

# PROGRAMA DE FORMACIÓN PARA LA INNOVACIÓN AGRARIA

FOLIO DE  
BASES

92

CÓDIGO  
(uso interno)

F01-01-2-017

## 1.- ANTECEDENTES GENERALES DE LA PROPUESTA

### NOMBRE DE LA PROPUESTA

ASISTENCIA AL CURSO DE VERANO "ECONOMIC ASPECTS OF APPLIED ANIMAL BREEDING"

### LUGAR DE FORMACIÓN

País : Canadá

Ciudad : Guelph

### TIPO O MODALIDAD DE FORMACION

Curso corto

### AREA DE FORMACIÓN

Rubro: Genética Animal

Tema: Aspectos económicos del mejoramiento genético.

### INSTITUCION O ENTIDAD RESPONSABLE QUE DICTA U ORGANIZA LA ACTIVIDAD DE FORMACIÓN A LA CUAL SE POSTULA

Nombre: Centre for Genetic Improvement of Livestock, University of Guelph

### POSTULANTE INDIVIDUAL

Nombre: Mario Alfodín Briones Luengo

RUT: 7.999.244-5

Dirección comercial: Vicente Méndez 595 Chillán

Dirección particular: Santa Cecilia 1666, Chillán

Fono: 42-208840

Fax: 42-270212

E-mail:

mabrione@udec.cl

Firma

### ENTIDAD PATROCINANTE (en caso que corresponda)

Nombre Entidad: Universidad de Concepción

RUT: 81.494.400-K

Dirección : Vicente Méndez 595

Fono: 42-208834

Fax: 42-270212

E-mail:

Representante Legal: Alejandro Santa María Sanzana

Nombre Entidad: Director General Campus Chillán

RUT: 5.144.003-K

Dirección : Vicente Méndez 595, Chillán

Fono: 42-208705

Fax:

E-mail: asantama@udec.cl

Firma



### ENTIDAD RESPONSABLE (Para propuestas grupales)

Nombre:

RUT:

Dirección comercial:

Dirección particular:

Fono:

Fax:

E- MAIL:

Firma

### COORDINADOR DE LA PROPUESTA (Para propuestas grupales)

Nombre:

Cargo en la Entidad Responsable:

RUT

Dirección:

Fono:

Fax:

E-mail:

Firma

### FECHA DE REALIZACION

Inicio: 9 de julio de 2001

Termino: 13 de julio de 2001

COSTO TOTAL DE LA PROPUESTA

\$ 1.366.219

FINANCIAMIENTO SOLICITADO

\$ 970.145

71 %

FINANCIAMIENTO CONTRAPARTE

\$ 396.074

29 %

## 2. JUSTIFICACIÓN DE PARTICIPACIÓN EN LA PROPUESTA

La selección y el mejoramiento animal relacionan de forma muy estrecha los principios de la genética poblacional, cuantitativa y molecular, con el análisis económico de los caracteres productivos. Es esencial un análisis económico de los factores que intervienen en el proceso productivo para poder definir apropiadamente las metas de cualquier programa de mejoramiento. El análisis económico permite también combinar los diferentes caracteres métricos que influyen sobre el beneficio económico de un sistema productivo, de acuerdo con la importancia relativa de cada uno de éstos en la producción.

El diseño de programas de mejoramiento involucra la integración de cuatro componentes principales en un programa, la meta de mejoramiento, los métodos para la evaluación de los potenciales reproductores, incluyendo la generación y recolección de datos, los métodos de selección y las estrategias de cruzamientos (una estrategia que maximice los objetivos del programa). Desde una perspectiva técnica, el objetivo del programa está frecuentemente formulado en términos de tasa de ganancia genética, y con frecuencia también, con algunas consideraciones sobre la consanguinidad. Sin embargo, en el actualmente competitivo mercado de reproductores es crucial que los programas de mejoramiento sean evaluados en relación con los objetivos y los factores que manejan o conducen el proceso de toma de decisiones. Esto significa no sólo la evaluación de las tasas de ganancia genética y la consanguinidad, sino que también la evaluación de los aspectos económicos, el uso de los recursos y la comerciabilidad y competitividad del producto logrado (Dekkers, 1998).

En la práctica, la información económica, recogida por ejemplo en estudios de mercado realizados sistemáticamente ha demostrado ser de importancia para la definición de un genotipo agregado en cerdos (P. von Rohr, A. Hofer, and N. Künzi, 1999)

Recientemente, un número de estudios han reportado resultados en experimentos con locus cuantitativos (QTL). Existe una importante fuente de variación genética que surge de genes con efecto mayor y que pueden ser incorporados en el diseño de programas de mejoramiento (ej: caseína en leche, gen calipígeo en corderos, etc). Esto en adición a la importancia que tiene la selección asistida por marcadores, en la cual los marcadores asociados a QTLs son utilizados para identificar las líneas de animales portadores de estos loci. Se han detectado QTLs en bovinos de carne, asociados al peso de nacimiento, crecimiento predestete, grasa y músculo en el ojo del lomo, en ganado lechero con producción de leche y componentes, en cerdos asociados con la fertilidad y el peso, grasa dorsal y otros (G. P. Davis and S. K. DeNise, 1998). La importancia de la simulación bioeconómica en el diseño de programas de mejoramiento ha sido destacada por Bourdon (1998) al proponer el reexamen de los paradigmas clásicos de esta área de la genética y propone que, en la medida que la evaluación genética y la selección multifactorial se conjugan, los investigadores en la evaluación genética deberían concentrarse en satisfacer las necesidades de la tecnología de la selección; que se necesita una combinación de herramientas empíricas tradicionales (análisis estadístico) y herramientas mecánicas (simulación bioeconómica para poder considerar las interacciones y las correlaciones).

El diseño eficiente de programas de mejoramiento requiere, especialmente en nuestro país, de herramientas técnicas complejas, que involucren metodologías de análisis genético y estadístico, molecular y económico, integrados en modelos que deben chequearse previamente en diferentes escenarios productivos teóricos, de corto, mediano y largo plazo, para obtener un progreso real y orientado a metas económicamente factibles.

En el caso personal del postulante, la formación genética previa y la participación en la propuesta, permitirán lograr un mayor grado de control sobre el diseño de programas de



mejoramiento en especies doméstica, el análisis más acabado de diferentes alternativas o modelos, y la incorporación de metas genéticas reales en proyectos de mejoramiento. El nivel académico del Centre for Genetic Improvement of Livestock de la Universidad de Guelph tiene relevancia mundial, en general como centro de formación e investigación genética y, en particular, en el área de la economía del mejoramiento animal. La formación en esta área es, definitivamente, imposible de conseguir en nuestro país.

#### Referencias:

**P. von Rohr, A. Hofer, and N. Künzi, 1999.** Economic Values for Meat Quality Traits in Pigs. Journal of Animal Science, Vol 77. No 10 2633-2640

**J. Dekkers. 1998.** Design of Breeding Programs: Chairman Summary. Proceedings of the 6<sup>th</sup> World Congress on Genetics Applied to Livestock Production. Vol 25, 405-406

**J. A. M. Van Arendonk, R. S. Spelman, E. H. van der Waaij, P. Bijma, and H. Bovenhuis. 1998.** Livestock Breeding Schemes: Challenges and Opportunities. Vol 27 407-418.

**R.M. Bourdon, 1998.** Shortcomings of Current Evaluation Systems. Journal of Animal Science. Vol 76, No 9. 2308-2323.

**G. P. Davis and S. K. DeNise 1998.** The impact of Genetic markers on Selection. Journal of Animal Science, Vol 76, No 9 2331-2339.



### 3. OBJETIVOS DE LA PROPUESTA

#### 3.1. GENERAL:

- Mejorar la capacidad de apoyo a los programas locales de mejoramiento genético en rumiantes pequeños mediante capacitación en el área de diseño y evaluación genético económica de dichos programas.

#### 3.2 ESPECÍFICOS:

- Mejorar el grado de manejo de herramientas de análisis económico y genético para el diseño de Índices de Selección en sistemas productivos nacionales.
- Mejorar la capacidad de diseño de programas de mejoramiento en sistemas productivos locales, mediante la aplicación y el análisis de los factores y criterios de selección económicos.

### 4. A QUIÉN ESTÁ DIRIGIDA LA PROPUESTA

La propuesta de capacitación está dirigida a un académico, profesor asistente del Departamento de Ciencias Pecuarias, de la Facultad de Medicina Veterinaria, de la Universidad de Concepción.



## 5. ANTECEDENTES DE LA INSTITUCION QUE DICTA LA ACTIVIDAD DE FORMACIÓN (Adjuntar antecedentes adicionales en el Anexo N° 2 )

El Centro de Mejoramiento Genético del Ganado (CGIL, por sus iniciales en inglés), de la Universidad de Guelph es un centro de alto prestigio internacional en el campo de la genética animal, tanto por su actividad en la formación de investigadores como por su directa relación con la investigación aplicada a la producción animal.

Este centro es un grupo de investigación afiliado con el Department of Animal and Poultry Science, que a su vez es parte del Ontario Agricultural College en la Universidad de Guelph. Realiza investigación en numerosas especies animales incluyendo acuicultura, ganado de carne, ganado lechero, avicultura y cerdos.

Vínculos en Internet:

CGIL: <http://cgil.uoguelph.ca/>

Department of Animal and Poultry Science: <http://www.aps.uoguelph.ca/>

Ontario Agriculture College: <http://www.oac.uoguelph.ca>

University of Guelph: <http://www.uoguelph.ca/>

Se adjunta en Anexos documento "Update 2000 Centre for Genetic Improvement of Livestock", además, se adjunta copia en diskette, en formato PDF.



## 6. PROGRAMA DE ACTIVIDADES DE LA PROPUESTA

Título del curso: **Economic Aspects of Applied Animal Breeding**

(Aspectos económicos del mejoramiento genético aplicado)

Instructor: Jack C. M. Dekkers, Iowa State University

Programa del curso:

- **Stochastic Methods to Simulate Breeding Programs**  
(Métodos estocásticos para la simulación de programas de mejoramiento).
- **Basic Principles for Deterministic Prediction of Response to Selection.**  
(Principios básicos para la predicción determinística de la respuesta a la selección)
- **Selection Index Methods.**  
(Metodologías de índice de selección)
- **Deterministic Models for Animal Breeding Programs.**  
(Modelos Determinísticos para programas de mejoramiento)
- **Breeding Goals and Economic Selection Criteria.**  
(Metas de mejoramiento y criterios económicos de selección)
- **Economic Appraisal of Animal Breeding Programs.**  
(Apreciación económica de programas de mejoramiento genético)
- **Marker Assisted Selection.**  
(Selección asistida por marcadores)

El curso está destinado a un nivel de Magister, Doctorado o superior. Los participantes deben tener un sólido conocimiento de genética cuantitativa y evaluación genética.

Sesiones matinales de clases y actividades en laboratorio computacional por la tarde.



## 6.1 CARTA O CERTIFICADO DE ACEPTACION DEL POSTULANTE O GRUPO A LA ACTIVIDAD DE FORMACIÓN (Anexar)

Se adjunta fax del Director del Centro que inscribe tentativamente en el curso.

De acuerdo con sus bases, el cupo es de 40 alumnos y se llena por orden de inscripción. Para la inscripción definitiva se necesita la cancelación del curso.





## 7. RESULTADOS E IMPACTOS ESPERADOS

La participación en este curso permitirá al postulante aplicar principios económicos a las metas de selección de programas de mejoramiento nacionales. Entre las proyecciones directas se encuentra la ampliación de las oportunidades de continuación del proyecto de innovación V99-0-P-013 "Introducción de la raza caprina Boer sobre cabras criollas en la provincia de Ñuble", que se encuentra actualmente en ejecución bajo la coordinación general del postulante. En este sentido, se aumentarán las posibilidades de diseño de programas que permitan una orientación del mejoramiento de la producción de carne caprina de acuerdo con los factores genéticos y económicos que participan en este sistema productivo, que actualmente tiene una baja definición.

Actualmente se encuentran en proceso de formulación y presentación a Indap de iniciativas para proyectos Bogan, para la difusión de la raza Boer con beneficiarios directos en pequeños propietarios de las comunas de San Fabián, Coihueco, Pinto y El Carmen, en la provincia de Ñuble, y en la comuna de Santa Bárbara en la provincia de Bio Bio.

Las posibilidades de diseño de programas de mejoramiento se amplían debido a la participación del postulante en proyecto de investigación orientados al desarrollo de embriones de genotipos especializados, actualmente en ejecución en el Departamento de Ciencias Pecuarias de la Facultad de Medicina Veterinaria de la Universidad de Concepción. Estos programas involucran especies como ovinos, caprinos y bovinos, asociados a productores comerciales de la VIII región. La capacitación adquirida permitirá, además, la dictación de cursos cortos dirigidos a médicos veterinarios e ingenieros agrónomos, en los tópicos específicos de Diseño de programas de mejoramiento genético y Factores económicos en el establecimiento de programas de selección.



## 8. COMPROMISO DE TRANSFERENCIA

Charlas (3):

1. Importancia de los programas de mejoramiento genético en la producción animal

Dirigido a: agricultores y técnicos.

Cantidad: 40

Lugar: Municipalidad San Fabián, Facultad de Medicina Veterinaria, Municipalidad de Pinto.

Fecha: 15 al 30 de agosto de 2001.

Tipo de información: oral, escrita (tríptico) y audiovisual (transparencias).

Cursos:

1. Diseño de programas de Mejoramiento Genético

Dirigido a: Estudiantes de Medicina Veterinaria, Médicos Veterinarios e Ingenieros Agrónomos.

Cantidad: 25

Lugar: Facultad de Medicina Veterinaria

Fecha: 15 de Septiembre de 2001

Tipo de información: oral, escrita (apuntes) y audiovisual (Presentación Power Point).

2. Factores económicos en el establecimiento de programas de mejoramiento.

Dirigido a: Estudiantes de Medicina Veterinaria, Médicos Veterinarios e Ingenieros Agrónomos.

Cantidad: 25

Lugar: Facultad de Medicina Veterinaria.

Fecha: 15 de Octubre de 2001

Tipo de información: oral, escrita (apuntes) y audiovisual (Presentación Power Point).



**9.- PARTICIPANTES A LA ACTIVIDAD DE FORMACIÓN (Adjuntar *c. vitae* de acuerdo a pauta adjunta, según Anexo 7)**

| NOMBRE                  | RUT         | FONO      | DIRECCIÓN<br>POSTAL  | REGIÓN | LUGAR DE<br>TRABAJO       | ACTIVIDAD<br>PRINCIPAL | FIRMA |
|-------------------------|-------------|-----------|----------------------|--------|---------------------------|------------------------|-------|
| 1. Mario Briones Luengo | 7.999.244-5 | 42-208840 | Casilla 537, Chillán | VIII   | Universidad de Concepción | Profesor Asistente     |       |
| 2.                      |             |           |                      |        |                           |                        |       |
| 3.                      |             |           |                      |        |                           |                        |       |
| 4.                      |             |           |                      |        |                           |                        |       |
| 5.                      |             |           |                      |        |                           |                        |       |
| 6.                      |             |           |                      |        |                           |                        |       |



## 10.- ITINERARIO PROPUESTO

| FECHA<br>(Día-mes-año) | ACTIVIDAD                             | OBJETIVO                                                                             | LUGAR                                   |
|------------------------|---------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------|
| 7-7-2001               | Viaje Santiago-Toronto-Guelph         | Traslado                                                                             |                                         |
| 9-7-2001 al 13-7-2001  | Curso de verano Universidad de Guelph | Asistencia al curso de Verano de CGIL: "Economic aspects of applied animal breeding" | Universidad de Guelph, Ontario, Canadá. |
| 14-7-2001              | Viaje Guelph-Toronto Santiago         | Traslado                                                                             |                                         |
|                        |                                       |                                                                                      |                                         |
|                        |                                       |                                                                                      |                                         |
|                        |                                       |                                                                                      |                                         |
|                        |                                       |                                                                                      |                                         |

| <b>11.- COSTOS TOTALES Y ESTRUCTURA DE FINANCIAMIENTO DE LA PROPUESTA (EN PESOS)</b> |                    |                      |                          |                                                     |
|--------------------------------------------------------------------------------------|--------------------|----------------------|--------------------------|-----------------------------------------------------|
| <b>ÍTEM</b>                                                                          | <b>COSTO TOTAL</b> | <b>APORTE PROPIO</b> | <b>APORTE SOLICITADO</b> | <b>Número de cotización adjunta (según Anexo 5)</b> |
| Pasajes aéreos internacionales                                                       | 746.610            |                      | 746.610                  | 1                                                   |
| Pasajes aéreos nacionales                                                            |                    |                      |                          |                                                     |
| Tasas de embarque                                                                    | 29.520             |                      | 29.520                   | 1                                                   |
| Seguro de viaje                                                                      | 37.515             |                      | 37.515                   |                                                     |
| Pasajes terrestres internacionales                                                   | 0                  |                      |                          |                                                     |
| Pasajes terrestres nacionales                                                        | 0                  |                      |                          |                                                     |
| Alojamiento                                                                          | 129,074            | 129,074              |                          | 2                                                   |
| Viático Alimentación y Movilización                                                  | 136,500            |                      | 136,500                  | 3                                                   |
| Matrícula o costo de la actividad de formación                                       | 195,000            | 195,000              |                          |                                                     |
| Materiales de trabajos y libros                                                      | 0                  |                      |                          |                                                     |
| Material de difusión                                                                 | 65.000             | 65.000               |                          |                                                     |
| Gastos emisión de garantía                                                           | 7.000              | 7.000                |                          |                                                     |
| Imprevistos                                                                          | 20,000             |                      | 20,000                   |                                                     |
| <b>TOTAL</b>                                                                         | <b>1.366.219</b>   | <b>396.074</b>       | <b>970.145</b>           |                                                     |

| <b>11.1. PROCEDENCIA DEL APOORTE DE CONTRAPARTE (EN PESOS)</b> |                                    |                                             |                                               |                                     |
|----------------------------------------------------------------|------------------------------------|---------------------------------------------|-----------------------------------------------|-------------------------------------|
| <b>ÍTEM</b>                                                    | <b>APOORTE ENTIDAD RESPONSABLE</b> | <b>APOORTE DIRECTO DE LOS PARTICIPANTES</b> | <b>APOORTE OTRA PROCEDENCIA (ESPECIFICAR)</b> | <b>APOORTE TOTAL DE CONTRAPARTE</b> |
| Pasajes aéreos internacionales                                 |                                    |                                             |                                               |                                     |
| Pasajes aéreos nacionales                                      |                                    |                                             |                                               |                                     |
| Tasas de embarque                                              |                                    |                                             |                                               |                                     |
| Seguro de viaje                                                |                                    |                                             |                                               |                                     |
| Pasajes terrestres internacionales                             |                                    |                                             |                                               |                                     |
| Pasajes terrestres nacionales                                  |                                    |                                             |                                               |                                     |
| Alojamiento                                                    |                                    | 129,074                                     |                                               | 129,074                             |
| Viático Alimentación y Movilización                            |                                    |                                             |                                               |                                     |
| Matrícula o costo de la actividad de formación                 |                                    | 195,000                                     |                                               | 195,000                             |
| Materiales de trabajos                                         |                                    |                                             |                                               |                                     |
| Material de difusión                                           |                                    | 65.000                                      |                                               | 65.000                              |
| Gastos emisión de garantía                                     |                                    | 7,000                                       |                                               | 7,000                               |
| Imprevistos                                                    |                                    |                                             |                                               |                                     |
| <b>TOTAL</b>                                                   |                                    | 396.074                                     |                                               | 396.074                             |



## 11.2 DETALLE DEL CALCULO DE LOS COSTOS

Pasaje aéreo Santiago Toronto Santiago: US\$ 1.214 /  $1.214 \times 605 = \$734.470$

Traslado Toronto Guelph Toronto: CAN\$95 /  $95 \times 390 = \$37.050$

Matrícula Curso de Verano: CAN\$ 500/  $500 \times 390 = \$195.000$

Alojamiento: CAN\$ 55.16 por día (incluye impuestos) /  $55.16 \times 390 \times 6 = \$129.074$

Alimentación: CAN\$ 15 x día /  $50 \times 390 \times 7 = \$40.950$

Movilización: CAN\$ 5 x día /  $5 \times 390 \times 7 = \$13.650$

Tasa de cambio del dólar canadiense, con fecha 15 de mayo de 2001: \$390

Tasa de cambio del dólar estadounidense, con fecha 15 de mayo de 2001: \$610

El ítem Viático Alimentación y movilización en la tabla de costos incluye el traslado ida y vuelta desde el aeropuerto de Toronto a la Universidad de Guelph, un gasto estimado de movilización diario y la estimación del gasto en alimentación.



**ANEXO 1:  
ANTECEDENTES DEL POSTULANTE O COORDINADOR DE LA  
PROPUESTA**



## PAUTA DE CURRICULUM VITAE RESUMIDO

### ANTECEDENTES PERSONALES

|                                                                      |                                |
|----------------------------------------------------------------------|--------------------------------|
| Nombre completo                                                      | Mario Alfodín Briones Luengo   |
| RUT                                                                  | 7.999.244-5                    |
| Fecha de Nacimiento                                                  | 9 de junio de 1959             |
| Nacionalidad                                                         | Chileno                        |
| Dirección particular                                                 | Santa Cecilia 1666, Chillán    |
| Fono particular                                                      | 42-270366                      |
| Fax particular                                                       |                                |
| Dirección comercial                                                  | Vicente Méndez 595, Chillán    |
| Fono y Fax comercial                                                 | 42-208840<br>42-270212         |
| Nombre y teléfono de la persona a quien avisar en caso de emergencia | Marcia Tejerina P<br>42-270366 |

### ESTUDIOS

|                        |                                                                       |
|------------------------|-----------------------------------------------------------------------|
| Educación básica       |                                                                       |
| Educación media        | Liceo de Hombres Narciso Tondreau, Chillán                            |
| Educación técnica      |                                                                       |
| Educación profesional  | Facultad de Medicina Veterinaria, Universidad de Concepción           |
| Estudios de post grado | Faculty of Science and Engineering, University of Edinburgh, Scotland |

Completar ambas secciones o sólo una de ellas, según corresponda

| <b>EXPERIENCIA PROFESIONAL Y/O COMERCIAL</b>                                                                              |                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Nombre y RUT de la Institución o Empresa a la que pertenece                                                               | Universidad de Concepción<br>81.494.400-K                                                               |
| Cargo                                                                                                                     | Profesor Asistente                                                                                      |
| Antigüedad                                                                                                                | 13 años                                                                                                 |
| Resumen de las labores y responsabilidades a su cargo                                                                     | Jornada Completa, Dedicación normal (44 horas), Docencia de pre y post grado, Investigación y Extensión |
| Otros antecedentes de interés                                                                                             |                                                                                                         |
| <b>EXPERIENCIA COMO AGRICULTOR</b>                                                                                        |                                                                                                         |
| Tipo de Agricultor (pequeño, mediano o grande)                                                                            |                                                                                                         |
| Nombre de la propiedad en la cual trabaja                                                                                 |                                                                                                         |
| Cargo (dueño, administrador, etc.)                                                                                        |                                                                                                         |
| Superficie Total y Superficie Regada                                                                                      |                                                                                                         |
| Ubicación (detallada)                                                                                                     |                                                                                                         |
| Rubros a los que se dedica (incluir desde cuando se trabaja en cada rubro) y niveles de producción en el rubro de interés |                                                                                                         |
| Resumen de sus actividades                                                                                                |                                                                                                         |



|                                                                                                    |                                                                                                                                        |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Organizaciones<br>(campesinas, gremiales o empresariales) a las que pertenece y cargo, si lo ocupa |                                                                                                                                        |
| Descripción de la principal fuente de ingreso                                                      | Profesor Asistente, Universidad de Concepción.                                                                                         |
| Objetivos personales de la actividad de formación                                                  | Aumentar el nivel de formación teórica y práctica en el diseño de programas de mejoramiento y en su apreciación económica.             |
| Otros antecedentes                                                                                 | Coordinador general del proyecto FIA "Introducción de la raza caprina Boer sobre cabras criollas en la provincia de Ñuble" V99-0-P-013 |

## EXPERIENCIA DOCENTE EN EDUCACIÓN SUPERIOR

En la Facultad de Medicina Veterinaria de la Universidad de Concepción:

### Pregrado.

Profesor de la asignatura de Genética Ganadera, 1988 a la fecha.

Profesor de la asignatura de Bovinos de Carne, 1994 a la fecha.

Profesor de la asignatura de Estadística y Diseño Experimental, 1997 a la fecha.

Profesor de la asignatura de Análisis Estadístico, 1999, 2000

### Postgrado

Profesor de la asignatura de Estadística y Diseño Experimental, Programa de Magister en Ciencias Veterinarias, 1997 a la fecha.

## PUBLICACIONES RECIENTES

**1994. Efecto de nuevas tecnologías reproductivas en el margen económico bruto para diferentes razas de toros de carne en el rebaño lechero y de crianza.**

Ciencia e Investigación Agraria Vol 20 No 2: XII Reunión de la Asociación Latinoamericana de Producción Animal. p9.

Autores: **M. Briones** y G. Simm.

**1995. Dose-dependent effect of heparin on fertilizing ability of goat spermatozoa.**

Theriogenology 44: 451-460,

Autores: J. F. Cox, F. Saravia, **M. Briones** and A. Santa María.

**1994 Efecto de la cafeína sobre la capacidad fecundante de espermatozoides caprinos y ovinos *in vitro*.**

Arch. Med. Vet. XXVI, No 2,

Autores: J. F. Cox, F. Saravia, A. Santa María y **M. Briones**

**1995. Asociación entre la condición corporal preparto/destete y el peso de los terneros en vacas Hereford de segunda parición.**

IX Congreso Nacional de Medicina Veterinaria, Chillán, Chile. Agrociencia, Número Extraordinario, Resúmenes de Trabajos en el IX Congreso Nacional de Medicina Veterinaria. Chillán, septiembre 1995, p. 103.

Autores: **M. Briones**, R. Prado y J. Pizarro.

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## **PRESENTACIONES A CONGRESOS**

**Comparación del comportamiento productivo de vacas Holstein Friesian en su segunda, tercera y cuarta lactancias**

Coautor

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**Efecto de algunas variables de manejo de ordeño sobre la calidad bacteriológica de la leche en estanque en lecherías de la Provincia de Ñuble., VIII región, Chile**

Coautor

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Coautor

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Coautor

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Autor Principal

XI Congreso Nacional de Medicina Veterinaria. Santiago, Chile, 25 al 27 de octubre de 2000.

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## **PROYECTOS DE INVESTIGACIÓN EN AREA DE ESPECIALIZACIÓN**

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**"Introducción de la raza bovina Pirenaica en Chile".**

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**Desarrollo de tecnologías competitivas para la producción de embriones bovinos de alta producción.**

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Investigador responsable, José Cox U.

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Investigador responsable: José Cox U.  
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V99-0-P-013

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### **"Programa de Mejoramiento Bovino en la Precordillera de Ñuble. Etapas I y II." 1994.**

Director.

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### **"Curso: Ley 19162. sus reglamentos y fiscalización". FMV 04/94**

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Dirigido a profesionales de las empresas de transferencia tecnológica de la zona.

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Dirigido a pequeños agricultores de Ñuble.

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Director.



Dirigido a agricultores y profesionales  
Octubre a Diciembre 1995.

**"Curso de Inseminación Artificial"** (asociado a Primeras Jornadas de Producción Animal).

Director.

Dirigido a profesionales de empresas de transferencia tecnológica.

Junio de 1995.

**"Ciclo de Charlas: Principios de Producción de Carne Bovina".**

Director.

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Director.

Realización: septiembre 96 - diciembre 96

Dirigido a: Pequeños campesinos del secano interior de Ñuble.

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**"Ciclo de charlas en aspectos geneticos de la ganadería de carne".**

Director.

Dirigido a agricultores ganaderos de Ñuble.

Agosto a Diciembre de 1997.

**"Curso: Evaluación genética de toros y lectura de catálogos de reproductores".**

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Noviembre de 1997.

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### **Mejoramiento genético bovino en la precordillera de Ñuble.**

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**Financiamiento privado** (1 curso de 5 días, diciembre 2000)

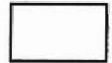
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### **Otras actividades:**

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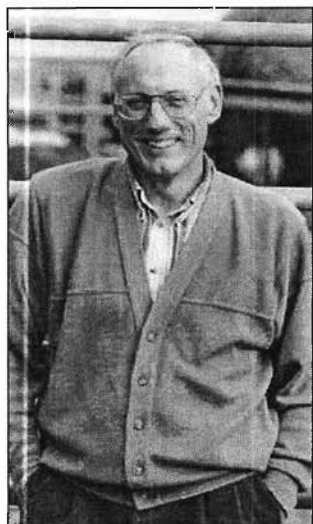
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**ANTECEDENTES DE LA INSTITUCION QUE EFECTUA O DICTA LA**  
**ACTIVIDAD DE FORMACIÓN**

# UPDATE 2000

Centre  
for  
Genetic  
Improvement  
of  
Livestock

## Director's Message

# 2000 and beyond



As we start a new century, it's with great pleasure that we bring you our latest publication. This continues our new communications approach; the articles we present here are meant to clearly show how our work has an impact on your life as a consumer, producer or industry partner. Our former reports and updates have contained information of an intensely scientific nature. Through our

homepage, [www.cgil.ca](http://www.cgil.ca), this information is still available to you. To augment that, we present *Update 2000*.

It's our hope that through this publication you will be able to establish some ideas about CGIL's capabilities and interests...for 2000 and beyond. As a group, we're interested in continual genetic improvement in a wide range of species, using numerous scientific tools. The articles included in this publication highlight some of our most recent efforts to genetically improve commercial livestock. Areas we see being most exciting in the near future include information systems, increasingly refined breeding plans, new genetic evaluation techniques and new genome enhancement studies that include marker assisted selection.

CGIL is part of a dynamic area of research and development. Change is a major part of our lives and here at CGIL we welcome Drs. Steve Miller and Andy Robinson as new members of the faculty team. Thanks to our industry partner BIO for Steve's funding. Andy is temporarily filling in for Dr. John Gibson who is on leave to the International Livestock Research Institute in Kenya. Our post-doctorates and graduate students continue to provide stimulating ideas and continue to move on to interesting work in a wide range of activities.

I hope you enjoy *Update 2000* and I welcome any comments or questions you have about our work.

Dr. Jim Wilton  
Director

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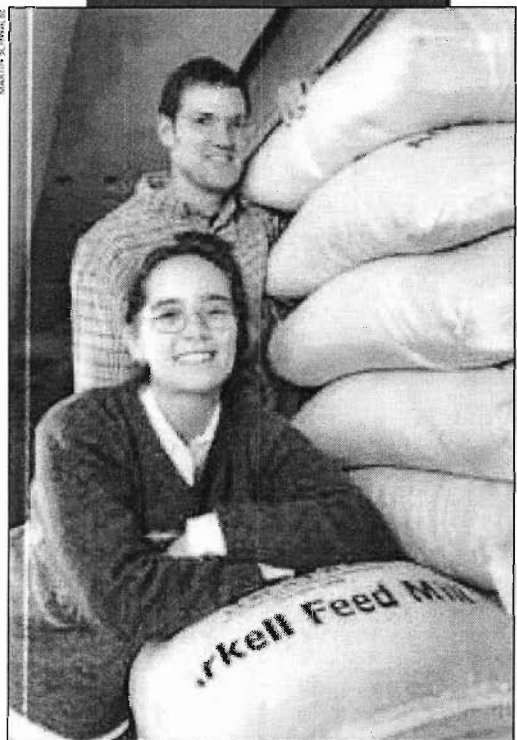
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# Breeding for balance

## *How feed energy impacts dairy cattle health*

BY JUHIE BHATIA



**Research associate Paul Boettcher and masters student Bethany Collard are learning how to select cows that eat more during early lactation, so the animals can better withstand stress to stay healthy.**

electing cows that have the ability to eat more during early lactation may reduce stress-related health problems and make for healthier animals, say University of Guelph researchers.

Research associate Dr. Paul Boettcher, from the Centre for Genetic Improvement of Livestock (CGIL) and graduate student Bethany Collard are trying to uncover a relationship between a dairy cow's energy balance (the difference between energy consumed and energy used for milk production, growth and maintenance) in early lactation, and health and reproductive problems during the course of that lactation.

"We hope to find a role for genetic factors in the relationship between energy intake and milk yield," says Collard. "If we could breed for a cow that eats more in early lactation, then maybe that cow could better withstand stresses and be healthier."

### **LACTATION: A STRESSFUL PROCESS**

Lactation is a stressful process for cattle, and stress appears to increase as milk production climbs. Although plenty of food is offered, many early-lactating cows fail to eat enough feed to meet their energy needs. And if the energy a cow requires for milk production and tissue maintenance exceeds what she's consuming in her feed, she'll experience a negative energy balance. That could lead to health problems.

However, increasing the feed energy concentration puts the cow at risk for digestive problems.

"A negative energy balance causes a cow to mobilize the energy stored in her body tissues and lose weight," says Collard. "We want to see how cows normally deal with this stress and whether it predisposes them to health and reproductive problems."

The researchers examined the daily production records in a Holstein herd at the Agriculture and Agri-Food Canada (AAFC) dairy research station in Lennoxville, Quebec. They measured daily feed intake and milk production, and periodically analyzed milk composition. The data was used to calculate the daily energy balance of the herd through a standard mathematical formula. The daily energy balance gives an indication of how long the cattle experienced a negative energy balance and also of the severity of the energy deficit.

The team also looked at herd health and reproduction and recorded all observable problems. These records were compared with the calculated daily energy balance for any possible relationships.

Results show that cows with a longer period of negative energy balance experienced greater health problems. They had higher incidences of locomotive problems like laminitis — inflammation of the soft tissues of the foot — and digestive problems.

This research was sponsored by the Dairy Farmers of Canada through the Cattle Breeders' Research Council and AAFC.

# Honing in on genes

## Genomics project puts Holsteins on the map

BY JENNY TYE

**T**o strengthen genetic improvement programs for Canadian Holsteins, University of Guelph researchers are collaborating with Western Canadian colleagues to detect Holstein genes that have economically important effects on traits such as milk production.

Prof. John Gibson and recent Ph.D. graduate Jeya Nadesalingam, Centre for Genetic Improvement of Livestock, along with Yves Plante, Bovine Blood Testing Laboratory, Saskatchewan, are working on an extensive study to understand the genes that cause variation in dairy cattle.

Pinpointing the source of variation in animals is the key to making genetic improvements. The project, a combination of molecular genetics and quantitative statistics, will help increase the rate of genetic improvement in Canadian Holsteins and potentially reduce the cost of current bull testing programs.

The study started in the fall of 1996, and looks at the genetics of six prominent Holstein bulls. The researchers are following the inheritance of special genes — known as quantitative trait loci or QTL — in 70 sons of each bull. These QTLs are segments of DNA that, if inherited by a calf, will lead to an improvement in a certain trait, such as milk production. The tools that allow researchers to explore and track the inheritance of QTL are called genetic markers.

Genetic markers act like bookmarks; they're tiny fragments of DNA that are unique to Holstein cattle. Each marker is a landmark at a specific point on a particular chromosome. So, when researchers follow the inheritance of a particular marker from parent to offspring, they also follow

the inheritance of a particular region of a chromosome.

Using genetic markers called microsatellite markers, the researchers genotyped the sons of six popular bulls and used the marker genotype information to determine which copy of each chromosome segment was inherited from the sire. They then related that information to the genetic value of each son to determine which, if any, segments had useful effects on milk production.

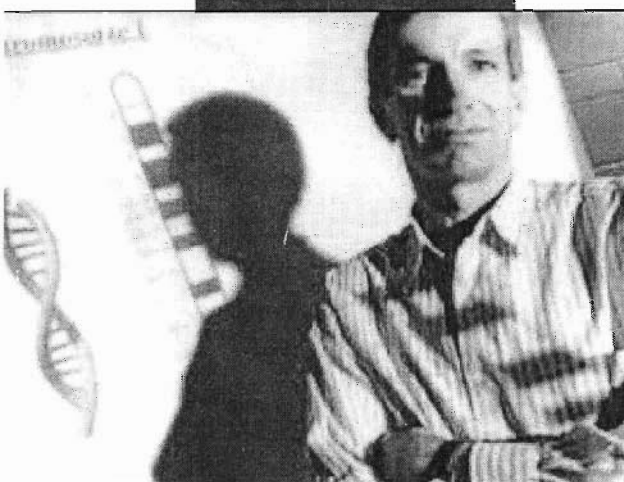
After performing and analysing more than 20,000 genetic tests, the data has shown that several QTL have substantial effects on Holstein milk production. Given that QTL exist, it's now possible to use genetic markers to track the inheritance of QTL in new sons or grandsons. Sons that inherit desirable QTL are much more likely to be useful in genetic improvement programs than average sons. Sons that don't inherit useful QTL have little chance of scoring high in the standard progeny test that every bull must go through. Because progeny testing is expensive — about \$50,000 per bull — cattle breeders can reduce costs by only testing those animals that have the greatest chance for success.

### CONTINUED EXPANSION

Gibson says the project analysis will continue to expand. He and his colleagues plan to search for genes controlling additional traits, such as somatic cell counts, milking speed, temperament and 40 different conformational traits, including feet and legs and udder conformation.

The researchers hope industry will take these results to heart and pursue studies to confirm existing QTL, to locate QTL more accurately, hunt for a wider range of QTL and ultimately put these techniques into routine application in their breeding programs.

The research is sponsored by DairyGen (formerly the Cattle Breeders' Research Council), the National Research Council IRAP program, the Natural Sciences and Engineering Research Council and the Ontario Ministry of Agriculture, Food and Rural Affairs.



**Prof. John Gibson and colleagues are working on an extensive project to understand the genes that cause variation in dairy cattle, in an effort to strengthen genetic improvement programs for Canadian Holsteins.**

MARTIN SCHWABE



# Gene tracking

*New approach improves selection  
among dairy cattle*

BY IAN LANG

**N**ew genetic technologies that more efficiently trace the inheritance of key genes for production traits may lead to improved selection programs for dairy breeders.

Prof. Gerald Jansen, Centre for Genetic Improvement of Livestock (CGIL), in collaboration with visiting scientist Dr. Giulio Pagnacco from Italy's University of Milan, has adopted a method, called molecular marker technology, to track important genes. If it works in industry, Jansen says it has the potential to change the way breeders select their parent stock.

The team's method involves the identification of genes called quantitative trait loci (QTL) — segments of DNA that, if inherited by the calf, will lead to a small improvement in a certain trait, such as milk protein levels or rate of growth. The final productivity of a grown calf for any one quality depends on how many positive QTLs it inherits for that particular trait.

"By using this new technology, we can figure out the specific genes that offspring have inherited from their parents," says Jansen. "This could, for example, significantly improve our accuracy in selecting test bulls."

On average, each calf has a 50 per cent chance of inheriting a particular QTL variant from one of its parents. The industry bases its relatedness estimates on this average, assuming a calf will be born with exactly half of its genetics from the dam and half from the sire.

But, as Jansen points out, the 50 per cent estimate is inexact. Since the combination of genes passed to a calf is random, it can receive more

favourable QTL variants from one parent than the other.

The result? For a trait of interest, certain calves can be genetically more similar to the sire than the dam or to one sibling over another.

By using genetic markers — or gene landmarks — known on either side of a specific QTL, Jansen and Pagnacco can

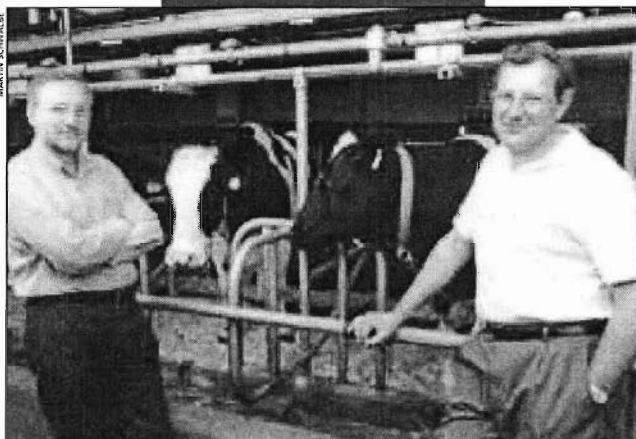
compare the DNA of full siblings to find which may have the upper hand for production potential. In some cases, they may find that a calf is missing genes from the sire and immediately exclude it from testing...a method much faster and more economical than discovering genetic shortcomings after years of breeding.

Jansen subjected this technique to a computer simulation, going head-to-head against today's conventional genetic testing programs. Tracking the progress of computerized herds of 200 animals for five generations, Jansen and Pagnacco found the new technique increased the rate of trait-specific genetic improvement by up to eight per cent over two generations —

before settling to a final overall improvement of two per cent above standard methods.

Jansen sees the results as a first small step in the move toward better genetic improvement strategies. "We're looking to go far beyond this simulation," says Jansen. "By expanding the process to include multiple QTLs and using it alongside other genetic techniques, we could significantly enhance the accuracy and efficiency of dairy breeding programs."

This research is supported by DairyGen (formerly the Cattle Breeders' Research Council).



**Dr. Giulio Pagnacco (left), University of Milan and Gerald Jansen, CGIL, have adopted a new method to trace the inheritance of key genes for production traits, allowing for more efficient dairy selection programs.**

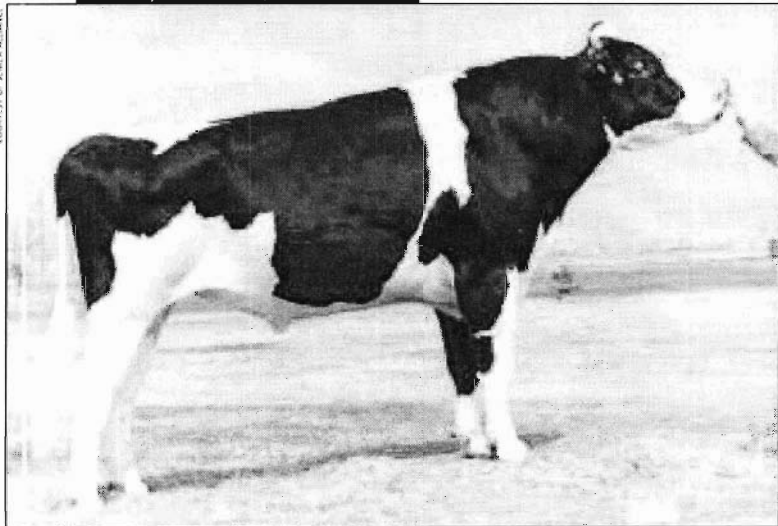


# Like father, like son

*Breeding values are further refined for selection decisions*

BY CAROL PILLEY

COURTESY OF SIMPLY A LANC



**Understanding the heritability of lactation breeding values from sires to their sons will lead to changes in breeding decisions.**

**U**nderstanding the heritability of lactation breeding values from sires to their sons will help dairy producers make better breeding decisions.

Prof. Larry Schaeffer of the Centre for Genetic Improvement of Livestock and Marc Rutten, a visiting scientist from the Wageningen Agricultural University in the Netherlands, have found that changes in the estimated breeding values (EBVs) of sires over lactations are heritable.

They say this could change the use of breeding values in selection decisions.

"This new interpretation of EBVs will help us make better breeding decisions and is a major step in estimating the genetic potential of animals over lactations," says Schaeffer.

In February 1999, the Canadian Test Day Model (CTDM) — used to evaluate the genetic merit of dairy cows and their sires — was implemented in Canada. The CTDM uses the test day records for a cow's first three lactations to calculate the contribution of its genetics to milk, fat

and protein yields. These values are expressed as EBVs.

All progeny of a bull inherit half of the sire's EBV. The researchers looked at changes in EBVs across lactations to determine if similar patterns were observed for sires and their sons. For example, the EBV of a sire could increase from the first to second lactation and increase, decrease or remain constant from the second to third lactation. But, the researchers wondered, would a similar pattern be expected for the son of this sire?

Schaeffer and Rutten discovered that if a sire's breeding value increased from the first to second lactation, then the son did indeed follow a similar breeding pattern. That suggests the change of EBVs across lactations is hereditary.

To further examine this trend, they determined how changes in breeding values between sires and sons correlated. From first to second lactation, they found a high correlation in EBV changes...but it tailed off from second to third lactation.

Ideally, dairy producers want the EBV to be high for all lactations, or increase over lactations. If a producer was aiming for higher milk production, using bull EBVs to predict progeny EBVs would be a useful breeding strategy — plus, it offers a new way of using breeding values for future selection decisions.

This research was sponsored by DairyGen (formerly the Cattle Breeders' Research Council).

# Counting sheep... year-round

*Better breeding may make fresh lamb more readily available*

BY KELLY CROWE AND JENNY TYE

Genetics may hold the key to helping sheep lamb throughout the year, rather than just in the spring...and help local farmers supply consumers with fresh lamb all year long.

Dr. Jane Tosh, a research associate with the Centre for Genetic Improvement of Livestock (CGIL), is working with sheep genetics specialist Delma Kennedy, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) to evaluate the potential of sheep to lamb year-round. Their goal is to make genetic evaluations of sheep available to farmers to help them select for animals with shorter intervals between lambing, and for those most capable of lambing outside the traditional season.

"If Ontario wants to compete globally against Britain and New Zealand in the fresh lamb market, we have to be more intensive to be more efficient," says Kennedy.

## A CONSISTENT SUPPLY

The researchers are generating numbers called Expected Progeny Differences (EPDs) for those specific reproductive traits in sheep that will help lead to a more consistent supply of lamb. EPDs are used in many livestock industries including the beef and lamb industries and are used to predict how an animal's progeny will compare genetically to an average animal for certain traits.

Currently used by sheep producers, EPDs help select those individuals in a flock that are genetically superior for traits related to meat production such as market weight, rate of gain and ultrasonic measurements of loin fat cover and muscle depth. However, EPDs are not available to help producers identify animals with shorter lambing intervals or animals that breed outside of the spring breeding season.

"Until now, genetic evaluations focused mainly on meat and weight characteristics of lambs," says Tosh. "We're now looking at other characteristics that are more difficult to genetically evaluate, such as those ewe traits that could lead to the year-round supply of lamb."

The problem is tough to tackle. Both genetic and environmental factors can greatly influence reproductive traits in all species, including sheep. To determine whether EPDs can be generated for these traits, the researchers must determine the role of genetics.



MARTIN SCHWABER

Kennedy and Tosh are analysing data from a private flock of over 400 Rideau-Arcott ewes near Grand Valley, Ontario.

Meticulous records have been kept on these animals. Mathematical models, which take into consideration the genetic and environmental factors that may influence when and how often an ewe lambs, are now being applied to the data by the researchers.

This study will help the researchers separate genetic and environmental factors and look at how genetics alone, influences these reproductive traits. Kennedy and Tosh hope to determine a reliable method to calculate EPDs for reproductive traits that may help farmers supply a fresh product outside of the traditional season.

"We know EPDs are useful to producers for making better selection decisions, because they're objective measures of genetics, free of environmental influences," says Tosh.

The difference made by the decisions based on reliable EPD values can appear negligible in a flock at first; farmers may only see a 10 per cent increase in the number of lambs born per year. But in commercial-size flocks with 300-400 ewes, the increase could translate into substantial profit.

This research is sponsored by OMAFRA.

**Sheep genetics specialist Delma Kennedy, OMAFRA, and CGIL research associate Jane Tosh, are evaluating the genetic potential of sheep to lamb throughout the year.**



# A sound technology

*Real-time ultrasound accurately measures sheep carcass traits*

BY CHRISTINA CLARK

**S**electing sheep with superior carcass traits will soon be easier, faster and less expensive, thanks to real-time ultrasound technology, say University of Guelph researchers ... and that means a better eating experience for consumers.

The technology — already widely used in the cattle and swine breeding industries to select for sires with an optimal lean meat-to-fat ratio — is being adapted for Ontario's growing sheep industry. Prof. Jim Wilton, Centre for Genetic Improvement of Livestock, is working with graduate student Tamara Fernandes to evaluate the technology's effectiveness in the sheep industry.

They conducted trials on 30 sheep farms across the province to measure the carcass traits of live lambs — of similar age — using real-time ultrasound.

Ultimately, the researchers hope to give the Ontario sheep industry an edge over competitors from New Zealand and Australia.

"There's a tremendous industry interest in this technology," says Wilton. "The technology is simple to use and the cost of sending a technician to the farm is very reasonable."

In sheep, genetics play an important role in determining fat content. In fact, about 35 per cent of a sheep's fat content is heritable. That makes it important to select for sires with higher lean muscle-to-fat ratios that will pass on these carcass traits to their progeny.

Traditionally, selecting optimal sires depends on post-slaughter carcass trait measurements of progeny from different sires. But waiting for progeny can take time.

That's where ultrasound comes in. It measures the fat content of young animals directly and can give a quick estimate of a sire's potential for passing on lean meat traits. That's important to breeding associations which could benefit by using the technology to boost the reputation of their breed

and sell more stock. Ultrasound is also non-invasive and less expensive than post-slaughter measurements.

Here's how the technology works. Sound waves are generated by a vibrating crystal housed in the ultrasound machine and sent through an animal's body. The waves travel through different types of tissues at different speeds depending on the tissue density. For example, sound waves pass through muscle quickly, but their transit is slower through fat. The waves bounce off different tissues and are picked up by a recorder that displays a complete on-screen picture of the animal's carcass traits.

Ultrasound measurements are usually carried out on marketplace lambs, the stage when the animals begin to fatten. A lamb's total fat content is estimated from the amount of fat covering the rib muscle.

As part of a validity check on the technology, the researchers are working with the Ontario Lamb Improvement

Breeding Strategies Program to compare the accuracy of ultrasound measurements to

post-slaughter carcass measures. Live animal ultrasound and carcass measures were carried out on lambs from the New Liskeard Agricultural Research Station and show that while ultrasound isn't an exact science, it's very close.

"Real-time ultrasound has the potential to help producers provide consumers with a product that's more uniform," says Fernandes. "That will help increase the retail market for Ontario lamb."

This research is sponsored by the Ontario Sheep Marketing Agency through the CanAdapt program (administered by the Agricultural Adaptation Council). Fernandes's position is being partially supported by Ontario Rural Jobs Strategies.

**Graduate students Tamara Fernandes and Jeff Rau demonstrate how real-time ultrasound technology is an easy, fast and inexpensive method to select sheep with superior carcass traits.**



MARTIN SCHWABER



# Testing for the best

**Information  
from packing  
plants can  
help assess  
beef sires**

BY IAN LANG

Departing from tradition, two University of Guelph researchers are taking beef sire progeny testing right into the packing plant.

By grading selected cuts of meat from processed steers and tracing them back to their original sire, Profs. Jim Wilton and Ira Mandell, Animal and Poultry Science, along with technicians Chris Haworth and Cheryl Campbell, hope to rank beef sires according to the tenderness of meat produced by their offspring. They say this will reduce the need for costly and specialized progeny tests for improving customer satisfaction.

Mandell says the first step is to determine how much genetics affects beef tenderness.

"Progeny from a single sire can arrive at the packing plant from a wide range of management practices and environments," says Mandell. "We want to know if tenderness is consistent among these individuals or whether management has overshadowed the genetic influence."

Typically, progeny tests are organized by breed associations, which take a sampling of the bull's progeny, rear them separately to control for environmental influence, and grade them for traits such as lean yield, marbling, colour and other factors that make the product more appealing to the consumer.

## APPLYING THE CRITERIA

Mandell is applying these same criteria to cuts from the packing plant, using a manual grading procedure that emulates a soon-to-be-available Computer Vision System (CVS) grading developed by Agriculture and Agri-Food Canada, in Lacombe, Alberta. This automated grading system has the potential to enable sire testing using packing plant information, a proposition that Mandell wants to explore.

The research project focuses on evaluating beef from two parts of the carcass, the ribeye muscle cut from the rib and the 'eye-of-round' muscle cut from the hip. Steaks from the two muscles are cooked and then evaluated for tenderness, using an instrument that measures the force needed to cut through the muscle fibres, providing the user with a numerical tenderness score.

**Prof. Ira Mandell and colleagues are grading selected cuts of beef from processed steers and tracing them back to their original sire. The researchers hope to rank beef sires according to the tenderness of meat produced by their offspring.**



Mandell hopes that his repeated evaluations will develop into a clear picture of the relative importance of genetics and management on beef tenderness...and ultimately develop the potential for conducting sire assessment from information gathered at the packing plant.

"Our ability to accurately choose sires that lead to increasingly higher meat quality will have a strong impact on consumers," says Mandell. "Tender steaks lead to a greater overall eating experience."

This research is supported by the Ontario Cattlemen's Association and the Natural Sciences and Engineering Research Council.



# Sire surfing

*BIO-Mate is opening new doors  
for improved beef production*

BY IAN LANG

he information highway could make finding the ideal beef sire as easy as ordering steak from a menu.

BIO-Mate, a website developed by Profs. Steve Miller and Jim Wilton, along with research associates Marc Lazenby, Larry Banks and Steve Klinge, Centre for Genetic Improvement of Livestock, is designed to make purchasing beef sires easier, faster — and above all, more profitable — for farmers.

"We're providing producers with a convenient opportunity to buy the sires that best suit their business," says Miller. "They only need to answer a few questions on the web site and our program will reply with a detailed list of dozens of tested bulls with the qualities they're after."

For example, the BIO-mate web page asks these questions:

What cattle breeds do you own?

How many replacement females are kept each year?

What are your pasture and grain costs?

What beef market do you produce for?

When complete, farmers can further narrow down their options by stressing certain sire features such as its birth weight or age. The program then generates a list of all suitable Ontario bulls and their associated EPD's. Included in this list is information about the sire's parentage, its various test results, estimated progeny performance...and even a photo, where available.

Most importantly, the information provided is always accurate and up-to-date — a valuable attribute in a business where statistics and prices can vary on a daily basis.

In recent years, breeding beef cows to the proper

sire has become a complex and, at times, confusing business. Bulls are being tested and graded on an ever-increasing number of factors, from the expected weights of their offspring at various ages to the type and quality of different cuts of meat.

No bull will be ideal in all qualities. So farmers must weigh their priorities and choose the best possible sire from this maze of statistics, ratings and test results.

To address the information overload, Miller, Wilton and their research team developed a computer program that helps producers choose the most profitable bull for their individual farm. The customized selection index takes an array of variables into considera-

tion to produce a Predicted Dollar Difference (PDD), which represents the extra money that the producer will earn by choosing one particular bull over another — an amount that can reach thousands of dollars per

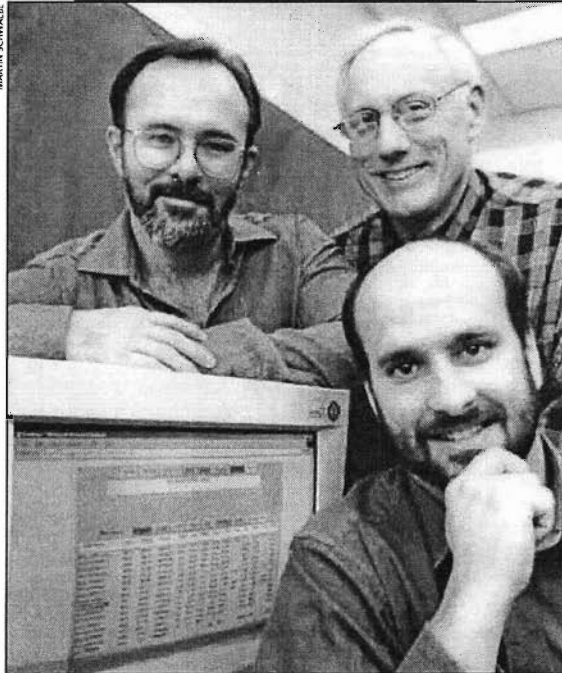
year.

Taking this technology one step further, BIO-mate will soon be offered to Ontario beef producers over the Internet. Although still in its testing phase, Miller feels this product will be a welcome addition to the Ontario beef industry and possibly beyond.

"The current model is restricted to Ontario sires, but there's plenty of room for expansion," says Miller. "With artificial insemination it's possible that in the future, producers could be choosing the most profitable sires from around the world."

This project is supported by Beef Improvement Ontario and the Natural Sciences and Engineering Research Council.

MARTIN SCHWABE



**Research associate Larry Banks (left), along with Profs. Jim Wilton and Steve Miller have developed BIO-Mate, a website that's designed to make purchasing beef sires easier, faster and more profitable for farmers.**

# Targeting top-notch beef

*Novel breeding approach aims for a bull's eye*

BY ARIANA MURATA

Predicting the best bull to sire first-rate beef is usually very difficult. But now, a novel genetic performance assessment is closing in on the mark.

Prof. Steve Miller, Centre for Genetic Improvement of Livestock, has developed a beef cattle evaluation method that considers the dynamic nature of biological traits such as growth, feed intake and body composition for potential breeding bulls. By studying dynamic or changing traits, an individual bull's progress can be followed over time, rather than focusing on static or fixed measurements.

## FOCUS ON THE FINAL PRODUCT

Traditional beef cattle genetic evaluations consider characteristics such as birth weight or fat thickness measured only at one year of age. They give greater importance to these checkpoints rather than the desired end product: a beef steer that has attained an optimal weight and fat thickness for market. With repeated measurements of dynamic traits over the life span of bulls on test, the accuracy of genetic evaluations will improve.

"Weight gain rates will vary for each animal, depending on growth conditions and genetic make-up," says Miller. "Overall, a beef steer's weight and fat thickness will only matter once it's ready to go to market — not at birth, or when it's one year old."

On a four-month research study at Armidale, Australia in 1998, Miller analysed data — previously collected by Australia's Beef Cattle Cooperative Research Centre — on 3,000 steers. Uniquely, this centre had taken repeated carcass trait measurements (between the period of weaning to slaughter) for each steer with the use of ultrasound — a costly but effective procedure. Carcass measurements included weight, growth rate, back fat depth, and rib-eye area.

Analysis of the data gave Miller insight into the usefulness of repeated ultrasound measurements to improve the genetic evaluation of bulls.

Now, as a continuation of his study, Miller is taking similar measurements from steers at the Elora Research Station, University of Guelph. The data collected at Elora will help Miller expand and validate the work he did in

Australia and hopefully show that the usefulness of multiple carcass measurements outweigh the cost of using ultrasound.

Beef Improvement of Ontario's Bull Evaluation Program has data collected on 50,000 bulls since the 1970s. Ultimately, the program's goal is to select the most promising bulls for breeding stock. Miller hopes his research will also contribute to this information database and overall, help to genetically improve beef cattle in Canada.

"Previously, we were mainly concerned with back fat depth, rib-eye area, and marbling measurements at a year of age," says Miller. "This novel genetic evaluation model will allow us to be more flexible and ultimately, more efficient at predicting carcass traits in commercial steers."

This research was sponsored by the Meat Research Council of Australia, as well as Beef Improvement Ontario, with matching funds provided by the Natural Sciences and Engineering Research Council.



**A new genetic performance evaluation method will help better predict the best bull to sire first-rate beef.**

# It's all in the genes

## Beef genetics assessed for role in meat tenderness

BY MIRJANA VRBASKI

**G**enetically improved meat tenderness traits will help ensure consistent beef quality. And that means more satisfied consumers, say University of Guelph researchers.

Since 1996, research associate Profs. Michelle Edwards, Ira Mandell and Jim Wilton, Centre for Genetic Improvement of Livestock, along with beef geneticist Joanne Handley, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) have been studying the genetic factors that affect meat tenderness levels in beef. The project is an effort to satisfy all players in the Ontario beef industry, including producers, processors, retailers and consumers. Another objective of the work is to provide beef producers with added knowledge about their product and the ability to make improvements to it.

"The primary reason for the dissatisfaction of meat consumers is the lack of product consistency," says Edwards. "By understanding the genetics behind beef tenderness, producers will have the tools to deliver a consistent product that better meets market requirements."

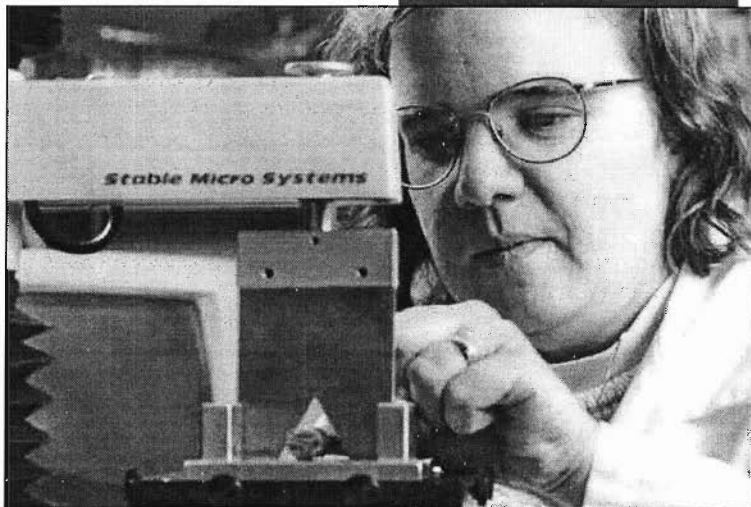
### TARGETING DIFFERENT MARKETS

For the study, researchers are developing two lines of cattle, a maternal and a terminal line. Each line is geared towards a different market — the maternal line produces heifers with high reproductive rates, good mothering ability and high milk yield. Steers from this line have carcass weights of 650-700 lbs and high marbling, carcass traits favoured by the restaurant industry. Steers from the maternal line are tested for quality traits. The heifers and cows from that line are then bred to sires in the terminal line.

Terminal line progeny produce lean beef with high cutability and carcass weights of over 750 lbs, traits favoured by meat processors. The researchers are using these herds to determine the genetics that influence carcass differences when targeting production to two specific end markets.

The study targets the relationship between steer performance traits, which include growth and feed requirements (efficiency), and its carcass quality. This relationship is determined by conducting various carcass assessments, including weight, marbling and rib-eye-area measurements. The influence of different diets on steers' meat quality is also tested.

Cattle are raised at New Liskeard Agricultural Research Station, Agriculture and Agri-Food Canada's Kapuskasing



Using tests such as the Warner-Bratzler shear force test (shown here), research associate Michelle Edwards is studying the genetic factors that determine meat tenderness levels in beef.

Research Station and Elora Beef Research Centre (EBRC), with all feedlot measurements taking place at the Elora centre. All steers and terminal heifers are slaughtered at the University of Guelph's meat laboratory, where carcass quality measures are taken.

Rib-eye roasts from each steer are evaluated in taste panels and assessed for traits such as tenderness, juiciness and flavour. These data are statistically analyzed, taking into account trait differences between cattle breeds, feed type, as well as between sires, dams and progeny.

### THE POTENTIAL TO IMPROVE PROGENY

By calculating expected progeny differences for sires, the researchers are able to determine which sire has the potential to improve beef quality traits.

So far, the researchers have evaluated three calf crops from the maternal line and one calf crop from the terminal line. A new group of calves born in 1999 entered the feedlot last fall.

"We have concluded that sire breed has an effect on carcass weight, rib-eye area and marbling," says Edwards. "By identifying sires with desirable meat quality traits, beef producers will have the tools required to meet consumers' demands."

This project is sponsored by the OMAFRA and is a cooperative effort of the breeding programs from New Liskeard Agricultural Research Station, Agriculture and Agri-Food Canada's Kapuskasing Research Station and EBRC.

# Survival data, at its best

## *Finding the best method to measure dairy cattle longevity*

BY JUHIE BHATIA

Canadian systems that measure and record dairy cattle longevity are being improved at the University of Guelph.

Research associate Dr. Paul Boettcher, Centre for Genetic Improvement of Livestock, is working to find the best approach for the statistical analysis of dairy longevity data. Longevity is an important trait for dairy cows' genetic evaluation, by organizations such as the Canadian Dairy Network, that compile a range of records from Canadian dairy farms and statistically predict the genetic value of animals in a population.

### A LONGER LIFE

A longer life span is associated with lower production costs and decreased culling. Raising a cow is expensive; it can cost a producer up to \$2,000 to care for a calf until it's old enough to be milked. Improved longevity makes this upbringing more economical and leads to increased milk production, because older cows produce more milk than younger cows.

Longevity is based on how long each animal lives — expressed as the number of lactations the cow survives — from which valuable herd life information can be determined. Longevity is measured in a variety of ways.

"In Canada, longevity is assessed as a binary trait," says Boettcher. "It's based on yes or no answers as to whether the cow survived through the lactation. This system has its advantages in that it's simple to implement...but it has some theoretical weaknesses."

However, Boettcher says Canada's current method for assessing longevity doesn't account for the differences in days survived within a lactation. Also with this system, records of survival are not added to the database until a reported re-calving or culling. This can delay the results of longevity evaluation for up to a year or more.

### FINDING AN ALTERNATIVE

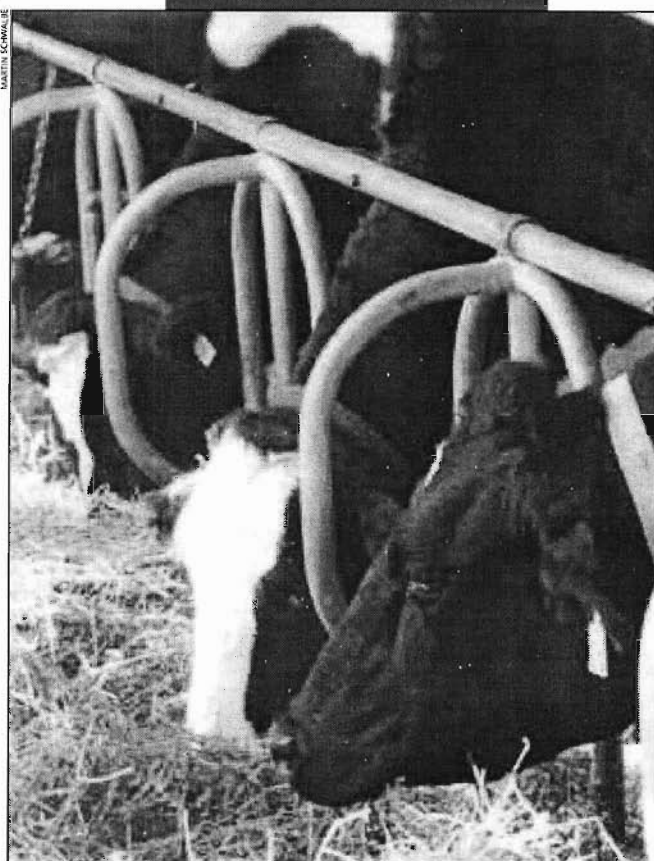
Boettcher says that an alternative longevity measuring system, called "survival analysis," is better than Canada's current system. It estimates a producer's need to cull an animal at any period throughout its lifetime.

Boettcher believes survival analysis may be a more appropriate way to analyze survival because it's a more precise statistical model. It can account for differences in the number of days lived between cows that survive the same number of lactations. Also, the survival model includes data on the number of days a cow has survived even while it's lactating, instead of having to wait for the start of lactation or culling. This makes greater amounts of information available earlier, because it's immediately recorded.

Boettcher doesn't believe the survival analysis approach on its own is ideal, either. So he's devising a more appropriate method of data analysis that combines existing methods with survival analysis.

"If survival data is analyzed using the two different approaches, there will be a clear difference in longevity results," says Boettcher. "This makes it worthwhile to change the system."

This research was funded by DairyGen (formerly the Cattle Breeders' Research Council).



**Longevity is an economically important trait in dairy cows. However, Canadian systems that currently measure this trait are being improved with more precise statistical methods.**





# All the answers

## *Advanced dairy data simulation: a sophisticated research tool*

BY IAN LANG

**R**ealism and flexibility — those are the critical characteristics a University of Guelph research group says will propel a new technology its developed to new heights in dairy herd simulation.

Drs. Andy Robinson, Gerald Jansen, Jane Tosh, and Ching Lin, Centre for Genetic Improvement of Livestock, are completing what they believe is one of Canada's most advanced dairy data simulation programs, the Dairy Data Simulator (DDS).

### WHAT ARE THE LONG RANGE EFFECTS?

The DDS is a software program that gives researchers a way to create a realistic population of computer-generated dairy cows to predict the long range effects of experimental production practices. The program is highly flexible, capable of assisting in matters that include nutrition, genetics and management.

"We're building a sophisticated research tool," says Robinson. "The Dairy Data Simulator can be used to quickly and efficiently answer a countless number of questions that the dairy industry may have."

The simulation process begins when researchers input information about the virtual population they want to create, such as the number of cows they'd like to use and the experimental changes they're making.

After the initial input, the computer takes over, mimicking the Canadian dairy industry as closely as possible. A dairy population of thousands of animals is artificially generated with the genetic make-up and variability of current Canadian-bred Holsteins. This simulation herd is then divided into herds averaging 45 head (the average number in a typical Canadian dairy herd).

The virtual cows are kept for three lactations and poor performers are culled and replaced when needed. Young bulls are tested according to industry standards; the best are kept and used for breeding for up to 12 years in a simulated artificial insemination unit.

### CREATING VIRTUAL CATTLE

Within a matter of hours, many generations of virtual cattle are produced. Output from the program is given in terms of milk 'test day' records (the simulator is also the only program of its kind that's directly compatible

with the model used by the Canadian Dairy Network to generate bull and cow proofs).

The first project for the simulator will be to look at the effects of reducing the number of milk test days per cow each year. Although milk testing is critical to producers in terms of finding the best individuals to breed, it can be very expensive. The program has already simulated a reduction of test days from 10 times a year to five, and found that it doesn't affect progress of the breeding program decades into the future.

The possibilities don't end there — the DDS may soon be giving answers to researchers from a wide range of fields.

"We can look at anything from breeding strategies to new feed additives to the type of floor surface used in a stall," Robinson says. "If we know the initial effects on just a few cows, we can accurately extend it to cover thousands."

This research is supported by DairyGen (formerly the Cattle Breeders' Research Council) and Agriculture and Agri-Food Canada.



MARTIN SCHWALBE

**Prof. Andy Robinson and colleagues are putting the finishing touches on a software program that's one of Canada's most advanced methods of dairy data simulation.**

# A mindful model

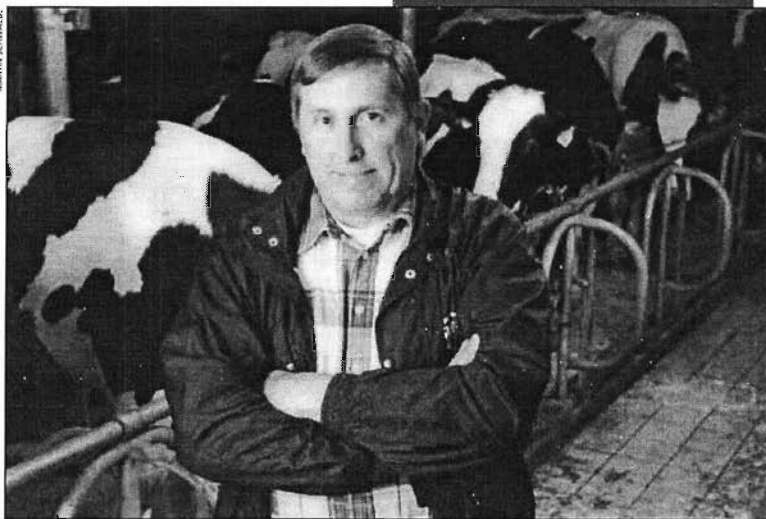
## Greater milk recording flexibility for dairy producers

BY CAROL PILLEY

A new statistical model that predicts daily milk yields could mean greater flexibility for dairy producers involved in milk recording programs, allowing them to decrease their costs while maintaining the accuracy of their records.

Prof. Larry Schaeffer and research associate Dr. Janusz Jamrozik, Centre for Genetic Improvement of Livestock, graduate student Renate Van Dorp, Don Lazenby from the Ontario Dairy Herd Improvement Corporation (Ontario DHI) and Prof. David Kelton, Ontario Veterinary College, have developed factors to predict 24-hour milk, fat and protein yields from a single milking — figures known as test day records — for dairy cows that are milked either two or three times daily.

MARTIN SCHWABE



### DETERMINING GENETIC POTENTIAL

Test day records are used in the new Canadian Test Day Model (CTDM) that was also developed by Schaeffer and Jamrozik. The CTDM accurately determines the genetic potential of dairy cows and their sires for production traits. Test day records are collected monthly for each animal's first three lactations. The results from the CTDM are expressed as estimated breeding values (EBV). For official test day records, EBVs for sires are published as bull proofs or cow indexes by the Canadian Dairy Network so that breeders can assess an animal's genetic performance.

### MILK RECORDING IS BENEFICIAL

Approximately 70 per cent of dairy farms in Ontario are voluntarily involved in milk recording programs. Milk recording is beneficial to producers because each farm receives production information about their dairy cows from Ontario DHI, as well as management information for their herd.

But it's still a costly initiative for dairy producers. Although the development of new software and hardware programs has improved milk recording, a visit from an Ontario DHI supervisor can slow down a facility's production on test day. As well, there is a fee for this service. So milk recording organizations are trying to improve the flexibility of data collection by allowing producers to choose how often they want to provide data.

"A more flexible milk recording system could make it easier for producers to continue to participate," says Schaeffer.

Traditionally, dairy herds are milked twice a day. A growing number of farmers are now milking three

times a day — a practice that increases milk production by about 10 per cent. However, many producers have avoided the three-times daily milking scheme...there were no accurate factors for estimating daily milk yields from just one or two milkings (instead of all three) using this scheme, so highly coveted official genetic evaluations could not be provided for their cows. Lazenby and Kelton initiated the research by collecting data from farms that were milking three times daily.

The new factors are aimed to help producers get the information they need by generating accurate test day records for genetic evaluation. The most ideal and accurate milk recording schedule would involve taking weights and samples at all milkings. But farmers prefer not to have the Ontario DHI supervisor on the farm all day. With this model, yields from a particular milking can be used to extrapolate the yields for 24 hours. For example, data can be collected at the morning milking only, or the morning and afternoon. Even without data from each milking, daily yields can be estimated and included in the test day model, giving the farmers more flexibility in choosing the appropriate milk recording alternative for them.

This research was sponsored by the Ontario Ministry of Agriculture, Food and Rural Affairs.

**Prof. Larry Schaeffer and colleagues have developed a new statistical model that predicts daily milk yields, to allow more flexibility for dairy producers involved in milk recording programs.**

# Family planning... for fish

## *Genetic technology improves selection of better rainbow trout*

BY IAN LANG

**B**y tracing the family trees of farmed fish, a University of Guelph research group is hoping to give producers improved breeding stock...and provide consumers with the best product possible.

Research teams from the Centre for Genetic Improvement of Livestock (CGIL) and the Department of Zoology are collaborating to examine the genetic relationships within schools of rainbow trout. They're using DNA technology to sort the fish into families, to select a strong and progressive parent stock without the fear of inbreeding.

### **DEVELOPING A NEW STRAIN**

The researchers are defining how much impact genetic selection can have on improving the physical traits of rainbow trout. Using DNA analysis, they'll develop a new strain of rainbow trout – one that grows more rapidly, reaches sexual maturity at a later age, and spawns in the spring rather than the fall. Early spawning is of particular interest because it would provide producers with a second annual harvest and consumers with a more consistent source of fresh Ontario fish.

Without looking at the genetic make-up of the fish, selecting breeding stock can be a problem.

"Looking down into a tank of hundreds or thousands of rainbow trout, it's impossible to know who's who," says research associate Laura McKay, one of the project's leaders. "Genetic analysis reduces that problem and helps us avoid breeding brother to sister."

Rainbow trout are quickly becoming a major factor in the agricultural landscape of Ontario. Farms that can produce hundreds of thousands of individual fish each year are appearing throughout the southern part of the province, busily accommodating the expanding retail fish market.

Like any agricultural commodity, fish producers continually strive for improved parent stock and better management practices. Progress toward faster growing, more efficient animals can, however, be particularly difficult in aquaculture. With thousands of virtually identical fish intermingling in pool-sized tanks, it's difficult to identify individuals with superior genetics and isolate individuals that show extraordinary physical properties.



Prof. Ian McMillan (left), graduate student Cheryl Quinton and research associate Laura McKay are examining the genetic relationships within schools of rainbow trout to select a strong and progressive parent stock without the fear of inbreeding.

Then, even if this feat is accomplished, there's no guarantee the parents selected aren't

brother and sister...a single mating will typically produce 3,000 to 5,000 fry, so accidentally breeding siblings is an easy mistake to make.

McKay says genetic technologies may be the key to making the best possible choices of breeding pairs. Using several tanks, the CGIL research team produced a series of pooled lots of rainbow trout. Each group was started with three to four unrelated females and three to four unrelated males. As the fry grew and developed, fin clippings were collected, the DNA extracted and then analyzed by the Zoology team.

The results of the DNA tests enabled the researchers to trace offspring back to their parents. This information allows young fish with desirable characteristics to be selected and bred with unrelated counterparts, avoiding the potential complications of inbreeding.

"Genetic technologies can provide us with an edge over traditional parent selection techniques," says McKay. "With faster development of new trout strains, we can pass those advantages on to the consumer as quickly as possible."

The research team consists of McKay, Prof. Ian McMillan and graduate student Cheryl Quinton, CGIL, and Prof. Roy Danzmann, Prof. Moira Ferguson, and graduate student Gavin McDonald, Zoology.

This research is sponsored by the Ontario Ministry of Agriculture, Food, and Rural Affairs.

***"Genetic technologies  
can provide us with  
an edge over  
traditional parent  
selection techniques."***

# Transgenic chickens lay future benefits

*These eggs could fight a broad range of bacteria*

BY JUHIE BHATIA

**T**ransgenic technology is being used at a University of Guelph research laboratory to modify the normal antibiotic component of chicken eggs, for increased food safety and medical benefits.

Prof. Ann Gibbins, Animal and Poultry Science, is working with research assistant Dr. Guodong Liu and graduate students Jan Losos and Gregory Lampard to create transgenic chickens with increased amounts and types of an antimicrobial protein called lysozyme.

Lysozyme, normally found in egg white, protects the embryo within the egg from microbial contamination. In food processing, it is routinely isolated from eggs and used to enhance food preservation and prevent contamination of everything from fish and cooked meats to toothpaste and mouth wash.

"Lysozyme can selectively destroy certain harmful microorganisms while allowing beneficial bacteria to survive," says Gibbins. "There are tremendous market applications for this protein if its production could be increased."

So researchers want to genetically engineer increased lysozyme levels in eggs, and broaden its effectiveness against more disease-causing and food-spoilage organisms.

## THE DEMAND IS INCREASING

Canada produces about one-sixth of the world's supply of lysozyme from egg white proteins. But the demand is increasing rapidly. Lysozyme can also be modified to have a wider bacterial range against disease-causing or food-spoilage bacteria. This is of particular interest to the medical community where there's concern

of pathogenic bacteria developing resistance to current antibiotics. Gibbins says novel lysozyme could act as an alternative antibiotic.

## MAKING ALTERATIONS

Alterations to lysozyme are possible through transgenic animal lines. Transgenic animals such as sheep, fish and goats have been developed by researchers worldwide, but transferring genes to chickens has proven more difficult. This is mainly due to the hard eggshell which surrounds chickens' embryos, restricting access.

Gibbins and her research team have been working for 10 years to develop an effective technique for inserting foreign material into chicken embryos. They have been successful in producing transgenic birds using a method that involves a donor and recipient egg. Cells from the donor embryo are mixed with the foreign gene and then injected into the recipient embryo through a hole in its eggshell.

The embryo grows as a mixture of normal and modified cells — called the chimeric intermediate — in hopes that its offspring display the foreign genes.

A series of experiments by Gibbins and her team have begun, involving the insertion of extra copies of the lysozyme gene into chickens to improve lysozyme production. They're also inserting altered copies of the gene to produce a novel version of lysozyme.

Potential transgenic birds are currently being analyzed, and their eggs will later be examined for the deposition of the increased or modified lysozyme. Commercially useful transgenic chickens should be available in the next five years.

This research is sponsored by the Ontario Egg Producers' Marketing Board, Ontario Ministry of Agriculture, Food and Rural Affairs, Agriculture and Agri-Food Canada and the Natural Sciences and Engineering Research Council.



Graduate students Gregory Lampard (left) and Jan Losos, along with research assistant Guodong Liu and Prof. Ann Gibbins (right) are creating transgenic chickens with increased amounts and types of an antimicrobial protein called lysozyme.



# The French connection

***A Canadian horse's link to its French counterparts may provide a genetic safety net for the future***

BY IAN LANG

If a "genetic emergency" arises in native Canadian horse breeds, a University of Guelph researcher is helping the industry be ready.

Industrialization has left regional and national breeds — including three distinctly Canadian breeds — out of the spotlight and potentially threatened with extinction, says researcher Anouk Behara. This leaves horse enthusiasts concerned about inbreeding and limited genetic variability within these groups. So along with Prof. John Gibson, Centre for Genetic Improvement of Livestock, and Dave Colling, Maxxam Equitest Inc., she's used DNA technology to investigate the genetic backgrounds of Canadian horse breeds and track down some of their distant ancestors...in case they ever need a quick dose of genetic variability.

## A THOROUGH INVESTIGATION

Behara's research began as an investigation into a few of Canada's horse breeds: the cheval Canadien (also known as 'Canadian'), and two ponies, the Newfoundland, a sturdy, all-purpose breed, and the Lac LaCroix, used originally for riding by some aboriginal Canadians. The cheval Canadien dwindled in numbers to about 400 in the 1970's before making a comeback to roughly 3,000 today. And, only meager populations of the Newfoundland (200) and Lac LaCroix (32) exist currently. As genetic variation decreases, it becomes increasingly likely that heritable diseases will increase within the population.

By looking at DNA samples from these horses and comparing their variability to those of 11 common North American breeds such as the Quarterhorse and the Thoroughbred, Behara found that the cheval Canadien and the Newfoundland have healthy and acceptable levels of genetic variation. The Lac LaCroix pony, however,

seems to have a more limited genetic basis, although inbreeding is not yet a major concern.

If a problem ever does arise, Behara has proposed a strategy: find the breeds that are most closely related to the endangered group, minimize the genetic severity of the combination, and hopefully make as small a physical change in the new generation as possible.

## MINIMIZING THE THREAT OF EXTINCTION

To this end, Behara compared the DNA of the cheval Canadien to those of other breeds, including horses of both North American and European descent. She discovered that a French breed, the Trotteur Français is its closest relative. One North American breed — the Morgan — also stood out as a close cousin of the cheval. Although the cheval is currently thriving on its own, these two related breeds seem to be the best choice for cross-breeding purposes, if a "genetic emergency" should ever arise.

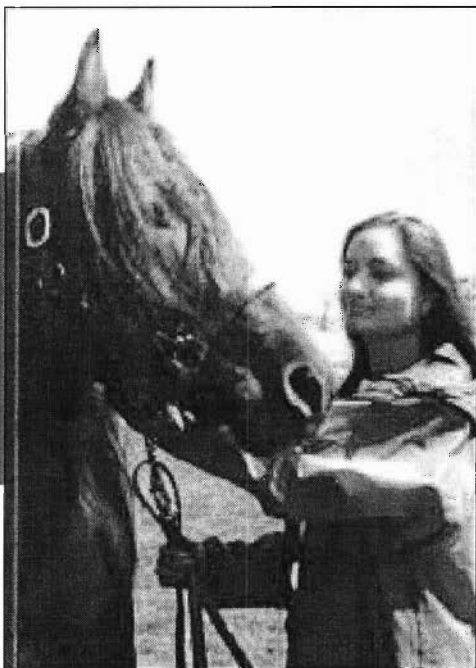
Behara says her techniques are easily transferable to any breed facing the threat of extinction.

"Nothing about the general research methods is specific to horses," says Behara. "Rare breeds of cattle, pigs, poultry, even wild species may be able to benefit from this model."

This research was sponsored by the Equine Research Centre with data provided by Maxxam Equitest Inc. and Dr. J.C. Meriaux from the Institut National de la Recherche Agronomique, France.

KESTI KAHAR

**Anouk Behara is using molecular genetics to compare the amount of genetic variation within rare and common horse breeds.**



# Right on the mark

## Molecular markers help map the pig genome

by JENNY TYE

**Q**uickly and efficiently pinpointing animals most likely to succeed in genetic evaluation is crucial in today's highly competitive swine breeding business.

And that's part of the reason Profs. John Gibson and Zhihua Jiang, Centre for Genetic Improvement of Livestock, are working with researchers from the Roslin Institute, Scotland to detect genes called quantitative trait loci (QTL). These genes cause variation in swine and can have economically important effects on traits such as reproduction.

Ultimately, locating QTLs will help pig breeders quickly select those progeny that are most likely to pass superior reproductive ability to their offspring. This project is part of a larger effort aimed to help Canadian swine breeding programs stay competitive by developing a solid and viable Canadian research program in pig genome mapping.

Right now, the researchers are tracking inheritance patterns of QTLs that affect litter size in crosses of Chinese Meishan pigs — famous for large litter sizes — and European Large White pigs, popular in North America for sow productivity and carcass traits. Litter size is one of the most difficult and expensive traits to improve in traditional swine breeding programs because reproduction can only be measured in sexually mature females.

### USING POWERFUL GENETIC TOOLS

To detect QTLs, the researchers are using powerful genetic tools called molecular markers. Each marker is a landmark at a specific point on a given swine chromosome and can be associated with genes of economically valuable function. When researchers follow the inheritance of a particular marker from parent to offspring, they also follow the inheritance of a particular region of a chromosome. Genetic markers provide an accurate way to learn about an animal's genetic make up.

Molecular genetic markers are divided into two groups: anonymous markers and candidate gene markers. Anonymous markers are not part of known genes and do not control sequences of known genes. However, when an animal inherits a genetic marker from its parents, it also inherits a large region of DNA on either side of the marker. When researchers follow the inheritance of these anonymous markers from parent to off-

spring and compare this information to the genetic value of each sow, they can determine which DNA segments have useful effects on reproduction.

Candidate gene markers are used similarly to anonymous markers. But they're more targeted and can detect variation in swine genes of known or inferred function, related to reproduction.



**Profs. Zhihua Jiang (pictured here) and John Gibson are working with researchers in Scotland to compile genetic information that will allow them to quickly and efficiently pinpoint pigs that are most likely to succeed in genetic evaluations.**

### MICROSATELLITE MARKERS

For this genome mapping project, researchers at the Roslin Institute collected information from their resource swine herd using microsatellite markers, the most widely used class of anonymous markers used in genetic research today. The CGIL researchers collected information from the same pigs using a newer and less commonly used type of anonymous marker, called amplified fragment length polymorphisms (AFLPs), as well as candidate gene markers. Gibson, Jiang and their colleagues in Scotland are now compiling and analyzing the data collected during the three marker studies.

Each marker type complements the other because they differ in the amount, type and quality of information provided. In this way, the researchers ensure they gather the most comprehensive QTL data possible.

Using different marker types has other advantages, too. As part of this pig genome project, the researchers are comparing the performance of the two anonymous marker types, AFLP and microsatellites. AFLP are faster and less expensive to use than microsatellites, but AFLP can be difficult to score. This pig genome project is the perfect opportunity to scientifically explore the potential for more AFLP use in future genome mapping projects.

Data collection for the first part of this study is now complete, but data analysis is still underway. The CGIL researchers will soon continue and then test their pig genome work with another company called Genex, which has a commercial Meishan x Large White herd in Saskatchewan.

This research is sponsored by Ontario Pork, Ontario Swine Improvement, the Natural Sciences and Engineering Research Council and the Ontario Ministry of Agriculture, Food and Rural Affairs.

<http://cgil.uoguelph.ca>

CGIL

## **CURRICULUM RESUMIDO**

### **ANTECEDENTES PERSONALES**

**Nombre:** Mario Briones Luengo

**Fecha de nacimiento:** 9 de junio de 1959

**Nacionalidad:** Chileno

**RUT:** 7.999.244-5

**Dirección:** Vicente Méndez, Casilla 595, Chillán.

### **TÍTULOS Y GRADOS**

Médico Veterinario (Universidad de Concepción, 1986)

Master of Science. Animal Breeding (University of Edinburgh, Scotland, 1992)

### **OTROS CURSOS EN EL AREA DE ESPECIALIZACION**

Farm Management Diploma (Talking Farms, University of Edinburgh, University of Reading and ODA, Inglaterra, 1991).

Artificial Insemination and Embryo Transfer (Somerset Cattle Breeding Centre, Inglaterra, 1991).

Formulación y Evaluación de Proyectos (Facultad de Medicina Veterinaria, Universidad de Concepción, septiembre 1994)





**ANEXO 3**  
**CARTA O CERTIFICADO DE ACEPTACION DEL POSTULANTE O**  
**GRUPO A LA ACTIVIDAD DE FORMACIÓN**

# UNIVERSITY of GUELPH

ONTARIO AGRICULTURAL COLLEGE  
Department of Animal and Poultry Science

May 10, 2001

To Whom It May Concern:

This letter is to confirm that Mario Briones is a registered participant in the Centre for Genetic Improvement of Livestock Summer Course 2 "Economic Aspects of Applied Animal Breeding" scheduled for July 9-13, 2001 at the University of Guelph, Ontario, Canada. His registration is tentatively confirmed assuming payment will be forthcoming in the very near future since the course is limited to 40 participants on a first come, first served basis and placement is only guaranteed upon payment of the registration fees

Yours truly,



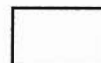
L.R. Schaeffer  
Acting Director  
Centre for Genetic Improvement of Livestock

LRS:gc

Aquaculture  
Extension Centre

Centre for the  
Study of Animal Welfare

Centre for the  
Genetic Improvement of Livestock



**ANEXO 4**  
**ANTECEDENTES CURRICULARES Y/O**  
**CONTENIDOS DE LA ACTIVIDAD DE FORMACIÓN**

Centre for Genetic Improvement of Livestock  
Courses



## *Summer Courses 2001*

The Centre for Genetic Improvement of Livestock at the University of Guelph is pleased to offer the following two summer courses to be held in July, 2001.

### **Course 1**

Genetic Improvement of Resistance to Infectious Diseases

Instructor: Johann Detilleux, Belgium

July 2-6, 2001

Outline:

#### ■ Justifications

- Monetary Losses
- Unfavourable Associations
- Emerging Infectious Diseases
- Changes In Consumers' Attitude
- Farm Animal Welfare
- Antibiotic Resistance
- Farm Animal Biodiversity

#### ■ Fundamentals

- Genetics
- Bacteriology
- Immunology
- Epidemiology
- Ecology
- Clinical Sciences

#### ■ Applications In Improvement of Resistance to Bovine Mastitis

- Receiver Operating Characteristic Curves
- Mixed Normal Mixture Models
- Mathematical Models of Mastitis Dynamics

Level: M.Sc./Ph.D. and above level. A sound knowledge of basic quantitative genetics and basic principles of animal breeding is assumed.

### **Course 2**

Economic Aspects of Applied Animal Breeding

Instructor: Jack C.M. Dekkers, Iowa State University

July 9-13, 2001

Outline:

- Stochastic Models to Simulate Breeding Programs
- Basic Principles for Deterministic Prediction of Response to Selection
- Selection Index Methods
- Deterministic Models for Animal Breeding Programs
- Breeding Goals and Economic Selection Criteria
- Economic Appraisal of Animal Breeding Programs
- Marker Assisted Selection

Level: M.Sc./Ph.D. and above. Participants should have a sound knowledge of basic quantitative genetics and principles of genetic evaluation.

### Note

Morning sessions will have lectures while afternoon labs will work on exercises in the computer lab.

### Cost Per Course

Graduate Students - \$250.00

Post-Docs/Researchers - \$500.00

Industry - \$750.00

\* Course notes, computer use and coffee breaks included. Room and board extra.

### Eligibility

Open to all on a first come, first served basis. Maximum of 40 participants.

### Location

Courses will be held at the University of Guelph, Guelph, Ontario, Canada.

### Registration Details

Deadline for registration is June 15, 2001. Registrations may be made by mail or fax. If registering by mail please send your registration form together with payment to Gail Costigan, Animal & Poultry Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1. If registering by fax please forward your payment to the same address.

**Registration is only guaranteed upon receipt of payment.** The registration form in PDF format is provided below. You will require Adobe Acrobat Reader to view and print. Payment of course fees should be by cheque, bank draft or money order payable in Canadian dollars to the "University of Guelph". Visa, Mastercard or American Express cannot be accepted. If you have any questions please direct them to [gcostiga@uoguelph.ca](mailto:gcostiga@uoguelph.ca).

[Registration Form](#)

### Accommodation

Conferences/Hospitality Services at the University of Guelph will be providing on-campus accommodation for those who require same. An accommodation form in PDF format is provided below. You will require Adobe Acrobat Reader to view and print. **Please note** that the form should be forwarded directly to Conferences/Hospitality Services.

[Accommodation Form](#)



## **ANEXO 5 COTIZACIONES**



CHILLAN, 15 Mayo del 2001

SEÑORES

MARIO BRIONES

PRESENTE

LINEA AEREA : LAN CHILE  
ROTA : SANTIAGO/TORONTO/SANTIAGO  
TARIFA : USD 1.214  
TAX : USD 41  
TOTAL : USD 1.255

LINEA AEREA : UNITED AIRLINES  
ROTA : SANTIAGO/TORONTO/SANTIAGO  
TARIFA : USD 1.214  
TAX : USD 41  
TOTAL : USD 1.255

TARIFAS SUJETAS A MODIFICACION POR LA LINEA AEREA

Le saluda Atte.

  
MARIA YLRESA CHORIOTTI  
Gerente General

ALTO NIVEL LTDA. AGENCIA DE VIAJES NACIONALES E INTERNACIONALES - TOURS Y EXCURSIONES

BARALCO 681 - OFICINA 5 - TELEFONO 227267 - TELEX 265011 - BOOTH CL - CASILLA 75 - FAX 211314 - CHILLAN

\*\*\*END\*\*\*





## REGISTRATION FORM

Please complete and return the form with payment to:

Gail Costigan

Centre for Genetic Improvement of Livestock

Animal & Poultry Science

University of Guelph

Guelph, ON N1G 2W1

Telephone 1-519-824-4120, Ext. 6180

FAX 1-519-767-0573

### THE CENTRE FOR GENETIC IMPROVEMENT OF LIVESTOCK SUMMER COURSES JULY 2-6, 2001 & JULY 9-13, 2001

PLEASE TYPE OR PRINT LEGIBLY

Name \_\_\_\_\_

Organization \_\_\_\_\_

Address \_\_\_\_\_

Advisor's Name (if Graduate Student) \_\_\_\_\_

Telephone \_\_\_\_\_

FAX \_\_\_\_\_

Email \_\_\_\_\_

**Course 1 Genetic Improvement of  
Resistance to Infectious Diseases**

Johann Detilleux

July 2-6, 2001

Graduate Student \$250 \_\_\_\_\_

Post-Doc, Faculty \$500 \_\_\_\_\_

Industry \$750 \_\_\_\_\_

**Course 2 Economic Aspects of Applied  
Animal Breeding**

Jack C.M. Dekkers

July 9-13, 2001

Graduate Student \$250 \_\_\_\_\_

Post-Doc, Faculty \$500 \_\_\_\_\_

Industry \$750 \_\_\_\_\_

**Total Fees** \_\_\_\_\_

Deadline for registration is June 15, 2001. Please mail registration form together with payment to Gail Costigan, Animal & Poultry Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1. Registration is only guaranteed upon receipt of payment. Payment of course fees should be by cheque or bank draft payable in Canadian dollars to the University of Guelph. If you have any questions please direct them to [gcostiga@uoguelph.ca](mailto:gcostiga@uoguelph.ca) or call 1-519-824-4120, Ext. 6180. Accommodation is being handled by Conferences/Hospitality Services under a separate form.



## ACCOMMODATION FORM

Please complete and return the form to:

Conferences/Hospitality Services  
University Centre, Room 432  
University of Guelph  
Guelph, ON N1G 2W1

**COURSE JULY 2-6, 2001**

**COURSE JULY 9-13, 2001**

### THE CENTRE FOR GENETIC IMPROVEMENT OF LIVESTOCK SUMMER COURSES JULY 2-6, 2001 & JULY 9-13, 2001

Please return the completed form with your payment (in Canadian funds) to the above address and your accommodation will be reserved for the dates indicated below. Please note, in order to receive the early bird rate your reservation must be received by our office **15 working days** before your scheduled check-in date. Also, please be aware that you must vacate your residence room (including personal items) and your residence key returned by 12 noon on the date of your departure.

#### PLEASE TYPE OR PRINT LEGIBLY

Name: \_\_\_\_\_ Male \_\_\_\_\_ Female \_\_\_\_\_

Address: \_\_\_\_\_ Email Address: \_\_\_\_\_

Telephone: (W) \_\_\_\_\_ (H) \_\_\_\_\_ Fax: \_\_\_\_\_

Arrival Dates: \_\_\_\_\_ Departure Dates: \_\_\_\_\_

Roommate: \_\_\_\_\_

#### ON CAMPUS RESERVATIONS - BED & BREAKFAST PACKAGE (including taxes)

| Type of Room<br>with Continental Breakfast | Arrival<br>Date | Departure<br>Date | Early Bird | Regular<br>Rate |   | # of<br>Nights | Total: |
|--------------------------------------------|-----------------|-------------------|------------|-----------------|---|----------------|--------|
| Single                                     |                 |                   | \$53.48    | \$55.16         | X |                |        |
| Shared (per person)                        |                 |                   | \$47.88    | \$49.56         | X |                |        |

Payment Enclosed \_\_\_\_\_. If choosing to make your payment by credit card, please include your credit card information below for processing (for on campus accommodation only) and fax completed form to 1-519-837-8630.

**HOTEL RESERVATIONS:** Please Do Not Send Payment for Hotel Reservations. Your payment will be processed by the hotel upon arrival. Your credit card number will only guarantee your room reservation. If you need to cancel reservations, please contact the hotel directly. If cancellations are not made, one night's room and tax will be applied to your credit card. For any changes please contact the hotel directly.

| Hotel       | Rate Per Night (not including tax) | Arrival Date | Departure Date |
|-------------|------------------------------------|--------------|----------------|
| Holiday Inn | \$129.00                           |              |                |
| Ramada Inn  | \$109.00                           |              |                |

\* Please provide a credit card number in order to guarantee your room. Credit card information.

Visa \_\_\_\_ Master Card \_\_\_\_ AMEX \_\_\_\_ Card Number: \_\_\_\_\_ Expiry Date: \_\_\_\_\_

Signature: \_\_\_\_\_ Today's Date: \_\_\_\_\_

**Thank you for choosing the University of Guelph. Should you have any questions, please do not hesitate to contact us at 1-519-824-4120 Ext. 2353**

Gail Costigan, 01:49 PM 15/05/01, Re: about my recent mail

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Date: Tue, 15 May 2001 13:49:32 -0400  
From: Gail Costigan <gcostiga@uoguelph.ca>  
X-Mailer: Mozilla 4.76 [en] (Windows NT 5.0; U)  
X-Accept-Language: en  
To: Mario Briones <mabrione@udec.cl>  
Subject: Re: about my recent mail

Regarding your questions. The course fees are in Canadian dollars. As far as transportation from the airport to Guelph I would recommend Red Car Airport Service. Arrangements can be made for pick up at the airport and transport to the University of Guelph. The cost is approximately \$95.00 return.

Gail Costigan  
CGIL  
Animal & Poultry Science  
University of Guelph

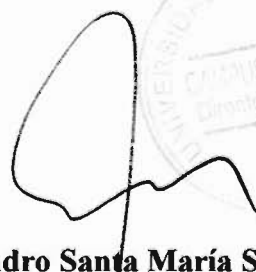


**ANEXO 6**  
**CARTAS DE COMPROMISO DE APORTES DE CONTRAPARTE**



## CARTA COMPROMISO

Mediante esta carta, la Dirección General del Campus Chillán respalda el aporte de contraparte en la propuesta **“Asistencia al curso de verano: Economic Aspects of Applied Animal Breeding”**, presentada al Programa de Formación para la Innovación Agraria del FIA. Este aporte corresponde a la suma de \$ 331.074, como se indica en las tablas de costos y de procedencia de los aportes de contraparte.



**Alejandro Sanja María Sanzana**  
Director General de Campus

Chillán, mayo 15 de 2001.



**ANEXO 7**  
**ANTECEDENTES DE LOS POSTULANTES O GRUPO**

## PAUTA DE CURRICULUM VITAE RESUMIDO

### ANTECEDENTES PERSONALES

|                                                                      |  |
|----------------------------------------------------------------------|--|
| Nombre completo                                                      |  |
| RUT                                                                  |  |
| Fecha de Nacimiento                                                  |  |
| Nacionalidad                                                         |  |
| Dirección particular                                                 |  |
| Fono particular                                                      |  |
| Fax particular                                                       |  |
| Dirección comercial                                                  |  |
| Fono y Fax comercial                                                 |  |
| Nombre y teléfono de la persona a quien avisar en caso de emergencia |  |

### ESTUDIOS

|                        |  |
|------------------------|--|
| Educación básica       |  |
| Educación media        |  |
| Educación técnica      |  |
| Educación profesional  |  |
| Estudios de post grado |  |

Completar ambas secciones o sólo una de ellas, según corresponda

| <b>EXPERIENCIA PROFESIONAL Y/O COMERCIAL</b>                                                                              |  |
|---------------------------------------------------------------------------------------------------------------------------|--|
| Nombre y RUT de la Institución o Empresa a la que pertenece                                                               |  |
| Cargo                                                                                                                     |  |
| Antigüedad                                                                                                                |  |
| Resumen de las labores y responsabilidades a su cargo                                                                     |  |
| Otros antecedentes de interés                                                                                             |  |
| <b>EXPERIENCIA COMO AGRICULTOR</b>                                                                                        |  |
| Tipo de Agricultor (pequeño, mediano o grande)                                                                            |  |
| Nombre de la propiedad en la cual trabaja                                                                                 |  |
| Cargo (dueño, administrador, etc.)                                                                                        |  |
| Superficie Total y Superficie Regada                                                                                      |  |
| Ubicación (detallada)                                                                                                     |  |
| Rubros a los que se dedica (incluir desde cuando se trabaja en cada rubro) y niveles de producción en el rubro de interés |  |





|                                                                                                             |  |
|-------------------------------------------------------------------------------------------------------------|--|
| Organizaciones<br>(campesinas, gremiales o<br>empresariales) a las que<br>pertenece y cargo, si lo<br>ocupa |  |
| Descripción de la<br>principal fuente de<br>ingreso                                                         |  |
| Objetivos personales de<br>la actividad de formación                                                        |  |
| Otros antecedentes                                                                                          |  |