

10012- Use of laboratory generated dust as proxy exposure indicator in agricultural field operation

Agricultural workers are prone to exposure to mixed dust of inorganic and organic compounds. Diverse working conditions and operations in agriculture make direct measurements of the mixed dust exposure difficult. This study was conducted to develop a new dust generation system to determine possible exposure potency indicators of soil samples. The dust generator consists of a blower, a rotating chamber and a settling chamber. The rotating chamber has inner baffles to provide sufficient agitation of the samples while the chamber is rotating. A blower provides air into the rotating chamber, and the suspended dust is moved to the settling chamber through a perforated pipe. A small fan inside the settling chamber helps maintain suspension of the dust. Various size fractions of dust are sampled on filters suspended in the chamber via outlet ports and attached pumps. Air pressure is released through a filter plate mounted on the wall of the settling chamber. The following operating conditions were used to optimize results for dust sample: 300 g soil sample, blower choke 1/4 open, sampling time of 3 minutes, rotation speed of 16 rpm. To evaluate the characteristics of dust from the generation system, we collected dust samples from agricultural fields while the soil was prepared for planting. Bulk soil samples were collected from the fields where dust samples were collected. Analytical results using X-ray diffractometry (XRD) for mineralogical composition, and scanning electron microscope energy-dispersive X-ray spectra indicated that mineralogical and elemental characteristics of laboratory-generated dust and agricultural field dust are similar. It was observed that soils with higher silt and clay percentages produced more dust than soils with higher sand content. Soil with higher moisture content produced less dust than the same soil at lower soil moisture content. The results suggest that the new dust generation system can provide valuable information about soil dust characteristics.

10031- A STUDY ON ISOLATION AND PURIFICATION OF THE GENE EUKARYOTIC VECTOR VR1012 OF Sj28GST AND Sj23 *SCHISTOSOMA JAPONICUM*

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Abstract: The gene encoding Sj28GST and Sj23 (membrane protein) antigens of *Schistosoma Japonicum*(Chinese strain) was inserted into eukaryotic vector VR1012, then transected bacterium TG1. With this method to extrust plasmid DNA, the results indicated that the DNA yield of Sj28 and Sj23 detained 292.158 μ g/ml and 344.295 μ g/ml respectively. This method of isolation and purification product is simple,high pure and stable .

Key words: *Schistosoma Japonicum*(Chinese strain), Sj28DNA, Sj23DNA, VR1012, isolation and purification, yield

**10042- STUDY OF IMMUNE EFFECTS IN CORN FARMERS WITHIN
THE AGRICULTURAL HEALTH STUDY**

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When compared to the general population, farmers have an increased risk of non-Hodgkin's lymphoma (NHL). Factors that contribute to this excess risk have not yet been identified. While several epidemiologic studies have observed an increased risk of NHL among farmers who are exposed to certain pesticides (i.e., phenoxyacetic acids, organophosphates, organochlorines, and triazines), these studies have not been conclusive. In addition, a clear mechanistic association between farming or pesticide exposure and subsequent development of cancer has not been identified. It has been hypothesized that altered immune function may be an indicator of increased potential for the development of immunologically-based diseases such as NHL. Therefore, research into immunologic perturbations due to farming activities and exposures holds some promise in discerning disease mechanisms and in identifying specific etiologic agents for immunologically-based diseases such as NHL. Few such studies have been conducted. We have recently launched a study of immune effects in corn farmers within the Agricultural Health Study (AHS) cohort. The main objective is to evaluate the changes in immune function throughout the growing season. Farmers and control subjects will be contacted just prior to planting (March-April) to be enrolled in the study. Biological sampling before and after planting and application of preemergent pesticides including atrazine will allow examination of short-term biologic effects associated with specific pesticide exposures and general planting activities (e.g., tillage). The first postemergent application of chlorpyrifos will also be monitored, in order to evaluate short-term biologic effects associated with this organophosphate insecticide exposure. Mid-season, post-harvest, and off-season samples will be collected to allow evaluation of overall immune effects of farming activities during one growing season. Pesticide exposures (e.g., atrazine, organophosphates, and potentially 2,4-D or carbamates) will be primarily assessed by measurement of the parent compound or its metabolites in urine, and by empirical exposure modeling based on supplementary information on farming activities and work practices. Immune function will be assessed by means of multiple assays including complete blood cell- and differential cell counts, direct measurement of cytokines, immunoglobulins, and autoantibodies in plasma, and functional assays involving stimulation of cultured lymphocytes to measure proliferation and cytokine production. Farmers will serve as their own self-controls, and a selected control group will provide a means for external comparison. By presentation of our study design and preliminary field experience, we hope to stimulate discussion regarding effective conduct of such mechanistic studies in exposed populations.

10206- TITLE: Mortality Among A Cohort of Female Farm Residents in New York State

ABSTRACT: A retrospective cohort study of mortality among 6,405 female farm residents who are New York Farm Bureau members or members' spouses or relatives was conducted from 1980 through 1993. Similar to the previous findings for New York State male farmers, the female farm resident cohort experienced significantly lower mortality rates for all causes including malignant neoplasms compared to rural non-farm female residents. The findings suggest that farmers of both genders had favorable habits with respect to several life-style factors, and they therefore agree with results from other studies on farmers.

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10207- Agricultural chemical exposure and birth defects in the Eastern Cape, South Africa.
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Abstract

Introduction: A case - control study was conducted in the rural area of the Eastern Cape, South Africa, to investigate the association between pesticide exposure and the prevalence of congenital malformations in agricultural workers. A total of 89 cases and 178 controls were interviewed. Data from the Register of the Department of Paediatrics at the Cecilia Makiwane Hospital were analysed with regard to birth defects. The cases were those who were diagnosed with selected defects during the first year of their lives. Controls were chosen from the same area as the cases, ensuring the same socio-economic background. Similar studies have been conducted in the developed world and they confirmed the existence of an association between pesticide exposure and birth defects. This study, conducted in a rural African environment, set out to examine whether a similar association exists.

Aim: The aim of this study was to establish the association between birth defects and pesticide exposure.

Method: A structured questionnaire was used as the principal data collection instrument. The data was analysed using logistic regression with birth defect as the response. Pesticide exposure and some socio-economic factors were the predictors.

Results: Statistical analyses of the data showed a significant association between pesticide exposure in gardens and fields and birth defects, with an OR = 9.52 , a 95 % CI of (4.91, 18.57) and $p < 0.005$. Results of exposure from dipping animals showed an OR = 2.15, a 95 % CI of (1.23, 3.75) and $p < 0.004$. Of the dipping animals, exposure to cattle alone was statistically significant with an OR =2.53, a 95 % CI of (1.4, 4.7) and $p < 0.0014$. Exposure to water stored in plastic containers which were previously used for chemical storage was also significant with an OR =1.87, a 95 % CI of (1.06, 3.31) and $p < 0.02$.

Conclusion: It has been established in this study that there is a statistically significant association between pesticide exposure and birth defects. However, since this study was restricted to one study area it is necessary that similar studies be carried out in other regions of Africa. These studies should aim at identifying the chemicals used for pesticide and weed control in both crop and livestock farming. The outcomes of such studies would enable policy makers to make informed decisions on programmes that could be implemented in order to prevent or minimise the prevalence of birth defects.

Recommendations: Educational programmes on safe use of pesticides, especially for rural women, need to be designed and implemented. Alternative farming methods should be introduced. Storing water meant for household use in containers previously used for chemical storage should be discouraged. Finally, a national birth register with details of child birth conditions and the mother's socio-economic activities should be developed as a way of monitoring the prevalence of congenital malformations.

10208- FARM WORK AND AGRICULTURAL EXPOSURES AMONG CHILDREN ON KENTUCKY BEEF CATTLE FARMS.

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With 71,000 family-owned and operated farms, many Kentucky children are active participants in farm labor operations. Previous research has suggested that children living on Kentucky beef cattle farms may be at an increased risk for work-related injuries compared to children on other commodity farms, such as tobacco or grain. We report results from a three-year longitudinal cohort study of children age 5-18 years working on family farms in Kentucky. The primary purpose of the study was to characterize the work tasks, agricultural exposures, and farm work injuries among these children. Baseline data were obtained by telephone interview from parental or guardian proxies from a two-stage cluster sample of 999 children living on Kentucky farms in 1995 (86% response) with follow-up telephone interviews in 2000 (N=299) and 2001(N=242). Animal-related injuries were the third most prevalent type of injuries reported among children at baseline, following injuries from foreign objects and injuries due to machinery. Boys age 16-18 had the highest rate of farm work injuries. Among children age 5-18 years interviewed in 2000, 82% were involved in farm work one or more hours per week during the school year. The mean hours of farm work per week ranged from 2.2 hours (SE=0.31) for girls 5-9 years to 9.0 hours (SE=1.3; range 1-35 hours) for boys 15-18 years. An ANCOVA model was used to examine differences in farm work hours per week while controlling for current age, gender, usual level of

supervision, the number of children working on the farm, the age child began to participate in farm work, and the number of beef cattle per farm. Children who began doing farm work early in life (before age 7) performed more hours of farm work per week at interview (adjusted difference = 3.2; SE= 1.3) compared to children who began farm work after age 7. Similarly, children who worked on farms with greater than 40 head of beef cattle performed more hours of farm work per week (adjusted difference = 2.3; SE=1.4) compared to children living on farms with less than 40 cattle (adjusted difference = 1.8; SE=1.3) or other commodity farms. Among children living on beef cattle farms who did farm work, 51% (95% CI: 0.43-0.58) participated in loading and unloading cattle, 40% (95% CI: 0.32-0.48) treated cattle with medications or ear tags, and 23% (95% CI: 0.16-0.29) worked in a yard with a bull. Our data confirm a greater number of hours of farm work per week for children on beef cattle farms, relative to other farms, and document their involvement in many tasks and activities that place them in direct contact with cattle and may increase their risk for farm work related injuries.

10248- Understanding the Pesticide Knowledge and Beliefs of Adolescent Farmworkers

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It is estimated that adolescents make up seven percent of the seasonal agricultural workforce in the US. These young workers may be at increased risk for the toxic effects of environmental exposures encountered during their work. Furthermore, language barriers and health beliefs may influence the risk perceptions and protective behaviors of this population. Cross-sectional surveys of 263 migrant Latino adolescent farmworkers were conducted in three agricultural communities throughout Oregon between 1998-2001. Adolescents were recruited in migrant labor camps and English as a Second Language programs. Questionnaires were administered by personal interviews with trained bilingual research staff and explored knowledge of pesticides and their effects, agricultural work experience, and occupational health beliefs. While pesticide training is an occupational requirement for fieldworkers, only 29.2% of the adolescents reported having received pesticide training prior to beginning agricultural work. Of the youth participating in this study, 24.6% indicated they currently or previously mixed and/or applied agricultural chemicals, an activity that requires specialized training or certification and has specific age restrictions. Adolescents described common health effects associated with pesticide exposure and measures that one could take to decrease exposure. When adolescents were asked if they believed that a teenager working in the field would experience some health problems in the future, 33.2% reported that it was somewhat to definitely likely. The adolescent farmworkers differed on their knowledge of hazards associated with pesticides according to the geographic areas in which they worked. A subgroup of 81 participants was given worker protection training in the form of a EPA approved video or flip chart. Responses to the knowledge questions were analyzed and certain areas such as dermal exposure and chronic health effects associated with exposure appeared more difficult for the adolescents to comprehend. The results of this study point to a need for improved pesticide training in youth agricultural workers and specialized education efforts directed toward the increasing number of minority youth speaking indigenous dialects. Special attention is merited towards those adolescent farmworkers who report that their work includes mixing or applying agricultural chemicals. As the number of adolescent farmworkers increases in the U.S. and the characteristics of the migrant stream continue to change, culturally and developmentally appropriate instruments are needed to adequately assess the health beliefs and protective practices of this population.

10426- Exposure of Canadian Male Farm Residents to Animals and Hodgkin's Disease. ¹Pahwa P, McDuffie HH¹, McLaughlin JR², Spinelli JJ³, Dosman JA¹, Fincham S⁴, Robson D⁵
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Known risk factors for Hodgkin's disease (HD) include a family history of cancer, especially cancers of the hematopoietic system, exposure to specific pesticides (diazinon, chlorpyrifos) and certain infectious, autoimmune and viral medical conditions. We conducted a six province incident case (n = 316), control (n = 1506) population-based study of HD among men. Farm residence was reported by 38% (n = 119) of cases and 45% (n = 673) of controls. We evaluated their exposure to animals on the farm because animals may develop leukemia or lymphoma, transmit viruses to humans and because we reported that raising swine and exotic animals were independent risk factors for non-Hodgkin's lymphoma. We evaluated exposure to farm animals (cattle, dogs, cats, chickens, horses, swine, turkeys, ducks, geese, sheep, rabbits, goats and exotics), personally caring for any of these animals and the presence/absence on the farm of animals with leukemia or lymphoma. Covariates included selected medical conditions, occupational exposures, exposure to pesticides classified into broad categories such as herbicides, insecticides, fumigants and fungicides, personal and family history of cancer. We conducted conditional logistic regression analyses and report odds ratios (OR_{adj}) and 95% confidence intervals (95% CI) adjusted for age and province of residence. Variables which were statistically significant at the univariate level (OR_{adj} (95% CI)) were: a diagnosis of shingles (4.70 (2.11, 10.45)), a history of treatment for head/body lice (2.44 (0.99, 6.02)), occupational exposure to uranium (6.96 (2.04, 23.8)), and exposure to sheep and cattle dip/veterinary drugs (0.28 (0.08, 1.03)). Among the variables related to animals, exposure to dogs and horses as well as personally caring for animals met the criterion (p ≤ .20) for inclusion in the final model. After adjustment for covariates, a diagnosis of shingles (4.66 (1.96, 11.1)), treatment for head or body lice (2.64 (1.01, 6.94)) and occupational exposure to uranium (4.74 (1.28, 17.5)) increased the risk of Hodgkin's disease. Exposure to farm animals had no effect on risk. Supported by Health Canada, British Columbia Health Research Foundation, Centre for Agricultural Medicine.

10579- Soft Tissue Sarcoma Among Canadian Male Farm Residents. McDuffie P¹, Fincham S², Dosman JA¹, Spinelli JJ³, McLaughlin JR⁴, Robson D⁵

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Soft tissue sarcomas (STS) constitute a heterogeneous mix of cancers which are rare individually or in the aggregate. Known, suspected and inferred risk factors are diverse including certain occupations, phenoxyherbicides as a group, individual phenoxyherbicides, viral and autoimmune medical conditions, previous personal history of cancer, history of cancer in first degree relatives and therapeutic radiation. Contradictory conclusions have been reported utilizing data from well-conducted studies. We conducted a six province incident case (n = 365), control (n = 1506) population-based questionnaire study of STS among men. Farm residence was reported by 159 (43.1%) cases and 673 (45%) controls. We evaluated their exposure to farm animals: cattle, dogs, cats, chickens, horses, swine, turkeys, geese, sheep, rabbits, goats and exotics, personally caring for these animals, and the presence/absence of leukemia or lymphoma among the animals. Selected covariates included a previous diagnosis of cancer, a medical implant, allergy skin prick tests, occupational exposure to uranium or radium, certain jobs and exposure to pesticides classified into broad categories such as herbicides or insecticides. We conducted conditional logistic regression analyses and report odds ratios (OR_{adj}) and 95% confidence intervals (95% CI) adjusted for age and province of residence. Variables which were statistically significant at the univariate level were: a previous history of cancer (1.57 (1.07, 2.29)), temporary jobs in chicken farming (1.63 (1.05, 2.52)) and exposure to sheep/cattle dips/veterinary drugs (0.09 (0.01, 0.70)). Among the variables related to animals, exposure to cats and personally caring for animals met the criterion ($p \leq 0.20$) for inclusion in the final model. After adjustment for covariates, a personal history of cancer (1.58 (1.07, 2.34)), and temporary jobs in chicken farming (1.73 (1.07, 2.77)) increased risk for STS while exposure to sheep/cattle dips/ veterinary drugs (0.10 (0.01, 0.77)) reduced risk. Exposure to farm animals had no effect on risk. Supported by Health Canada, British Columbia Health Research Foundation, Centre for Agricultural Medicine.

10835- The Association Between Use of Farm Chemicals and Neurological and Depression Symptoms in a Cohort of Farmers.

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Regulations governing toxicity of farm chemicals, improvement of formulations, packaging to minimize handling, and safer application techniques have helped reduce exposure and the risk of acute poisoning from such exposure. But farmers remain concerned that long-term exposure to low doses of farm chemicals leads to the increased prevalence of nonspecific, multiple-cause diseases, reproductive disorders, and higher mortality rates. The Iowa Farm Family Health and Hazard Surveillance Project (IFFHHSP) was a multi-year environmental health and safety study conducted with farmers in 18 randomly-selected Iowa counties. The present study aims to investigate the association between neurological and depression symptoms and exposure to farm chemicals and to determine if wearing gloves at the time of exposure made any difference. Neurological symptoms were measured using a 24-item scale to which subjects responded to each symptom with “Not at all, A little, Moderately, Quite a bit, or Extremely.” Three items closely related to arthritis (difficulty moving/grasping with fingers, numbness/tingling in fingers or toes) were removed from the analysis. Responses were summed, and those with a score of 10 or more were considered to have high levels of neurological symptoms. Depression symptoms were measured using the 20-item Center for Epidemiological Studies – Depression (CES-D) Scale. Those with a score of 16 or more were considered to have high levels of depression symptoms. Chi square analyses of the responses of 385 male farm operators indicated that older farmers were more likely than younger farmers to have high levels of neurological symptoms (OR 1.55, 95% CI 1.02, 2.35), while there was no such association with farm income and farm size. No association was found between age, farm income, or farm size and depression symptoms. While sixty-six percent of the respondents reported having been trained in farm-related occupational diseases and the safe use of farm chemicals, a smaller percentage actually personally applied farm chemicals: from 8.5% (insecticides on crop storage area) to 47% (herbicides). The only significant associations between farm chemical use and neurological symptoms were for those who applied livestock

pesticides (OR 1.55, CI 1.00, 2.40) and those who applied chemical fertilizer (OR 0.61, CI 0.39, 0.94). Few farmers reported using gloves for mixing and applying, and there were no differences in neurological symptoms between those who used gloves and those who didn't. Those who reported getting chemicals on their hands or arms while mixing or applying had higher levels of neurological symptoms than those who didn't (OR 1.67, CI 1.05, 2.64). The only significant association between farm chemical use and depression symptoms was for those who applied livestock pesticides (OR 1.79, CI 1.004, 3.19). Results show an association between some kinds of farm activities and neurological and depression symptoms.

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10861- Abstract for ISEA/ISEE 2002

Occupational Exposure in Agricultural Workers in Costa Rica

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Agriculture

A cross-sectional epidemiological study was conducted to determine the association between herbicide, specifically paraquat, exposure and respiratory health effects among agricultural workers in Costa Rica. While the study relied on questionnaire data to establish chronic exposure to the herbicide, exposure assessment was also carried out to verify exposure levels, exposure patterns and determinant factors of exposure. To assess exposure 173 agricultural workers were recruited, including 119 herbicide handlers and 54 controls, from banana, coffee and palm oil farms. Twenty-four hour urine samples were collected along with information about herbicide handling operations. All but one farm used a backpack sprayer for application of the herbicide. Most workers in coffee farms mixed, loaded and sprayed the herbicide. In banana and palm oil farms, a designated person mixed the herbicide while workers loaded and sprayed the herbicide. Personal protective equipments were rarely used on coffee farms, while workers on banana and palm oil farms have better protection. In addition, occupational inhalable dust exposures of agricultural workers were measured to determine the exposure route of paraquat. Inhalable dust samples were collected from 50 workers at nine farms using an IOM sampler with a 25 mm Teflon filter and an air flow rate of 2 L/min. Five samples were discarded because the filter papers were damaged with a hole. High humidity, the rainy season and the proximity of the sampler to plants during sampling were possible reasons for sampling error. A geometric mean of inhalable dust exposure of 45 subjects was $124.5 \mu\text{g}/\text{m}^3$ with a geometric standard deviation of $3.8 \mu\text{g}/\text{m}^3$. The dust exposure levels in banana and palm oil farms were slightly higher than those in coffee farms. Variations in dust levels between the farms and subjects were significant. Exposures on sunny days were about two times higher than those in rainy days.

10900- Prostate cancer among farmers: disease characteristics seem to be different among men with lifetime involvement in crop and animal farming.

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Reported literature suggests that the risk of prostate cancer may be higher among farmers and others involved in agricultural operations. This study investigates the risk of prostate cancer among farmers and examines certain disease characteristics among farmers and non-farmers.

Cancer is a reportable disease in Saskatchewan and the Saskatchewan Cancer Registry has a case ascertainment of 99%, because the physicians get paid upon registration of cases and cancer treatment costs are covered by universal health care. The Registry maintains a complete record of all cancer cases and sends follow-up letters every six months. Medical charts at the Saskatchewan Cancer Registry were reviewed for all cases diagnosed during the study period, 1985 – 1994. Pre-designed extraction forms were used to collect information at the time of diagnosis on age, prostate specific antigen (PSA) levels, stage and grade of tumor, smoking profile and reported major occupation. Occupational information was used to classify men as farmers or non-farmers; unreported or missing occupations were identified as unknown.

A review of 53486 medical charts of prostate cancer patients diagnosed during the study period comprised 31% farmers (n=1679), 27% non-farmers (n=1459) and 41% unknown (n=2210). The unknown group was not included in any further analyses for it includes farmers and non-farmers. The mean incidence of prostate cancer in Saskatchewan during the study period among farmers was 194.4/100,000 cases and among non-farmers 150.7/100,000 cases. The mean age at diagnosis was 73.0±7.5 years for the entire population and 72.9±7.4 years and 69.9±8.3 years for farmers, non-farmers respectively (p<0.01). Stage A or B tumor was diagnosed among 30% of farmers compared with 28% of non-farmers and stage C tumor was diagnosed among 39% of farmers compared with 30% of non-farmers. Metastasized tumor, stage D, was diagnosed among 33% of farmers and 28% of non-farmers. Approximately 19% of farmers and non-farmers were diagnosed with stages AB, BC or ABC. Well-differentiated tumor at the time of diagnosis was identified in 29% of farmers and 25% of non-farmers, moderately differentiated tumor in 33% of farmers and 30% of non-farmers and poorly differentiated tumor in 35% of farmers and 26% of non-farmers. Median PSA levels at diagnosis among farmers was 15.1 ng/ml compared with 13.4 ng/ml among non-farmers (p<0.05). Higher PSA levels were reported at the time of diagnosis among younger farmers compared to older farmers; the reverse was true for non-farmers.

Farmers were diagnosed with prostate cancer later in life and were also observed to have a higher median PSA level at diagnosis compared to non-farmers. Younger farmers were observed to have higher PSA levels compared to older farmers and the reverse was true for non-farmers. More of the farmers, although older, had localized and well to moderately well differentiated tumors compared to non-farmers.

11104- THE OBSERVATION FOR THE PHENOMENON OF *MICROTUS FORTIS*
AGAINSTING *SCHISITOSOMA JAPONICUM*

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Abstract *Microtus fortis*, Golden hamster, Balb/c mouse was infected by 1000, 200 and 40 *Schistosoma japonicum* cercariae separately in laboratory. On the day of the 1st, 2nd, 3rd, 4th, 5th, 7th, 9th, 12th, 15th, 16th, 18th, 19th, 21st, 22nd, 24th and 42nd after infected, the three kinds of each mice were dissected. Worms were collected, and checked under microscope. It was found that *Schistosoma japonicum* can not grow up in *Microtus fortis*, and all of the worms are disappearance on 19th day. However, the recovery rates of worms collected from Gold shrewmouse, Balb/c mouse was 65% and 60.6% separately. The inflammation reactions were observed in the lung and liver tissues while the *Microtus fortis* was infected, but the pathological changes were not so serious as that seen in Golden hanster and Balb/c mice, and recovered normal very soon. The experiment testified that the *Microtus fortis* did resist on *Schistosoma japonicum*.

Key Words: *Microtus fortis*, *Schistosoma japonicum*