Axelsson, L.G.; Landström, E.; Bylund-Fellenius, A.C. Experimental colitis induced by dextran sulphate sodium in mice: Beneficial effects of sulphasalazine and olsalazine. *Aliment. Pharmacol.Ther.* **1998**, *12(9)*, 925-34.
WT; CCR9(-/-); CCL25 (-/-)	2%	7	Wurbel, M.A.; McIntyre, M.G.; Dwyer, P.; et al. CCL25/CCR9 interactions regulate large intestinal inflammation in a murine model of acute colitis. *PLoS One.* **2011**, *6(1)*, e16442.
Wild-type; DPIV -/-	2%	6	Yazbeck, R.; Howard, G.S.; Butler, R.N.; et al. Biochemical and histological changes in the small intestine of mice with dextran sulfate sodium induced colitis. *J.Cell Physiol.* **2011**, *226(12)*, 319-24.
BALB/c	5%	7	Kumar, G.K.; Dhamotharan, R.; Kulkarni, N.M. Embelin ameliorates dextran sodium sulfate-induced colitis in mice. *Int. Immunopharmacol.* **2011**, E



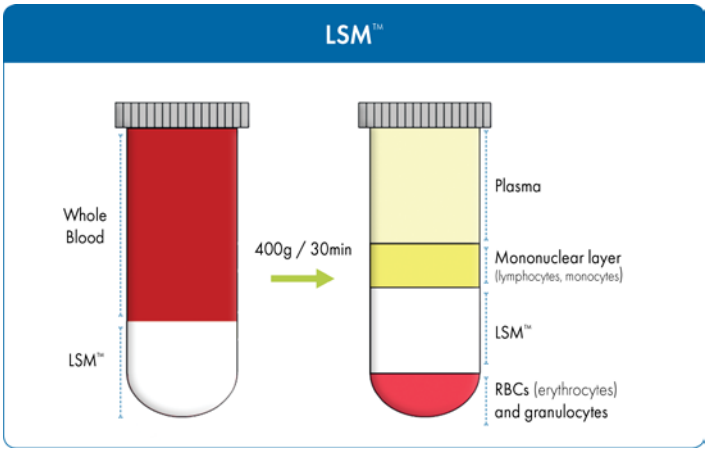
Isolation of Cells from Blood and Plasma

Blood is composed of several cell types that need to be routinely isolated, such as monocytes, lymphocytes, and polymorphonuclear leukocytes. Isolation of mononuclear and polymorphonuclear cells from blood serves as the starting point for a wide spectrum of immunology studies. One challenge for many researchers is how to specifically isolate mononuclear and polymorphonuclear cells from blood with high yield and cell viability. MP Bio offers three products for the isolation of mononuclear and polymorphonuclear cells from human peripheral blood, bone marrow, and umbilical cord blood. Lymphocyte Separation Medium (LSM™), LymphoSep™, and Mono-Poly™ Resolving Medium have been used for these applications by researchers worldwide.

Mononuclear Cell Isolation for Research Use

Lymphocyte Separation Medium (LSM™) is a legendary tool to separate lymphocytes from human peripheral blood, as well as bone marrow and umbilical cord blood. As proven by more than 2,200 scientific publications, it ensures:

- **Maximum yield of monocytes**
- **> 96% cell viability of lymphocytes**
- **Easy one-step centrifugation**
- **Low endotoxin levels**
- **Sterility**



Lymphocyte Separation for in vitro Diagnostics

LymphoSep® lymphocyte separation medium from MP Bio is based on the original Bøyum formulation with a density of 1.077 g/mL. It is validated for *in vitro* diagnostic (IVD) usage and has designation as an FDA class I exempt medical device for lymphocyte separation (21CFR864.8500). It offers similar product features to our Lymphocyte Separation Medium (LSM™), but it is specifically designed for in vitro diagnostic use.

Mononuclear and Polymorphonuclear Isolation in One Step

When it is necessary to separate both mononuclear and polymorphonuclear cells from blood, Mono-Poly™ Resolving Medium (Mono-Poly™, M-PRM) may be used. Differential migration during centrifugation allows for the resolution of both mononuclear and polymorphonuclear leukocytes into two distinct bands that are relatively free of erythrocytes. This can be performed in a one-step centrifugation process.

Description	Size	Cat. No.
LSM™ - Lymphocyte Separation Medium	5 x 100 mL	0850494
LymphoSep®	500 mL	091692254
Mono-Poly® Resolving Medium	100 mL	091698049

Induced Immune Response in Animals

Freund's adjuvant is a solution of antigen emulsified in mineral oil and used as an immunopotentiator. MP Bio offers both Freund's Complete Adjuvant and Incomplete Adjuvant with strong and persistent immune response in animals.

Freund's Complete Adjuvant contains killed mycobacterium tuberculosis, attracting macrophages and other cells to the injection site. Therefore, it is used for the initial injections to enhance the immune response. On the contrary, Freund's Incomplete Adjuvant is commonly used for boosts with minimized side effects, as it does not contain inflammation-causing mycobacteria.

Description	Size	Cat. No.
Freund's Incomplete Adjuvant	50 mL	08642861
	25 mL	0855829
Freund's Complete Adjuvant	50 mL	08642851
	10 mL	08642852

7X™ Ready-to-use Detergent

Ideal for instrument and glassware cleaning

- Effective, water-soluble and eco-friendly cleaning solutions
- Does not etch glass or plastic labware
- Nontoxic for tissue and cell cultures
- Eliminates interfering fluorescence residues for flow cytometry
- No need for pH adjustment
- Easy and safe to use, no gloves required
- Concentrated – 1 gallon can make up to 100 gallons of cleaning solution

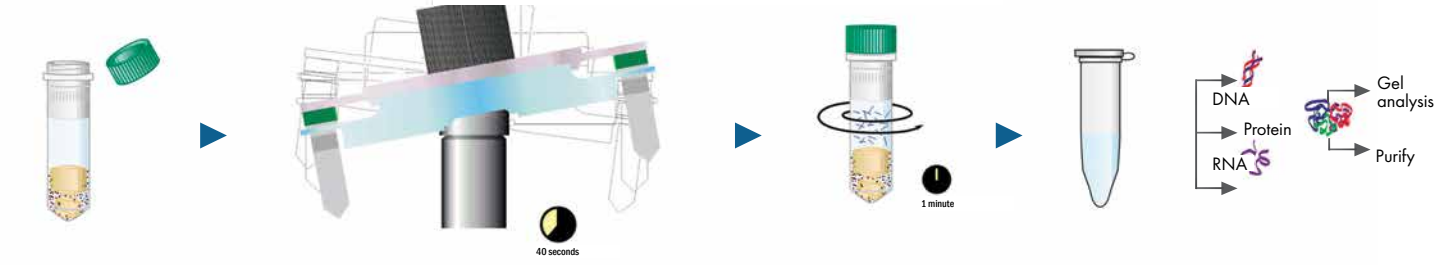
Description	Size	Cat. No.
7X Cleaning Solution	1 gal	097667093
7X Cleaning Solution	4 x 1 gal	097667094
7X-O-Matic Solution, Machine Wash	4 x 1 gal	097667494
ES 7X Cleaning Solution, Environment-Safe	4 x 1 gal	097667194
ES 7X Cleaning Solution, Environment-Safe	1 gal	097667193

Trusted for over 65 years, cleanup has never been so easy!

Sample Preparation and Nucleic Acid Isolation

FastPrep® instruments, Lysing Matrix tubes and kits from MP Bio offer a complete solution for your sample preparation needs. FastPrep systems are ideally suited for animal research work, including preparing samples from cells, animal tissues, bone, insects, feces and more. Lyse, homogenize or grind any sample to extract and purify high yields of DNA, RNA and proteins in 40 seconds or less.

FastPrep Workflow



1. Prepare lysis tube
2. Process with FastPrep Instrument
3. Centrifuge to pellet debris
4. Transfer cleared lysate

FastPrep-24™ 5G Instruments and Adapters

A benchtop instrument based on bead-beating technology, the FastPrep-24 5G is a versatile sample disruption device providing the ultimate in speed and performance for the lysis of biological samples. A self-contained system, the FastPrep-24 5G eliminates the risk of cross-contamination and time-consuming cleanup associated with manual lysis methods. The instrument provides complete and quantitative lysis of difficult and routine samples and is suitable in all applications that require grinding, lysing, or homogenization.

- Consistent results
- Interchangeable adapters for flexibility in sample size and cryogenic lysis capability
- High reproducibility with precise setting of lysis time and speed
- Easy touch screen user interface
- Power to homogenize resistant samples with ease
- High Yields

FastPrep-24™ 5G

Cat. No. 116005500

QuickPrep™ 3 Adapter included with instrument

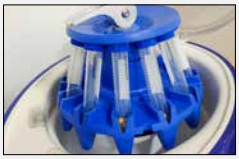
www.mpbio.com

FastPrep-24 Adapters are flexible, interchangeable and available for ambient or cryogenic sample types

MP Bio offers the widest selection of adapters to best meet your needs in sample grinding. Our adapters allow for sample sizes ranging from 2 to 250 mL tubes and are built for durability in ambient and cryogenic conditions.

Ambient Temperature Adapters for FastPrep-24™ 5G Instruments

QuickPrep™ 3 Adapter
24 x 2 mL tubes
(included with FastPrep-24™ 5G instrument)
Cat. No. 116005512

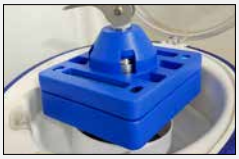


TeenPrep™ Adapter
12 x 15 mL tubes

Cat. No. 116002526

HiPrep™ Adapter
48 x 2 mL tubes

Cat. No. 116002527



BigPrep™ Adapter
2 x 50 mL tubes

Cat. No. 116002525

TallPrep™ Adapter
24 x 4.5 mL tubes

Cat. No. 116002540

Cryogenic Temperature Adapters for FastPrep-24™ 5G Instruments

During mechanical lysis, the temperature within the tube can increase. This can cause damage to the molecules in the sample, especially proteins or RNA, which can be damaged at higher temperatures.

- **Protects thermosensitive molecules** from heat degradation due to an innovative cooling chamber design.
- **Prevents the increase of sample temperature** during the homogenization process by maintaining sample temperature at 4°C.
- **Ensures a highly effective grinding process for any sample,** even the most elastic, by making them brittle.

CoolPrep™ Adapter
24 x 2 mL tubes

Cat. No. 116002528

CoolTeenPrep™ Adapter
6 x 15 mL tubes

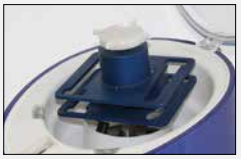
Cat. No. 116002530

CoolBigPrep™ Adapter
2 x 50 mL tubes

Cat. No. 116002531

Metal Adapters for FastPrep-24™ 5G Instruments

All-Metal adapters are ideally suited for work with highly infectious, pathogenic or other biologically hazardous samples. They withstand temperatures of up to 450°C, allowing for sterilization by pyrolysis or autoclaving. Pathogens, including bacteria, viruses, fungi, parasites, viroids and prions, can be effectively eliminated. All-Metal adapters are also safe to use with most laboratory detergents and sterilization solutions, ensuring easy care and maintenance.

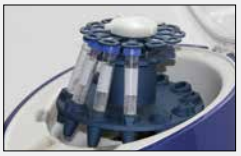


Metal BigPrep™ Adapter
2 x 50 mL tubes

Cat. No. 116002547

Metal QuickPrep™ Adapter
24 x 2 mL tubes

Cat. No. 116002545



Metal TeenPrep™ Adapter
12 x 15 mL tubes

Cat. No. 116002546

FastPrep-96™ Instruments and Adapters

The FastPrep-96 delivers superior performance, speed and reproducibility with high-throughput capabilities – process up to 192 samples simultaneously in 2 x 96 deep well plates. MP Bio's high throughput device offers exceptional versatility with interchangeable adapters and fast processing speeds. The true linear motion of FastPrep-96 eliminates the need to re-orient plates mid-cycle.

FastPrep-96 offers a large variety of adapters (2 x 96 deep well plates, 96 x 2 mL, 48 x 4.5 mL, 20 x 15 mL, 8 x 50 mL and 2 x 250 mL) and a simple, accurate, closed loop control of lysing power and speed. All this and more makes the FastPrep-96™ the perfect solution for all of your high throughput or high volume sample grinding needs.

FastPrep-96™

Cat. No. 116010500

2 x 96 well plate adapter included with instrument

BigFlex™ Adapter
8 x 50 mL tubes

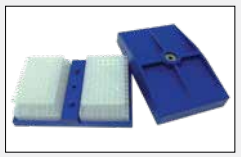
Cat. No. 116010550

TeenFlex™ Adapter
20 x 15 mL tubes

Cat. No. 116010560

LargeFlex™ Adapter
2 x 250 mL bottles

Cat. No. 116010590



Well Plate Adapter
2 x 96 deep well plates
(included with FastPrep-96™ instrument)
Cat. No. 119696168

Lysing Matrix Tubes

FastPrep® Lysing Matrix makes difficult-to-lyse samples easy. No matter how tough or resistant your samples, our bead beating tubes will effectively disrupt cell walls, providing the highest yields of nucleic acids and proteins in a matter of seconds. Lysing Matrix tubes from MP Bio are highly reproducible with no cross-contamination. All Lysing Matrix tubes are standard sizes and fit just about any homogenizer on the market. We offer a wide variety of lysing beads and matrices to fit all sample types and applications.

Optimal cell disruption for any sample	Size and composition optimized according to sample type	No cross contamination with closed Lysing Matrix tubes
Available in 2 mL, 4.5 mL, 15 mL, 50 mL tubes or 96 well plates	Fit any high-speed bead-beating homogenizers	Validated worldwide with 3,000+ Lysing Matrix specific publications

FastPrep® Lysing Matrix tubes range from low to high impaction, breaking down any sample type whether the cell walls are hard or soft. Sample types include, but are not limited to, human, animal, and plant tissues; microorganisms like bacteria, yeast and fungi; soil; feces; plus insects and worms.

Impact-resistant Lysing Matrix tubes with beads are available in 2 mL, 4.5 mL, 15 mL, 50 mL and 96-well format sizes and contain a wide variety of materials to meet your lysing, grinding, and homogenization needs. All matrix particles are produced to the highest quality standards to ensure optimum performance. The lysing matrix particles are then dispensed into the Lysing Matrix tubes under a rigorous set of proprietary conditions, allowing complete confidence for immediate use.

For optimal performance and results, we recommend using the Lysing Matrix tubes in conjunction with our FastPrep instruments to ensure easy grinding, lysing, and homogenization of any sample type in seconds.

Lysing Matrix		Matrix Composition	Lysing Matrix		Matrix Composition
●	A	Garnet matrix and 1/4 inch ceramic spheres	○	I	2 mm yellow zirconium oxide beads and 4 mm black ceramic spheres
●	B	0.1 mm silica spheres	●	J	2 mm yellow zirconium oxide beads and 1.6 mm aluminum oxide particles
●	C	1 mm silica spheres	●	K	0.8 mm zirconium silicate beads
●	D	1.4 mm ceramic spheres	●	M	1/4 inch ceramic beads
●	E	1.4 mm ceramic spheres, 0.1 mm silica spheres, and 4 mm glass beads	○	S	1/8 inch stainless steel beads
○	F	1.6 mm aluminum oxide particles and 1.6 mm silicon carbide particles	○	SS	6.35 mm stainless steel grinding balls
●	G	1.6 mm silicon carbide particles and 2 mm glass beads	●	Y	0.5 mm diameter Yttria-stabilized zirconium oxide beads
●	H	2 mm glass beads and 2 mm yellow zirconium oxide beads	●	Z	2 mm diameter Yttria-stabilized zirconium oxide beads

	Sample Type	Lysing Matrix						
	Animal & Human Tissues	A	D	K	M	S	SS	Z
Soft Tissues	Lung, Breast, Kidney, Heart, Intestine, Muscle, Spleen, Liver, Brain	•	•			•	•	•
Unique Samples	Skin	•	•					
	Nail					•		
	Tail, Ear	•				•		
	Vascular tissue	•	•					•
	Hair					•		
	Bone	•		•	•	•	•	
	Tumor	•				•		
	Mammalian cell	•	•					•
	Infected tissue (isolation of viruses or bacteria)				•			

Description	Pack Size	Cat. No.
Lysing Matrix A	50 x 2 mL	116910050
	100 x 2 mL	116910100
	500 x 2 mL	116910500
Lysing Matrix A	25 x 4.5 mL	116970025
	50 x 4.5 mL	116970050
	100 x 4.5 mL	116970100
Lysing Matrix A	5 x 15 mL	116930005
	25 x 15 mL	116930025
	50 x 15 mL	116930050
Lysing Matrix A	10 x 50 mL	116950010
	50 x 50 mL	116950050
	100 x 50 mL	116950100
	500 x 50 mL	116950500
Lysing Matrix A	96-well rack	116980001
	10 x 96-well rack	116980010
Lysing Matrix D	50 x 2 mL	116913050
	100 x 2 mL	116913100
	500 x 2 mL	116913500
Lysing Matrix D	25 x 4.5 mL	116973025
	50 x 4.5 mL	116973050
	100 x 4.5 mL	116973100
Lysing Matrix D	5 x 15 mL	116933005
	25 x 15 mL	116933025
	50 x 15 mL	116933050
Lysing Matrix D	10 x 50 mL	116953010
	50 x 50 mL	116953050
	100 x 50 mL	116953100
	500 x 50 mL	116953500
Lysing Matrix D	96-well rack	116983001
	10 x 96-well rack	116983010

Description	Pack Size	Cat. No.
Lysing Matrix K	50 x 2 mL	116920050
	100 x 2 mL	116920100
Lysing Matrix M	50 x 2 mL	116923050
	100 x 2 mL	116923100
	500 x 2 mL	116923500
Lysing Matrix M	25 x 15 mL	116939025
	50 x 15 mL	116939050
Lysing Matrix M	10 x 50 mL	116959010
	50 x 50 mL	116959050
Lysing Matrix S	50 x 2 mL	116925050
	100 x 2 mL	116925100
	500 x 2 mL	116925500
Lysing Matrix S	5 x 15 mL	116938005
	25 x 15 mL	116938025
	50 x 15 mL	116938050
Lysing Matrix SS	10 x 50 mL	116941010
	50 x 50 mL	116941050
	100 x 50 mL	116941100
Lysing Matrix Z	50 x 2 mL	116961050
	100 x 2 mL	116961100
	500 x 2 mL	116961500
Lysing Matrix Z	25 x 4.5 mL	116985025
	50 x 4.5 mL	116985050
	100 x 4.5 mL	116985100
Lysing Matrix Z	5 x 15 mL	116978005
	25 x 15 mL	116978025
	50 x 15 mL	116978050
Lysing Matrix Z	10 x 50 mL	116979010
	50 x 50 mL	116979050
Lysing Matrix Z	96-well rack	116961001
	10 x 96-well rack	116961010

DNA Isolation from Animal Tissues and Cells

High performance FastDNA purification kits provide ready-to-use methods for the isolation and subsequent purification of intact DNA from any source. Eluted DNA is ready for digestion, electrophoresis, PCR, and other desired applications.

Universal FastDNA™ Kit – 116540400 and FastDNA™ SPIN Kit – 116540600

Isolate genomic DNA from plant, animal, bacteria, yeast, algae, and fungi cells	Process up to 200 mg of tissue or cells with the FastPrep instrument	Lysing Matrix A tubes, all necessary buffers and silica-based spin filters are included in the FastDNA SPIN Kit.

The FastDNA SPIN Kit quickly and efficiently isolates genomic DNA from almost any sample (plant and animal tissues, cultured cells, bacteria, yeast, fungi, insects, etc). Up to 200 mg of tissue or cells are processed with a FastPrep instrument and Lysing Matrix A tubes. The kit includes 3 different lysis buffers for the homogenization of a wide variety of sample types, and the released DNA is purified by a silica-based spin filter method. Purified DNA is ready for enzyme digestion, electrophoresis, PCR and any other desired application.

References

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FastDNA™ SPIN Kit for Feces – 116570200

Isolate genomic DNA from fecal samples	Process up to 500 mg of feces with FastPrep instrument	Lysing Matrix E tubes, buffers and silica-based spin filters included

The FastDNA SPIN Kit for Feces is the newest addition to the evolving FastDNA™ kit family. Prompted by you, our customer, MP Bio has developed a FastDNA SPIN Kit designed exclusively for the isolation of genomic DNA from fecal material. The FastDNA SPIN Kit for Feces includes everything you need to quickly and efficiently lyse any fecal sample, isolating high quality DNA for immediate use in downstream applications. Used in conjunction with our FastPrep-24 homogenization system, you will be able to completely lyse fecal samples in seconds with no pre-grinding or preparation.

References

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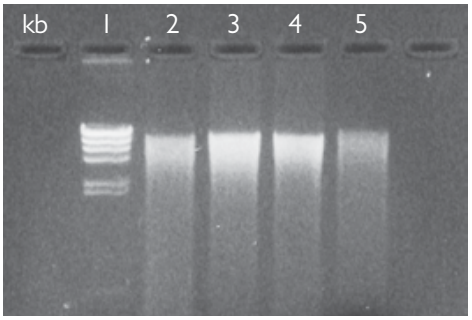

DNA from fecal samples with the FastDNA™ SPIN Kit for Feces. DNA was loaded on a 1.2% agarose gel (0.5X TAE).
Lane 1: Lamda HindIII Marker
Lane 2: Bovine stool 200 ng DNA
Lane 3: Equine stool 200 ng DNA
Lane 4: Feline stool 200 ng DNA
Lane 5: Avian stool 200 ng DNA

FastDNA™ SPIN Kit for Plant and Animal Tissue – 116540800

The FastDNA SPIN Kit for Plant and Animal Tissues quickly and efficiently isolates high quality genomic DNA from plant and animal tissues using Lysing Matrix D (1.4 mm ceramic beads) for cell lysis and a silica-based spin filter method for the purification process.

- **Isolate genomic DNA from plant and animal tissues**
- **Lysing Matrix D, buffers and silica-based spin filters included**

References

- Holdhoff, M.; Schmidt, K.; Diehl, F.; Aggrawal, N.; Angenendt, P.; Romans, K.; Edelstein, D. L.; Torbenson, M.; Kinzler, K.W.; Vogelstein, B.; Choti, M. A.; L. A. Diaz, Jr., L. A. *Clinical. Cancer Research.* **2011**, *17*, 3551.
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FastDNA™-96 Kits

High-throughput FastDNA-96 purification kits provide ready-to-use methods for the isolation and subsequent purification of intact genomic DNA from virtually any source. Samples can be lysed in approximately 60 seconds using the FastPrep-96 instrument. Eluted DNA is ready for digestion, electrophoresis, PCR, and any other desired application.

FastDNA™-96 Tissue and Insect DNA Kit – 119696500

Isolate genomic, viral, and mitochondrial DNA from animal tissues, cultured mammalian cells, whole blood, insects, and arthropods in approximately 40 minutes

FastDNA™-96 Fecal DNA Kit – 119696400

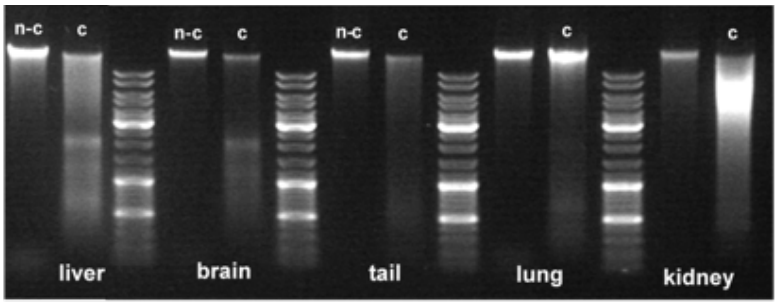
Isolate genomic DNA from microbes, fungi, parasites and other fecal organisms in approximately 50 minutes

RapidPure DNA Tissue Kit - 112711050

Superior non-chaotropic chemistry

Time savings through faster protocols. Up to 50 µg DNA in just 15 minutes after lysis step	Higher DNA yields from precious samples	More intact DNA

The RapidPure DNA Tissue Kit is an ideal tool for purification of DNA from various human and animal tissues. It provides reproducible yields of highly purified genomic DNA using a unique and innovative non-chaotropic technology. Using non-chaotropic binding conditions offers strong key advantages for nucleic acid preparation, including time savings through fast protocols, higher DNA yields from precious samples and more intact DNA.



Equal amounts of rat tissues were used to isolate DNA using the RapidPure DNA Tissue Kit (n-c, non chaotropic buffers). For comparison with chaotropic chemistry, an equivalent kit from a major supplier was evaluated (c, chaotropic buffers).

FastRNA™ Pro Green Kit – 116045050

- **Rapid and reproducible sample lysis in under 40 seconds with the FastPrep Instrument**
- **Safe and consistent RNA isolation with the single-reagent RNAPro solution**

The FastRNA Pro Green Kit is designed to isolate total RNA from any type of plant and animal tissue or cultured cells. Using FastPrep instruments, between 50-500 mg of tissue can be homogenized by Lysing Matrix D in impact-resistant 2 mL tubes. Total RNA is released into the proprietary, protective RNApro™ Solution, followed by extraction with chloroform and precipitation. High quality RNA is ready for all downstream applications including RT-PCR, gene expression, and microarray analysis.

References

- Dvorakova, M. C.; Mistrova, E.; Paddenberg, R.; Kummer, W.; Slavikova, J. *Frontiers in Physiology*. **2018**, *9*, 918.
- Ji, X.; Zhang, Q.; Zheng, W.; Yao, W. *Journal of Animal Science and Biotechnology*. **2019**, *10*, 9.
- Sharma, B.; Chaube, U.; Patel, B. M. *Cardiovascular Toxicology*. **2019**, *19*, 23.

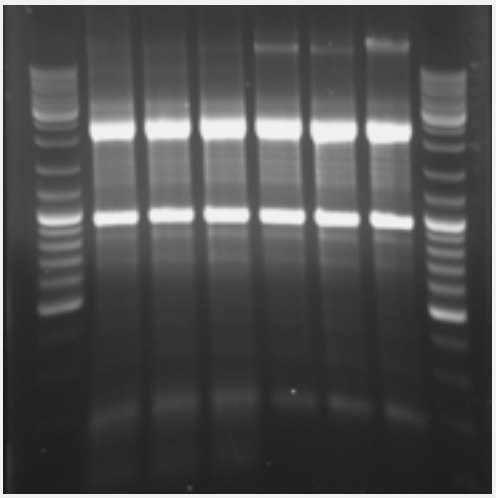
RapidPure RNA Tissue Kit – 112721050

Pure RNA without DNase digestion

Highly purified RNA for better RT-PCR results – up to 150 µg RNA in less than 20 minutes	Selective DNA removal during lysis	No DNase digestion required

The RapidPURE RNA Tissue Kit is designed to isolate and purify high quality total RNA from small amounts of various human and animal tissues (e.g. muscle, liver, heart, and brain), tissue sections from lung, spleen, or kidney and paraffin embedded tissue samples. The kit can also be used for simultaneous isolation of total RNA and proteins.

Special buffer conditions guarantee an efficient lysis of the starting material and a simultaneous inactivation of endogenous RNases. Genomic DNA is separated from the total RNA by binding to specially optimized mineral carrier particles included in the Lysis Buffer. A specialized buffering system allows RNA species of sizes down to 200 base to bind to the Spin Filter membrane.



Total RNA was isolated from 3T3 cells using the RapidPure RNA Tissue kit. 10 µL of the RNA eluate was used for the analysis using denaturating gel electrophoresis.

Automated Nucleic Acid Purification Platform

MPure-12™ is an automated benchtop system for rapid purification of nucleic acids from a wide variety of animal tissues and cells using magnetic bead separation technology. Combined with a uniquely designed magnetic bead processing chamber, the fully integrated and easy to use pre-packaged reagent kits deliver superior yields of nucleic acids and high quality results at an affordable price.

Step away from the norm and experience the difference in nucleic acid purification.

- Fully automated and integrated platform that offers cost and time savings
- Reproducibility, lot-to-lot consistency, scalability, ease-of-use and convenience
- Highest quality and yield of DNA and RNA for downstream applications
- Flexibility and simplicity: 1-12 samples from a wide range of biospecimens processed in a single cycle
- No cross-contamination of samples due to the unique platform design
- Minimized nucleic acid loss and degradation

The MPure-12 system employs an advanced magnetic bead separation technology that enables rapid and efficient purification of nucleic acids. This process includes four main steps: lysis, binding, washing and elution. Purifying nucleic acids with the MPure-12 system takes only 35 to 70 minutes depending on the selected protocol and kit.

High Quality, Reliable, Consistent Results.
Explore New Possibilities in Nucleic Acid Purification

Description	Size	Cat. No.
MPure-12™ System Fully automated platform for isolation of up to 12 nucleic acid samples	1 unit	117002200
MPure Blood DNA Extraction Kit Purification of genomic DNA from mammalian whole blood, peripheral blood mononuclear cells, buffy coat	48 preps	117022100/ 117022200
MPure Tissue DNA Extraction Kit Purification of genomic DNA from a variety of animal tissues, swabs and blood stains	48 preps	117022400
MPure Cultured Cell DNA Extraction Kit Purification of genomic DNA from cultured cells	48 preps	117022500

Wildlife Monitoring

Studying and understanding animals in the wild can provide impactful insight into the world around us and how certain circumstances can positively or negatively affect a species. However, there are many challenges related to collecting information on wild animals, especially when trying to understand the effect of stressors, both natural and man-made. Some methods of data collection can be considered invasive (blood collection), which can lead to unnatural stress levels that can potentially impact a research study. Non-invasive methods have become increasingly important and allow researchers to collect samples in a way that minimizes added stress. Such non-invasive samples include fecal matter and feathers. There are advantages associated with each type of sample, and our Corticosterone Radioimmunoassay test provides a means for obtaining the most accurate measurements of glucocorticoids from practically any sample.

"Cortisol metabolites were measured in faeces using a commercially available double antibody 125I Corticosterone RIA Kit (MP Biomedicals LLC, Thermo Fisher Scientific), that has been validated for several species (Chinnadurai et al. 2009, Millspaugh & Washburn 2004, Wasser et al. 2000) including South African herbivores (Franceschini et al. 2008). Although validation and antibody specificity was not determined in this experiment, several studies have concluded that the double-antibody RIA for corticosterone shows a better performance in the detection of FGMs in different non-domestic species because of its high cross-reactivity with different metabolites (Graham & Brown 1996, Möstl & Palme 2002, Terio et al. 1999, Wasser et al. 2000, Wielebnowski et al. 2002)."

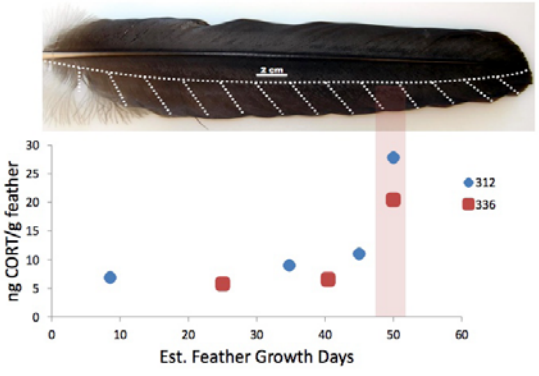
Brown, K.L. The effect of capture, confinement and immobilization on acute phase proteins, and immune and haemostatic responses in the impala (*Aepyceros melampus*). *Dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand.* 2017.

Measuring Handling Stress at Multiple Time Scales in the Chronically Lead-exposed California Condor

Conclusions

- RIA better suited for measurement and comparison of corticosterone and corticosterone metabolites across all sample types in study: plasma, urates and feathers
- Both RIA and ELISA return accurate and precise corticosterone measurements for condor plasma
- Results highlight the need to validate immunoassays for novel sample types
- Capture and handling elicits an increase in corticosterone release, measureable in urates and feathers
- Corticosterone responses to capture and handling stressor varies widely among individual condors (2-11 fold over baseline)

6. Feather grown during capture and handling stressor has higher corticosterone concentration than feather grown before stressor



Feathers from condors 312 and 336. Red arrows indicate size and location of sections on primary feather. Red shading indicates estimated time of handling event. Each section represents 4-5 days of feather growth.

Kuspa, Z.; Tubbs, C.; Smith, D.R.; et al. Measuring Handling Stress at Multiple Time Scales in the Chronically Lead-exposed California Condor. *UC Santa Cruz Graduate Research Symposium.* 2016.

Wildlife Stress Research

Validation of Fecal Glucocorticoid Metabolite Assays for South African Herbivores

"Fecal glucocorticoid metabolite (FGM) assays are a popular means of monitoring adrenocortical activity (i.e., physiological stress response) in wildlife. Species-specific differences in glucocorticoid metabolism and excretion require assay validation, including both laboratory and biological components, before assay use in new species. We validated a commercially available radioimmunoassay (MP 125I corticosterone RIA kit [MP Biomedicals, Solon, OH]) for measuring FGMs of several South African herbivores, including giraffe (Giraffa camelopardalis), impala (Aepyceros melampus), nyala (Tragelaphus buxtoni), kudu (Tragelaphus strepsiceros), wildebeest (Connochaetes taurinus), and zebra (Equus burchelli).

We validated an RIA that is capable of accurate and reliable quantification of FGM levels in 6 South African herbivores. Combined with other validation studies, our research demonstrates the utility of this RIA for FGM quantification in a diversity of wildlife species...For South African wildlife managers, this validation represented the first necessary step to successfully monitor the physiological stress response of several important wildlife species."

Chinnadurai, S. K.; Millspaugh, J. J.; Matthews, W. S.; Canter, K.; Slotow, R.; Washburn, B. E.; Woods, R. J. *The Journal of Wildlife Management.* **2009**, *73*, 1014-1020.

Ameliorating transport-related stress in endangered Kemp's ridley sea turtles (*Lepidochelys kempii*) with a recovery period in saltwater pools

"Sea turtle rehabilitation clinics and aquaria frequently transport stranded sea turtles long distances out of water, e.g. for release at sites with appropriate water temperatures. Endangered Kemp's ridley turtles (Lepidochelys kempii) are known to exhibit an adrenal stress response during such transports...Six hours in a saltwater pool appears to facilitate the recovery of Kemp's ridley sea turtles from transport-related stress and may therefore improve their readiness for release.

Unextracted plasma samples were assayed for corticosterone using a double-antibody 125I radioimmunoassay previously validated for Kemp's ridley turtle plasma (Hunt et al., 2012; catalog #07-120103, MP Biomedicals, Solon, OH, USA)."

Hunt, K.E.; Innis C.; Merigo, C.; Burgess, E.A.; Norton, T.; Davis, D.; Kennedy, A.E.; Buck, C.L. *Conserv Physiol.* **2019**, *7(1)*.

Effects of Neonicotinoid Insecticides on Physiology and Reproductive Characteristics of Captive Female and Fawn White-tailed Deer

"Over the past decade, abnormalities have been documented in white-tailed deer (Odocoileus virginianus) in west-central Montana. Hypotheses proposed to explain these anomalies included contact with endocrine disrupting pesticides, such as imidacloprid. We evaluated the effects of imidacloprid experimentally at the South Dakota State University Wildlife and Fisheries Captive Facility where adult white-tailed deer females and their fawns were administered aqueous imidacloprid (an untreated control, 1,500 ng/L, 3,000 ng/L, and 15,000 ng/L).

FT3 and FT4 thyroid hormones reflect the ability of the deer to utilize body fat reserves, regulate basal metabolic rate, and control thermal regulation...These assays were performed with commercially available solid-phase radioimmunoassay kits (FREE T3 Solid Phase Component System and Free T4 Solid Phase Component System, MP Biomedicals Diagnostics Division Orangeburg NY 10962). The volumes of sample, assay standards, and radioligand were used according to the manufacturer's protocol. Incubation times for free T3 and free T4 assays were 2.5 h and 1.5 h, respectively, at 37 °C."

Berheim, E. H.; Jenks, J. A.; Lundgren, J. G.; Michel, E. S.; Grove, D.; Jensen, W. F. *Scientific reports.* **2019**, *9(1)*, 4534.

All animals deserve to be treated with respect...even this guy!

Countless scientific discoveries have been made possible using animal models in preclinical research, which has led to breakthroughs in vaccine development, disease treatment and improved surgical techniques. Through many advances in technology and practical applications, animal testing has become more efficient and more humane, with the overall intent to cause less harm to animals while preserving the quality of research. Afterall, nearly every medical discovery involves animal testing and research. It is our ethical responsibility to properly care for our animal subjects and ensure the least amount of distress and discomfort possible during these critical research studies. Our immunoassays provide detailed information and insight on stress hormone levels for making decisions to help improve the welfare of laboratory animals and prevent avoidable discomfort.

Species Reference Table for MP Bio Immunoassays

		Mammal															
		Rodent										Bovidae					
Kit	Assay	Guinea Pig	Hamster	Hedgehog	Marmot	Mouse	Porcupine	Rabbit, Hare	Rat	Squirrel	Vole	Antelope	Bovine	Goat	Impala	Sheep	Wildebeest
RIA Kits	2-CAT							✓								✓	
	ACTH					✓			✓		✓					✓	
	Androstenedione																
	Corticosterone		✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓
	Corti-cote Cortisol								✓	✓			✓	✓	✓		
	Cortisol							✓	✓				✓	✓	✓		
	Estradiol					✓			✓				✓	✓	✓	✓	
	T3 (free)					✓											
	T4 (free)								✓								
	Gastrin								✓								
	Glucagon					✓			✓								
	Growth Hormone																
	Progesterone	✓				✓			✓				✓	✓	✓		
	Serotonin RIA					✓											
	T3 (total)					✓			✓				✓	✓	✓		
	T3 (uptake)					✓			✓								
	T4 (monoclonal)					✓			✓				✓	✓	✓	✓	
	Testosterone					✓			✓								
	Total Estrogen					✓	✓		✓			✓	✓	✓	✓		
EIA Kits	Cortisol																
	Estradiol	✓															
	T4 (free)								✓								
	HGH					✓			✓								
	Insulin	✓															
	Noradrenaline					✓											
	Progesterone					✓			✓								
	Corticosterone				✓				✓								
	Serotonin																
	T3 (total)		✓			✓			✓								
	T4 (total)					✓			✓								
	Testosterone					✓			✓								

		Mammal													
		Canine					Cer-vidae		Feline					Mus-telid	
Kit	Assay	Coyote	Dog	Dog, African Wild	Fox	Wolf	Deer, White Tail	Moose	Cat	Cheetah	Hyena	Jaguar	Leopard, Snow	Ferret	Sea Otter
RIA Kits	2-CAT														
	ACTH		✓												
	Androstenedione		✓						✓					✓	
	Corticosterone	✓		✓	✓	✓	✓			✓	✓	✓	✓		
	Corti-cote Cortisol														
	Cortisol														
	Estradiol		✓						✓						
	T3 (free)		✓			✓									
	T4 (free)														
	Gastrin		✓						✓						
	Glucagon		✓												
	Growth Hormone														
	Progesterone														
	Serotonin RIA														
	T3 (total)		✓			✓									
	T3 (uptake)														
	T4 (monoclonal)		✓												
	Testosterone		✓								✓				
	Total Estrogen			✓											✓
EIA Kits	Cortisol														
	Estradiol							✓							
	T4 (free)														
	HGH														
	Insulin														
	Noradrenaline														
	Progesterone														
	Corticosterone														
	Serotonin														
	T3 (total)														
	T4 (total)														
	Testosterone														

		Mammal											
		Primate							Other				
Kit	Assay	Ape	Baboon	Bonobo	Gorilla	Marmoset	Monkey	Other Primates	Armadillo	Bat	Camelid	Elephant	Equine, Zebra
RIA Kits	2-CAT												
	ACTH												✓
	Androstenedione					✓							
	Corticosterone		✓	✓			✓	✓	✓			✓	
	Corti-cote Cortisol				✓		✓					✓	
	Cortisol	✓					✓			✓			✓
	Estradiol		✓				✓	✓					
	T3 (free)												
	T4 (free)												
	Gastrin						✓						✓
	Glucagon												
	Growth Hormone		✓				✓						
	Progesterone		✓				✓	✓			✓	✓	✓
	Serotonin RIA												
	T3 (total)		✓										
	T3 (uptake)												
	T4 (monoclonal)		✓										
	Testosterone						✓						
	Total Estrogen		✓				✓					✓	✓
EIA Kits	Cortisol												
	Estradiol												
	T4 (free)												
	HGH												
	Insulin												
	Noradrenaline												
	Progesterone												
	Corticosterone												
	Serotonin												
	T3 (total)												
	T4 (total)												
	Testosterone						✓						

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Mammal								Avian																				Fish										Reptile				Amphib-ian				
Other																																													
Giraffe	Kangaroo	Panda	Pig	Rhino	Seal	Whale	Avian	Budgerigar	Canary	Chicken	Condor	Conure	Crane	Duck	Finch	Kestrel	Kingbird	Owl	Parrot	Perch	Quail	Seagull	Sparrow	Starling	Fish	Goldfish	Salmon	Shark	Shiner	Stickleback	Tilapia	Toadfish	Trout	Alligator	Lizard, Fence	Snake	Turtle	Frog	Salamander	Tadpole		
																																								2-CAT	RIA Kits
✓			✓																					✓							✓	✓								ACTH	
			✓																																					Androstenedione	
	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓					✓			✓												✓		✓	✓	✓			Corticosterone	
																																								Corti-cote Cortisol	
✓			✓		✓															✓					✓	✓	✓				✓	✓	✓								Cortisol	
			✓											✓	✓						✓												✓				✓				Estradiol	
																									✓				✓				✓								T3 (free)	
																									✓				✓				✓								T4 (free)	
																																								Gastrin	
																																								Glucagon	
																																								Growth Hormone	
✓			✓																																					Progesterone	
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						✓																			✓			✓														T3 (total)	
																																									T3 (uptake)	
																									✓			✓					✓				✓				T4 (monoclonal)	
								✓		✓	✓	✓					✓						✓	✓	✓													✓	✓			Testosterone	
✓		✓				✓												✓																								Total Estrogen	
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																																									HGH	
																																									Insulin	
			✓																																					Noradrenaline	
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																																									Corticosterone	
								✓			✓	✓																														Serotonin	
								✓								✓													✓					✓			✓		✓			T3 (total)	
		✓						✓								✓									✓	✓			✓					✓			✓		✓			T4 (total)	
																✓																		✓								Testosterone	

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