



## 两种微生物学等级老龄Wistar大鼠血清生化值比较

In order to improve the quality of laboratory animals for animal research, China modified the standards of laboratory animals after World Trade Organization (WTO) entry, especially those for the microbiological classification. The classification of conventional rats has been abolished, first in Beijing and Guangdong Province in 2001, and now specific pathogen-free (SPF) laboratory animals have been widely adopted in medical researches.

It has been found that the serum biochemistry of SPF rats, especially the aged rats, is significantly different from that of the conventional rats. But currently no documentation of the serum biochemical profiles is available, so that difficulty may arise in accurate analysis of the results obtained from the SPF rats. In this study, we examined the serum biochemical profiles of aged SPF Wistar rats using automatic blood biochemical analyzer in comparison with those of the conventional rats.

### MATERIALS AND METHODS

#### Laboratory animals

Thirty aged conventional rats (500-600 d), half male and half female weighing 420-600 g, were provided by the Department of Medical Research of Guangzhou General Hospital of Guangzhou Command (licensed for breeding). Thirty aged SPF Wistar rats (500-600 d) with equal number of the sex weighing 420-600 g were provided by the Experimental Animal Center of First Military Medical University, with certificate for commercial purposes issued by Guangdong Province.

#### Blood sample collection and testing

After a 12 h fasting with also deprivation of water, all Wistar rats were anaesthetized with the compounds of ketamine, promethazine and atropine (volume ratio of 2:2:1), and 3 ml blood was drawn with syringe from the heart for testing. Coulter-JT automatic biochemical analyzer manufactured by Coulter Instrument Co. (USA) was used for the measurement.

#### Statistical analysis

The data were analyzed by SPSS 10.0 software and expressed as Mean $\pm$ SD. Comparisons of serum biochemical measurements between aged SPF and conventional Wistar rats were performed using one-way ANOVA.

### RESULTS

Tab.1 lists the comparison of serum biochemistry between the SPF and conventional aged Wistar rats.

The serum levels of alanine aminotransferase (ALT), total protein (TP), alkaline phosphatase (ALP), total cholesterol (TC), triglyceride (TG), blood urea nitrogen (BUN), creatinine, Fe, P, blood glucose, uric acid (UA), and low-density lipoprotein (LDL) were very significantly different between male and female aged SPF Wistar rats ( $P<0.01$ ), with also significant differences in albumin, LDH and APOB ( $P<0.05$ ).

Between male aged Wistar rats of the two grades, the differences of TP, albumin, A/G ratio, TC, TG, blood glucose, APOA-1, APOB, UA, HDL, LDL, and glutamic oxalacetic transaminase (GOT) were very significant ( $P<0.01$ ), and ALT, Fe, as well as Mg also differed significantly ( $P<0.05$ ).

Between female aged Wistar rats of the two grades, the differences of ALT, TP, albumin, ABG, ALP, TG, BUN, CRE, Fe, APOA-1, APOB, HDL, LDL, and bile acid were very significant ( $P<0.01$ ), with also significant difference in Mg ( $P<0.05$ ).

**Tab.1 Comparison of serum biochemistry between aged SPF and conventional Wistar rats (Mean±SD)**

Indices	Unit	SPF (n=30)		Conventional (n=30)		F value	P value
		Male	Female	Male	Female		
ALT	U/L	47.5±6.98	37.1±9.05**	54.7±7.4 <sup>△</sup>	73.4±7.7 <sup>△△</sup>	57.2	0
TP	g/L	61.7±2.10	64.6±1.96**	67.5±2.49 <sup>△△</sup>	71.1±4.53 <sup>△△</sup>	27.5	0
Albumin	g/L	43.1±1.77	44.7±1.79*	38.4±1.14 <sup>△△</sup>	34.8±3.01 <sup>△△</sup>	73.4	0
A/G ratio		2.31±0.14	2.28±0.13	1.31±0.08 <sup>△△</sup>	0.96±0.17 <sup>△△</sup>	376.5	0
ALP	U/L	144±6.95	85.1±13.1**	126.1±24.0	177±79.2 <sup>△△</sup>	12.5	0
TC	mmol/L	2.11±0.07	1.62±0.12**	1.68±0.12 <sup>△△</sup>	1.53±0.19	52.9	0
TG	mmol/L	2.14±0.35	1.80±0.41**	1.43±0.37 <sup>△△</sup>	0.78±0.10 <sup>△△</sup>	47.3	0
BUN	mmol/L	8.65±0.36	7.36±0.72**	8.27±1.04	9.10±1.54 <sup>△△</sup>	7.9	0
Creatinine	μmol/L	48.87±4.4	38.0±3.38**	10.4±2.70	66.5±6.22 <sup>△△</sup>	48.4	0
Fe	μmol/L	41.9±3.02	65.7±7.30**	36.5±6.88 <sup>△</sup>	41.2±4.26 <sup>△△</sup>	80.5	0
LDH	U/L	1218±278	978±218*	1167±437	1113±160	1.86	0.15
P	μmol/L	2.17±0.16	1.88±0.10**	2.13±0.24	1.96±0.24	7.17	0
Blood glucose	μmol/L	8.18±1.09	9.07±0.37**	10.1±0.87 <sup>△△</sup>	9.12±0.82	14.5	0
Mg	μmol/L	0.91±0.07	0.91±0.05	0.96±0.04 <sup>△</sup>	0.97±0.05 <sup>△</sup>	5.26	0
ApoA1	g/L	0	0	0.02±0.005 <sup>△△</sup>	0.02±0.01 <sup>△△</sup>	99.56	0
ApoB	g/L	0.35±0.04	0.42±0.03*	0.04±0.005 <sup>△△</sup>	0.04±0.05 <sup>△△</sup>	1212.3	0
Uric acid	μmol/L	86.2±23.5	61.2±14.8**	64.0±12.5 <sup>△△</sup>	64.0±12.5	27.9	0
HDL	mmol/L	0.60±0.03	0.58±0.04	0.71±0.07 <sup>△△</sup>	0.71±0.07 <sup>△△</sup>	29.26	0
LDL	mmol/L	0.22±0.03	0.11±0.08**	0.18±0.04 <sup>△△</sup>	0.16±0.33 <sup>△△</sup>	44.0	0
GOT	U/L	174±34.5	158±54	135.2±43.1 <sup>△△</sup>	150±21.4	2.53	0.66
PBA	μmol/L	11.8±4.34	14.2±4.76	12.4±5.94	26.2±5.2 <sup>△△</sup>	26.56	0

\* $P<0.01$ , \*\* $P<0.05$  vs male SPF rats; <sup>△</sup> $P<0.01$ , <sup>△△</sup> $P<0.05$  vs male SPF rats; <sup>△</sup> $P<0.01$ , <sup>△△</sup> $P<0.05$  vs female SPF rats

## DISCUSSION

SPF laboratory animals are bred in a barrier system and strictly isolated from microorganisms, thereby various pathogens likely to influence the animal products and results of animal experiments are eliminated [1] for ensuring the accuracy and reliability of the results of the animal experiments. Such an advantage of the animals in life science researches has been recognized by world-wide researchers [2].

In China, SPF rats have been widely adopted since the abolishment of the classification of conventional rats. The aged SPF Wistar rats have also become the primary choice for researches in geriatrics that is attracting increasing attentions at present [3] [4]. The statistical investigation

of serum biochemical indices in aged SPF and conventional rats have not been reported yet in China. The results of this study showed that different microbiological grades significantly affected the serum biochemistry of these rats, a finding that may provide valuable reference for future medical researches with such animals.

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